



## POULTRY LAGOON CLOSURE

# CONSTRUCTION SPECIFICATIONS

March 2008

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**SAMPLE USE ONLY**

**Construction Specifications**  
**SITE NAME**  
**Poultry Lagoon Closure**  
**NRCS Conservation Practice Standard Code No. 360**

1. Scope

- a. The work shall consist of: closing and decommissioning two wastewater lagoons; the removal and proper disposal of litter, sludge and wastewater; removal of structures; and earthwork to provide positive drainage from the site. The contractor is responsible for obtaining necessary permits to proceed with work activities. This includes developing and implementing a Storm Water Pollution Prevention Plan (SWPPP) in accordance with TCEQ and EPA requirements and use of temporary measures to contain contaminated runoff, sediment and wastewater until demolition is completed and vegetated final grade is achieved.
- b. Construction activities may include, but are not limited to:
  - i. Mobilization and demobilization of equipment
  - ii. Removal and proper disposal of litter, sludge and wastewater from the lagoons and the site
  - iii. Demolition Activities
    - 1. Demolition and disposal of concrete slabs and concrete pipes identified in the construction plans
    - 2. Removal and disposal of plastic pipes
    - 3. Removal and disposal of marked power poles and associated wires
  - iv. Earthwork Activities
    - 1. Excavation and earthfill to provide positive drainage with a minimum grade of 0.2% to achieve final grade as represented in the construction plans
    - 2. Coordinating with utility company to move utility poles to final grade
    - 3. Seeding and establishment of vegetative cover
  - v. Other activities to facilitate the closure and decommissioning of the wastewater lagoons.
- c. Final Survey
  - i. The contractor shall provide a final topographic survey

2. Location

- a. The site is located **AT** [REDACTED].
- b. All work shall occur within the Work Boundary identified on the plans unless otherwise approved by the contracting agency's designated representative.
- c. The contractor shall not block the driveway from the county road to the occupied residence.
- d. Equipment may be staged within the work boundary. Written authorization for work or equipment stored outside the work boundary shall be obtained by the contractor from adjacent landowners if deemed necessary by the contractor to complete the work.
- e. The contractor shall be responsible for furnishing, installing and maintaining all barricades, warning signs, traffic control devices, etc. to control traffic and provide for public safety at the entrance to the site.
- f. The contractor's operations shall cause no unnecessary inconvenience to the public. The public rights-of-way shall be maintained at all times unless interruption is authorized by proper local authority. Contractor's authorized closing or detour plans shall be provided to the contracting representative for approval.
- g. Safe and adequate access shall be provided and maintained to all public protection devices and to all critical utility control locations. Facility access shall be continuous and unobstructed unless otherwise approved.

