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SECTION 02010 - FIELD ENGINEERING

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**PART 1 - GENERAL**

**1.1 DESCRIPTION**

A. Work Included

Work under this SECTION covers requirements for materials, tools, equipment, and services necessary to complete the Field Engineering of all work for this project. The work shall include, but is not necessarily limited to, completion of the following:

1. Surveys for acceptance of original ground lines
2. Stake Outs, including location and elevation of all work
3. Interim pay surveys as needed
4. Maintaining record survey notes and record plans (as-built drawings)
5. Final pay quantity surveys, including measurement of all bid items requiring taping or surveys
6. Preservation of the location(s) of land survey monuments, apparent property lines, all existing fencing, and any other features as noted on the plan or in other portions of the specifications

**1.2 QUALITY ASSURANCE**

- A. Contractor shall use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this SECTION.
- B. Contractor shall use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.
- C. In addition to complying with requirements of governmental agencies having jurisdiction, Contractor shall comply with the directives of Engineer and Division.
- D. Survey work and recording of data shall be in accordance with acceptable standards of practice of engineering and land surveying professions. Survey work shall be done with a licensed professional engineer or a licensed land surveyor in responsible charge, in accordance with provisions of Chapter 542B, Code of Iowa. This requirement is waived for that portion of the work that can be and is surveyed by Contractor's own personnel. The Contractor may use other competent persons that are trained in using Global Positioning System (GPS) equipment subject to the approval of the Engineer.

**1.3 SUBMITTALS**

- A. Record Plans (As Built Drawings): Specific requirements for record plans are indicated in the General Conditions (Document N, Paragraph 2-05 A) and in 3.7 below.
- B. Record Survey Notes: Specific requirements for record survey notes are indicated in the General Conditions (Document N, Paragraph 2-05 C), and in 1.2 D above.
- C. Survey notes of locations of all monuments, benchmarks, existing fences, and any other reference points that will be disturbed as part of construction.

**PART 2 - PRODUCTS**

Not Applicable

**PART 3 - EXECUTION**

**3.1 SURFACE CONDITIONS**

- A. Contractor shall examine the areas and conditions under which work of this SECTION will be performed and correct conditions detrimental to timely and proper completion of the work. Contractor shall not proceed until unsatisfactory conditions are corrected.

**3.2 DIMENSIONS AND ELEVATIONS**

- A. Contractor shall verify in the field all dimensions and elevations which are required. Elevations indicated and referred to in the Specifications and on the Plans are based on the bench mark datum indicated on the Plans. Horizontal and vertical control reference points shown on the Plans shall be re-established as necessary by Contractor prior to performing any layout of the work. Contractor shall promptly notify Engineer in case of discrepancies.

**3.3 POSITION, GRADIENT, AND ALIGNMENT**

- A. Competent survey personnel employed and paid by Contractor shall lay out and stake out all control points and reference stakes required for construction of the work. Contractor shall carefully preserve all existing monuments, bench marks, fence locations, and reference points shown on the Plans or encountered during construction. All existing monuments, bench marks, fence locations, and other reference points shall be surveyed prior to commencement of construction in these areas with the survey notes provided to Engineer. When necessary or requested, Contractor shall repair or replace damaged reference points at no cost to Division.
- B. All work performed under this Contract shall conform to the lines, grades and elevations shown on the Plans and with any tolerances which may be set forth in the Construction Specifications.
- C. All work completed without being properly located and established from the control reference points and bench marks shown on the Plans may be ordered removed and replaced at no cost to Division.
- D. Features such as terrace high points and low points, terrace outlets, ditches, etc., are shown on the Plans. Locate all features by coordinates or dimensions shown on the Plans. If no coordinates or dimension are shown, Contractor shall obtain this information electronically or request coordinates from Engineer.
- E. At the request of the Contractor, Engineer shall provide the site grading plan in a digital format to be used for GPS mounted equipment. The Engineer is not responsible for any misinterpretations or translations of the data that may arise.