3. Utilities and Improvements
  - a. The overhead power line is identified on the plans. The contractor shall obtain written authorization from the owner of the utility line to operate construction equipment on the site. All equipment operation shall be in accordance with the requirements set forth in the written authorization.
  - b. The contractor shall be liable for damage to improvements and utilities at the worksite. Utilities may exist and not be shown on the construction plans. The site shall be carefully scrutinized for evidence of utilities. One of the Texas call centers for identifying utility lines, such as 8-1-1 or 1-800-344-8377, shall be contacted at least ten days in advance of any ground disturbance to determine if utilities exist in the general work area. Be aware that there may be additional underground utilities in the work area. The contractor shall provide a written notice to the owners of all utilities a minimum of 10 days in advance of intent to perform work in the vicinity of the affected utility. The notice shall be in writing and a copy shall be furnished to the Contracting representative. Approval to work in the vicinity of utilities shall be obtained in writing from the owner of the utility.
4. Safety - Excavations shall comply with OSHA Construction Industry Standards (29CFR Part 1926) Subpart P, Excavations, Trenching, and Shoring. All excavations shall be completed and maintained in a safe and stable condition throughout the total construction phase. Structure and trench excavations shall be completed to the specified elevations and to the length and width required to safely install, adjust, and remove any forms, bracing, or supports necessary for the completion of the work. Excavations outside the lines and limits shown on the drawings or specified herein required to meet safety requirements shall be the responsibility of the contractor in constructing and maintaining a safe and stable excavation.
5. Pollution Control
  - a. The work consists of installing measures or performing work to control erosion and minimize the production of sediment and other pollutants to water and air from construction activities.
  - b. The measures and works may include, but are not limited to, the following:
    - i. **Staging of earthwork activities**—The excavation and moving of soil materials shall be scheduled to minimize the size of areas disturbed and unprotected from erosion for the shortest reasonable time.
    - ii. **Seeding**—Seeding to protect disturbed areas shall occur as soon as reasonably possible following completion of that earthwork activity.
    - iii. **Mulching**—Mulching to provide temporary protection of the soil surface from erosion.
    - iv. **Diversions**—Diversions to divert water from work areas and to collect water from work areas for treatment and safe disposition. They are temporary and shall be removed and the area restored to its original condition when the diversions are no longer required or when permanent measures are installed.
    - v. **Sediment basins**—Sediment basins collect, settle, and eliminate sediment from eroding areas from impacting properties and streams below the construction site(s). These basins are temporary and shall be removed and the area restored to its original condition when they are no longer required or when permanent measures are installed.
    - vi. **Sediment filters**—Straw bale filters or geotextile sediment fences trap sediment from areas of limited runoff. Sediment filters shall be properly anchored to prevent erosion under or around them. These filters are temporary and shall be removed and the area restored to its original condition when they are no longer required or when permanent measures are installed.
    - vii. **Other**—Additional protection measures required by Federal, State, or local government.

- c. Chemical pollution
  - i. The contractor shall provide watertight tanks or barrels or construct a sump sealed with plastic sheets to temporarily collect and contain chemical pollutants, such as drained lubricating or transmission fluids, grease, soaps, concrete mixer washwater, or asphalt, produced as a by-product of the construction activities. Pollutants shall be disposed in accordance with appropriate state and federal regulations. At the completion of the construction work, sumps shall be removed and the area shall be graded in accordance with the final grading plan. Sump removal shall be conducted without causing pollution.
  - ii. Sanitary facilities, such as chemical toilets, or septic tanks shall not be located next to live streams, wells, or springs. They shall be located at a distance sufficient to prevent contamination of any water source. At the completion of construction activities, facilities shall be disposed of without causing pollution.
- d. Air pollution
  - i. The burning of brush or slash and the disposal of other materials shall adhere to state and local regulations.
  - ii. Fire prevention measures shall be taken to prevent the start or spreading of wildfires that may result from project activities.
  - iii. All public access or haul roads used by the contractor during construction of the project shall be sprinkled or otherwise treated to fully suppress dust. All dust control methods shall ensure safe construction operations at all times. If chemical dust suppressants are applied, the material shall be a commercially available product specifically designed for dust suppression and the application shall follow manufacturer's requirements and recommendations. A copy of the product data sheet and manufacturer's recommended application procedures shall be provided to the contracting representative at least 5 working days before the first application.
- e. Maintenance, removal, and restoration
  - i. All pollution control measures and temporary works shall be adequately maintained in a functional condition for the duration of the construction period. All temporary measures shall be removed and the site shall be graded to achieve the final grade as specified in the construction plans.
- 6. Storm Water Pollution Prevention Plan and Texas Pollutant Discharge Elimination System (TPDES) Stormwater Permit
  - a. The contractor shall develop a SWPPP for the site and obtain the necessary TPDES permits.
    - i. This construction site is greater than one (1) acre in area and is therefore subject to the TPDES requirements administered by the Texas Commission on Environmental Quality (TCEQ). Pollution control will be required as part of industry recognized "good construction practices".
    - ii. Items of work to be performed in conformance with this specification and the construction details therefore are:
      - 1. performing all work and furnishing all materials necessary to meet the permitting requirements
  - b. Written plans for pollution control are required. The Contractor's plan for pollution control shall be provided to and approved by the contracting representative prior to the start of construction operations.

7. Mobilization and Demobilization

- a. The work consists of the mobilization and demobilization of the contractor's forces and equipment necessary for performing the work required under the contract. It does not include mobilization and demobilization for specific items of work for which payment is provided elsewhere in the contract. Mobilization will not be considered as work in fulfilling the contract requirements for commencement of work.
  - b. Mobilization shall include all activities and associated costs for transportation of contractor's personnel, equipment, and operating supplies to the site; establishment of offices, buildings, and other necessary general facilities for the contractor's operations at the site; premiums paid for performance and payment bonds including coinsurance and reinsurance agreements as applicable; and other items specified.
  - c. Demobilization shall include all activities and costs for transportation of personnel, equipment, and supplies not required or included in the contract from the site; including the disassembly, removal, and site cleanup of offices, buildings, and other facilities assembled on the site specifically for this contract.
  - d. This work includes mobilization and demobilization required by the contract at the time of award. If additional mobilization and demobilization activities and costs are required during the performance of the contract as a result of changed, deleted, or added items of work for which the contractor is entitled to an adjustment in contract price, compensation for such costs will be included in the price adjustment for the item or items of work changed or added.
  - e. The contractor shall remove any temporary works that were installed and return the area to a condition similar to that which existed before construction. Areas where temporary works were located shall be graded for sightly appearance with no obstruction to natural surface water drainage or the proper functioning and access to the works of improvement installed. The contractor shall exercise extreme care during the removal stages to minimize the loss of soil sediment and debris that was trapped during construction. Pipes, and any other material used to dewater the site shall be removed.
  - f. Materials not suitable to be buried or composted shall be disposed of at an offsite disposal area of the Contractor's own choosing and at the Contractor's own expense in accordance with state and local regulations.
8. Removal of litter, sludge and wastewater
- a. This item shall consist of removing the poultry litter, sludge and wastewater from Lagoons #1 and 2 as identified on the construction drawings.
  - b. Approximate limits of poultry litter, sludge and wastewater to be removed are shown on the construction drawings. Actual limits shall be determined and approved by the contracting representative.
  - c. Sludge excavation
    - i. *Sludge excavation* is defined as the excavation of wastewater sludge that has accumulated in the existing wastewater lagoons.
    - ii. Sludge shall be removed from the lagoons using the appropriate equipment selected by the contractor.
    - iii. The contractor may choose to stockpile the sludge on the concrete slabs that are identified for demolition to allow the sludge to dry and be handled easier. Temporary stockpiling of the litter shall be allowed upon approval of the contracting representative. Stockpiles shall be in a location that the stormwater runoff will be contained on-site, unless covered with a tarp to reduce the potential for contaminating stormwater runoff.
    - iv. Sludge shall be loaded for transport off-site to an approved location for proper application of nutrients or other beneficial reuse.

- d. Removal and disposal of waste from stockpiles
  - i. Litter shall be removed from the site using conventional methods, such as, a front end loader and a dump truck.
  - ii. Approximately 100 cubic yards shall remain on-site for use as organic fertilizer to establish vegetation on the site after construction is complete.
- e. Wastewater removal and disposal activities
  - i. The lagoons shall be dewatered using conventional methods, such as, pumps and tank trucks.
  - ii. The contractor shall furnish the contracting representative, in writing, a proposed plan for dewatering before commencing with any construction activity for which dewatering may be required. Acceptance of this plan or the waiving of the plan requirement will not relieve the contractor of the responsibilities for completing the specified work.
  - iii. Removal of water and wastewater from the construction site shall be accomplished so that erosion and the transporting of sediment and other pollutants are minimized. Pollution control activities shall not conflict with the requirements of Pollution Control
  - iv. Wastewater transferred to another site shall be transported in accordance with Texas Department of Transportation requirements and vehicles approved for the transfer of wastewater.
- f. Calculating Volume of Wastewater Removed
  - i. The contractor is responsible for utilization of a water meter or other approved method to determine the volume of wastewater removed from the site.
  - ii. The meter or other approved method shall be such that the measured quantity of waste water is accurate within 3 percent of the true quantity.
  - iii. The contractor shall provide necessary support to perform accuracy tests of the water meter or other approved method when requested by the contracting representative.
- g. Hauling of wastewater, litter and sludge
  - i. Sludge removed from the site shall be transported in accordance with Texas Department of Transportation requirements.
  - ii. All off-site transportation shall be in accordance with local and state traffic and road regulations.
  - iii. The contractor is responsible for any spills of materials being removed from the site.
- h. Application Area
  - i. The contractor shall provide a location and plan for disposal of the wastewater, litter, and sludge. The plan shall be submitted with the bid proposal. Changes to the plan shall be approved by the contracting representative.
  - ii. The contractor is responsible for obtaining application areas for litter, sludge and wastewater as necessary for the proper execution of the work. The contractor shall furnish, install, operate, and maintain all drains, sumps, pumps, casings, well points, and all other equipment required to properly dewater the site as specified. The contractor shall obtain written agreements between the contractor and all recipients of the wastewater, litter or sludge and provide copies to the contracting representative for approval.