**3.4 FINAL PAY QUANTITY SURVEYS**

- A. Any work item requiring field measurements shall be measured in place by Contractor accompanied by Engineer after said item is complete. Measurements shall be performed as agreed to by both the Engineer and Contractor.

- B. In the event surveying is required for final pay quantity, this work shall be performed and certified by a Contractor-retained licensed professional engineer or licensed land surveyor in responsible charge. In lieu of formal surveys, Contractor may wish to accept plan (bid) quantities for certain items as allowed for in the measurement and payment portion of each section.

### **3.5 INTERIM PAY QUANTITY SURVEYS**

- A. Any item of work which requires field measurements and which is not being submitted as final for that item, need not be certified.

### **3.6 STAKE OUTS**

- A. The number of earthwork stake outs is open to Contractor. A minimum of two (2) stake outs are required for earthwork when GPS mounted equipment is not used. The first stake out shall be near the beginning of the project to help establish rough grading limits, along with clearing and project limits. A final stakeout is required to establish final grades prior to liming for subgrade preparation. Interim stake outs shall be used at Contractor's discretion. The stake out used to establish final grades shall include stakes that are either set on a one hundred (100) foot grid, follow along contour lines with maximum one-hundred (100) feet spacing along the contour, or as needed to result in final grading consistent with project plans. Additional staking may be required to represent all site features. Engineer may request additional grade stakes to verify site features and/or elevations. Stake outs are not to be confused with required surveys for measurement purposes or as-built surveys.
- B. If the Contractor has equipment mounted with properly functioning GPS, then only a final check of key points or a final survey is required. The locations and frequency of checked locations shall be determined in consultation with the Engineer.

### **3.7 AS-BUILT SURVEY INFORMATION**

- A. The final locations of the items listed below must be surveyed by Contractor. This may be completed during the final stake out listed in 3.6 above or with GPS mounted equipment prior to removal of control points. As-built survey data collected with uncrewed aerial vehicles (UAVs) is preferable. When UAVs are used LiDAR or photogrammetric data is acceptable.
- B. The final as-built survey should include the location and elevations of the following items:
  - 1. All terrace ridges and flow lines
  - 2. All riser intake locations inlet elevations, and pipe outlets
  - 3. Site perimeter of disturbed area
  - 4. Any fence installation locations
  - 5. General location and elevation of final grade with enough frequency that a topographic map of final grading can be developed by the Engineer
  - 6. Any other points requested by Engineer or Division

### **3.8 RECORD SURVEY NOTES**

- A. A copy of all construction survey notes by Contractor's surveyor, whether written or electronic, should be provided to Engineer as data is acquired.

**3.9 PRESERVATION OF LAND SURVEY MONUMENTS**

- A. Land survey monuments include but are not necessarily limited to: Property pins; Public Land Survey section corners; elevation benchmarks; or geodetic control points.
- B. All known land survey monuments that will be disturbed by construction are noted on the Plans.
- C. Whenever any land survey monument is encountered during construction, Contractor shall notify the Engineer and Division and direct his Surveyor to measure the position of the monument and collect all relevant data necessary to restore or replace the monument after construction is complete.
- D. Land survey monuments shall be restored or replaced per the requirements stipulated in Iowa Code Chapter 355. A monument preservation certificate **or** a section corner certificate **or** a retracement plat of survey shall accompany each restored or replaced land survey monument.
- E. It shall be the Surveyor's responsibility to determine and develop the appropriate document for each restored monument and record it in the county where the monument is located. The Surveyor shall provide a copy of the recorded document to Contractor, Engineer, and Division.

**3.10 MEASUREMENT AND PAYMENT**

- A. Field Engineering shall not be a payment item. Payment for Field Engineering shall be incidental to all items requiring Field Engineering.

**END OF SECTION 02010**