- iii. The contractor shall have a nutrient management plan developed in accordance with NRCS Conservation Practice Standard Codes 590 and 633 for any land application areas. The nutrient management plan shall be approved by the local NRCS District Conservationist or the appropriate NRCS District Conservationist for the county prior to application of the waste or wastewater. Application areas and rates shall be completed in accordance with the nutrient management plan.
  - i. Calculating the Volume of Litter and Sludge Removed - The estimated quantities of litter and sludge removed are identified on the construction plans as sludge volumes and litter stock pile volumes. Variations in these quantities may be possible when the work is actually performed. Refer to Contract Documents for variations in quantities relating to modifications of contracts.
9. Structure Removal - The work shall consist of the removal, salvage, and disposal of structures from the designated areas
- a. Marking - Each structure or structure part to be removed will be marked by the contracting representative with stakes, flags, paint, or other suitable method.
  - b. Removal - All structures designated for removal in the contract shall be removed to the specified extent and depth.
  - c. Salvage - Structures or structure parts to be salvaged shall be carefully removed and neatly placed an approved storage location.
  - d. Disposal of refuse materials - Refuse materials resulting from structure removal shall be disposed of in a manner and at locations specified in this specification or in an acceptable manner and at locations approved by the contracting representative. Disposal by burning shall be in accordance with local rules and regulations.
  - e. Items of work to be performed in conformance with this specification and the construction details therefore are:
    - i. Structure Removal, Slab Demolition - This item shall consist of removing the concrete slabs identified for demolition on the construction drawings. This includes the removal of the slab to the extents required to allow the site to be graded as shown in the construction drawings. The slabs contain steel reinforcement.
      - 1. All concrete slabs within the work limits shall be removed and buried or salvaged in accordance with this specification.
      - 2. Approximate limits of slabs to be removed are shown on the construction drawings. Actual limits shall be as required to remove all concrete unless otherwise approved in writing by the contracting representative.
      - 3. Salvage of the materials will be acceptable upon approval of the Contracting representative.
      - 4. Materials not suitable to be buried or salvaged shall be disposed of at an offsite disposal area of the Contractor's own choosing and at the Contractor's own expense in accordance with state and local regulations.
      - 5. Concrete removed from the slabs may be buried on-site in the existing lagoons in accordance with state and local regulations. A minimum of three feet of compacted cover shall be placed over the top of any concrete fill material. Concrete shall be broken into a manageable size not to exceed 2 ft by 3 ft.

- ii. Structure Removal, Pipes
  - 1. This item shall consist of removing the existing waste transfer pipes on the construction drawings. This includes the complete removal of the pipes.
  - 2. Approximate locations of pipes to be removed are shown on the construction drawings. Actual locations shall be determined during construction operations.
  - 3. Salvage of the materials will be acceptable upon approval of the Contracting representative.
  - 4. Materials not suitable to be buried or salvaged shall be disposed of at an offsite disposal area of the Contractor's own choosing and at the Contractor's own expense in accordance with state and local regulations.
  - 5. Concrete pipes removed may be buried on-site in the existing lagoons in accordance with state and local regulations. A minimum of three feet of compacted cover shall be placed over the top of any concrete fill material. Concrete shall be broken into a manageable size not to exceed 2 ft by 3 ft.
  - 6. Plastic pipes must be removed from the site and properly disposed of.
- 10. Earthfill and Excavation - The work shall consist of the earthfill and excavation as shown on the drawings as required to obtain the final grade.
  - a. *Excavation* is defined as the excavation of all materials that can be excavated, transported, and unloaded using heavy ripping equipment and wheel tractor-scrapers with pusher tractors or that can be excavated and dumped into place or loaded into hauling equipment by excavators having a rated capacity of one cubic yard or larger and equipped with attachments (shovel, bucket, backhoe, dragline, or clam shell) appropriate to the material type, character, and nature of the materials.
  - b. *Earthfill* is composed of natural earth materials that can be placed and compacted by construction equipment operated in a conventional manner.
  - c. All fill material shall be obtained from required excavations. The selection, blending, routing, and disposition of material in the various fills shall be subject to approval by the Contracting representative.
  - d. Fill materials shall contain no frozen soil, sod, brush, roots, or other perishable material. Rock particles larger than 6 inches shall be removed prior to compaction of the fill.
  - e. Earthfill shall be placed in approximately horizontal layers. The thickness of each layer before compaction shall not exceed nine (9) inches. Materials placed by dumping in piles or windrows shall be spread uniformly to not more than the specified thickness before being compacted.
  - f. Each layer of earthfill shall be compacted by four passes of loaded earthmoving equipment or by an approved equivalent method. Each pass shall consist of at least one passage of the equipment over the entire surface of the layer.
  - g. Suitable material from the specified excavations may be used in the construction of required earthfill. The suitability of material for specific purposes is determined by the Contracting representative.
  - h. When the quantities of suitable material obtained from specified excavations are insufficient to construct the specified earthfills and earth backfills, additional material shall be obtained from a borrow area identified by the Contracting representative.
  - i. Borrow areas shall be excavated and dressed to blend with the existing topography and sloped to prevent ponding and to provide drainage.
  - j. Fill materials that are not suitable for use shall be disposed of at an offsite disposal area of the Contractor's own choosing and at the Contractor's own expense in accordance with state and local regulations.

- k. Items of work
  - i. Removal of the Earthen Pads
    - 1. This item shall consist of removing the earthen pads that were used as the foundation for the poultry houses and feed bins. This includes the removal of the earthen pads to the extents required to allow the final site to be graded as shown in the construction drawings.
    - 2. The earthen material removed shall be used as fill material for Lagoons #1 and #2.
  - ii. Removal of Earthen Materials
    - 1. This item shall consist of removing other earthen materials to the extents required to allow the site to be graded as shown in the construction drawings.
    - 2. The earthen material removed shall be used on-site as fill material to achieve the final grading plan.
  - iii. Earthfill of Lagoons #1 and #2
    - 1. This item shall consist of filling Lagoons #1 and #2 with fill, as identified on the construction drawings. This includes the placement of fill materials to the extents required to allow the site to be graded as shown in the construction drawings.
    - 2. Approximate limits of fill to be placed are shown on the construction drawings. Actual limits shall be as required to perform construction operations.
  - iv. Earthfill other areas
    - 1. This item shall consist of placing fill as identified on the construction drawings to the extents required to allow the site to be graded as shown in the construction drawings.
    - 2. Approximate limits of fill to be placed are shown on the construction drawings. Actual limits shall be as required to perform construction operations.
- 11. Seeding and Mulching - The work consists of preparing the area for treatment; and furnishing and placing seed, litter, and fertilizer over the entire area within the work boundary with an approximate area of 11.6 acres.
  - a. **Material - Seed**—All seed shall conform to the current rules and regulations of the state where it is being used and shall be from the latest crop available. It shall meet or exceed the standard for purity and germination listed.
    - i. Seed shall be labeled in accordance with the state laws and the U.S. Department of Agriculture rules and regulations under the Federal Seed Act in effect on the date of invitations for bids. Bag tag figures are evidence of purity and germination. No seed will be accepted with a test date of more than 9 months before the delivery date to the site.
    - ii. Seed that has become wet, moldy, or otherwise damaged in transit or storage will not be accepted. The percent of noxious weed seed allowable shall be as defined in the current State laws relating to agricultural seeds. Each type of seed shall be

delivered in separate sealed containers and fully tagged unless exception is granted in writing by the Contracting representative.

- iii. Common Bermuda grass seed will be used at this site at a rate of 4.7 lbs PLS per acre. Seed shall be planted at a 3/8" depth.
- iv. **Fertilizer**—Litter from the existing stockpile shall be used as the phosphorus fertilizer. It shall be applied at a rate of 3.7 tons per acre. The litter shall be incorporated by discing or tilling to a minimum depth of 6 inches prior to placement of seed.
- v. **Seeding mixtures and dates of planting** - The application rate per acre for common Bermuda grass seed shall be at a rate of 4.7 lbs PLS per acre. Planting shall occur between February and August.
- vi. **Seedbed preparation and treatment** - Areas to be treated shall be dressed to a smooth, firm surface. On sites where equipment can operate on slopes safely, the seedbed shall be adequately loosened (4 to 6 inches deep) and smoothed. Depending on soil and moisture conditions, disking or cultipacking, or both, may be necessary to properly prepare a seedbed. Where equipment cannot operate safely, the seedbed shall be prepared by hand methods of scarifying to provide a roughened soil surface so that broadcast seed will remain in place.
  1. If seeding is to be accomplished immediately following construction operations, seedbed preparation may not be required except on a compacted, polished, or freshly cut soil surface.
  2. Rocks larger than 6 inches in diameter, trash, weeds, and other debris that will interfere with seeding or maintenance operations shall be removed or disposed of as specified.
  3. Seedbed preparation shall be discontinued when soil moisture conditions are not suitable for the preparation of a satisfactory seedbed as determined by the Contracting representative.
- vii. **Seeding, fertilizing, mulching, and stabilizing**
  1. All seeding operations shall be performed in such a manner that the seeds are applied in the specified quantities uniformly in the designated areas. The method and rate of seed application shall be as specified. Unless otherwise specified, seeding shall be accomplished within 2 days after final grading is completed and approved.
  2. Fertilizer shall be applied as specified. When specified, the fertilizer and soil amendments shall be thoroughly incorporated into the soil immediately following surface application.
  3. The contractor shall maintain the vegetated areas until all work under the contract has been completed and accepted. Maintenance shall consist of the repair of areas damaged by water erosion, wind, fire, or other causes. Such areas shall be repaired to reestablish the intended condition and to the design lines and grades required by the contract. The areas shall be refertilized, reseeded, and remulched before the new application of the mesh or netting.
  4. The contractor shall ensure adequate moisture for 20 days following seeding. Supplementary irrigation may be required.

## 12. Construction Surveys

- a. **Scope** – the work consists of performing all surveys, measurements, and computations required by this specification.
- b. **Equipment and material** – Equipment for construction surveys shall be of a quality and condition to provide the required accuracy. The equipment shall be maintained in good working order and in proper adjustment at all times. Records of repairs, calibration tests, accuracy checks, and adjustments shall be maintained and be available for inspection by the Contracting representative. Equipment shall be checked, tested, and adjusted as necessary in conformance with manufacturer's recommendations.
  - i. Material includes field notebooks, stakes, templates, platforms, equipment, spikes, steel pins, tools, and all other items necessary to perform the work specified.
- c. **Quality of work** - All work shall follow recognized professional practice and the standards of the industry unless otherwise specified in this specification. The work shall be performed to the accuracy and detail appropriate for the type of job. Notes, sketches, and other data shall be complete, recorded neatly, legible, reproducible and organized to facilitate ease in review and allow reproduction of copies for job documentation. Survey equipment that requires little or no manual recording of field data shall have survey information documented as outlined in this specification.
  - i. All computations shall be mathematically correct and shall include information to identify the bid item, date, and who performed, checked, and approved the computations. Computations shall be legible, complete, and clearly document the source of all information used including assumptions and measurements collected.
  - ii. If a computer program is used to perform the computations, the contractor shall provide the Contracting representative with the software identification, vendor's name, version number, and other pertinent data before beginning survey activities. Computer generated computations shall show all input data including values assigned and assumptions made.
  - iii. The elevations of permanent and temporary bench marks shall be determined and recorded to the nearest 0.01 foot. Differential leveling and transit traverses shall be of such precision that the error of vertical closure in feet shall not exceed plus or minus 0.1 times the square root of the traverse distance in miles. Linear measurements shall be accurate to within 1 foot in 5,000 feet, unless otherwise specified in this specification. The angular error of closure for transit traverses shall not exceed 1 minute times the square root of the number of angles turned.
  - iv. The minimum requirements for placing slope stakes shall be at 100-foot stations for tangents, as little as 25 feet for sharp curves, breaks in the original ground surface and at any other intermediate stations necessary to ensure accurate location for construction layout and measurement. Slope stakes and cross sections shall be perpendicular to the centerline. Significant breaks in grade shall be determined for cross sections. Distances shall be measured horizontally and recorded to the nearest 0.1 foot. Side shots for interim construction stakes may be taken with a hand level.
  - v. Unless otherwise specified in this specification, measurements for stationing and establishing the location of structures shall be made to the nearest 0.1 foot.

- d. **Primary control** - The baselines and bench marks for primary control, necessary to establish lines and grades needed for construction, are shown on the drawings and have been located on the job site.
- i. These baselines and bench marks shall be used as the origin of all surveys, layouts, and measurements to establish construction lines and grades. The contractor shall take all necessary precautions to prevent the loss or damage of primary control points. Any stakes or control points lost or damaged by construction activity will be reestablished by the contractor or at contractor expense.
  - ii. **Construction surveys** - Before work starts that requires contractor performed surveys, the contractor shall submit in writing for the Contracting representative's review: the name, qualifications, and experience of the individuals to be assigned to the survey tasks. Contractor performed surveys shall consist of all work necessary for:
    1. establishing line and grade for all work
    2. setting slope stakes for all work
    3. checking and any supplemental or interim staking
    4. establishing final grade stakes
    5. performing quantity surveys, measurements, and computations for progress payment
    6. other surveys as described in this specification
- e. **Staking** - The construction staking required for the item shall be completed before work on any item starts. Construction staking shall be completed as follows or as otherwise specified in this specification:
- i. **Clearing and grubbing**—The boundary of the area(s) to be cleared and grubbed shall be staked or flagged at a maximum interval of 200 feet, closer if needed, to clearly mark the limits of work. When contractor staking is the basis for determining the area for final payment, all boundary stakes will be reviewed by the Contracting representative before start of this work item.
  - ii. **Excavation and fill**—Slope stakes shall be placed at the intersection of the specified slopes and ground line. Slope stakes and the reference stakes for slopes shall be marked with the stationing, required cut or fill, slope ratio, and horizontal distance from the centerline or other control line. The minimum requirements for placing slope stakes is outlined in Quality of work.
  - iii. **Structures**—Centerline and offset reference line stakes for location, alignment, and elevation shall be placed for all structures.
- f. **Records** - All survey data shall be recorded in fully identified standard hard-bound engineering survey field notebooks with consecutively numbered pages. All field notes and printed data shall include the purpose or description of the work, the date the work was performed, weather data, sketches, and the personnel who performed and checked the work. Electronically generated survey data and computations shall be bound, page numbered, and cross referenced in a bound field notebook containing the index for all survey activities. All work shall follow recognized professional practice.
- i. The construction survey records shall be available at all times during the progress of the work for examination and use by the engineer and when

requested, copies shall be made available. The original field notebooks and other records shall be provided to and become the property of the owner before final payment and acceptance of all work.

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