



**SPECIAL PROVISIONS  
FOR  
AUGER CAST PILES**

**Johnson County  
BRM-3715(667)--8N-52**

**Effective Date  
March 21, 2023**

**THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.**

**156241.01 DESCRIPTION.**

- A.** An auger cast pile foundation consists of an augered hollow shaft drilled into soil into which grout is pumped under pressure as the auger is withdrawn. A steel reinforcing cage is lowered into the column of fluid grout after the drilling and pumping is completed as shown in the contract documents. Minimal or no spoil material is anticipated to be brought to the surface during the augering and grouting operation.
- B.** Ensure elevations, dimensions, and depth of the auger cast piles are as specified in the contract documents. If bearing strata are encountered at different elevations or are judged to be of a different quality, the Engineer may adjust the auger cast pile depth.
- C.** Care shall be taken during the drilling operation to avoid penetration of layers noted on the soil boring logs and in the contract documents as contaminated. If contaminated layers are encountered, drilling shall cease and the Engineer shall be notified immediately.

**156241.02 MATERIALS.**

**A. Grout and Cement Materials.**

- 1.** All solids shall remain in suspension in the grout without excessive bleed-water. Apply Section 4101, Section 4102, Section 4103, Section 4108 of the Standard Specifications. All mix proportions and designs shall be submitted to the Engineer at least 2 weeks prior to commencement of work for Engineer review. The Engineer may require adjustment of the mix proportions to achieve proper solids suspension and optimum flowability. After the mix has been designated, do not change it without the Engineer's approval. Use proportioning and mixing equipment that meets the requirements of Articles

2001.20 and 2001.21 of the Standard Specifications. Provide mixers with sufficient mixing capacity to permit the intended pour to be placed without interruption.

2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Grout Flow: 10 to 25 seconds; Apply Materials I.M. 375 using a flow cone with 0.75 inch opening.

**B. Aggregate.**

Apply Section 4109 of the Standard Specifications, Table 4109.02 for grout, and Section 4110 of the Standard Specifications.

**C. Steel Reinforcement.**

Apply Section 2404 and Section 4141 of the Standard Specifications.

**D. Owner or designated representative shall perform quality control tests as follows:**

1. Pile excavation, placement, and testing.
2. Steel reinforcement.
3. Grout tests: testing of samples of fresh grout obtained according to ASTM C 172 shall be performed according to the following requirements:
  - a. Flow rate: ASTM C 939 and ASTM C 109 using a flow cone with 0.75 inch opening.
  - b. Compressive strength: ASTM C 109 with cube specimens restrained from expansion according to ASTM C 942
    - 1) Testing frequency: Obtain six 2 inch cubes for each 50 cubic yard or fraction thereof of grout placed, but not less than one set for each day's pour. Obtain an additional set of cubes from each truck during test pile placement.
    - 2) Test cubes at 7 days, two cubes at 28 days, and hold two cubes in reserve.
    - 3) Strength of each grout mixture is satisfactory if every average of any three consecutive compressive strength tests equals or exceeds specified compressive strength and no compressive strength test value falls below specified compressive strength by more than 500 psi.
    - 4) Report test results in writing to Engineer, grout manufacturer, and Contractor within 48 hours of testing. List project identification name and number, date of placement, name of testing and inspecting agency, location of grout batch work, design compressive strength at 28 days, grout mixture proportions and materials, compressive breaking strength, and type of break for both 7 and 28 day tests in reports of compressive strength tests.
    - 5) Additional tests: Testing and inspecting agency to make additional tests of grout if test results indicate that compressive strengths of other requirements have not been met, as directed by Engineer.
    - 6) Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.
    - 7) Correct deficiencies in the work that test reports and inspections indicate do not comply with the contract documents.
  - c. Low strain integrity testing: Performed and reported according to ASTM D 5882 on 1 pile per substructure group and reported for each pile.
  - d. Pile inspection reports: Prepare inspection reports for each auger cast pile as follows:
    - 1) Pile location
    - 2) Pile diameter
    - 3) Actual top and bottom elevations
    - 4) Final top centerline location and deviations from requirements
    - 5) Variation from plumb

- 6) Date and time of starting and completing
  - 7) Position and condition of reinforcing steel and splices or mechanical couplings
  - 8) Automatic monitoring equipment record including grout volume actually pumped
  - 9) Grout testing results
  - 10) Remarks, unusual conditions encountered, and deviations from requirements.
- d. Certified pile survey: Prepared by a qualified land surveyor or professional engineer showing final location of piles in relation to the project alignment, right of way lines, and existing benchmarks/control points. Notify Engineer when deviations from locations shown in plans exceed allowable tolerances.
  - e. Auger cast piles will be considered defective if they do not pass tests and inspections.
  - f. Prepare test and inspection reports.

### 156241.03 CONSTRUCTION.

#### A. Construction Tolerances.

Auger cast pile excavations and completed piles not constructed within the required tolerances will be considered unacceptable. Correct all unacceptable pile excavations and completed piles to the Engineer's satisfaction. Furnish materials and work necessary, including engineering analysis and redesign, to complete corrections for out of tolerance pile excavations (without either cost to the Contracting Authority or an extension of the completion dates of the project).

1. Ensure the auger cast pile is within 3 inches of plan position at the top of pile.
2. Ensure the vertical alignment of pile excavation does not vary from the plan alignment by more than 1/4 inch per foot.
3. Set reinforcing steel cages as shown in contract documents immediately after grout pumping operation is complete.
4. The top elevation of the pile may have a tolerance of + 1 inch or - 3 inches from the plan top of pile elevation. Ensure sufficient reinforcement bar splice length for splices above the pile.
5. Ensure the reinforcement cage is installed as shown on the plan documents and placed within the pile with the shown clearances.

#### B. Auger Cast Pile Installation Plan.

1. No later than 4 weeks after letting, the contractor shall submit a list containing at least 3 auger cast pile projects, of similar diameter and length to those shown on the plans, completed in the last 4 years. In the list of projects include names and phone numbers of owner's representatives who can verify the Contractor's participation on those projects. In addition, submit a signed statement that the Contractor has inspected the project site and all the subsurface information made available in the contract documents.
2. No later than 1 month prior to constructing auger cast pile, submit an auger cast pile installation plan for the Engineer to review. In this plan provide the following information:
  - a. Name and experience record of firm(s) and associated personnel for the following:
    - 1) Driller.
    - 2) Auger cast pile superintendent.
    - 3) Site exploration and layout.
  - b. List of proposed drilling and pumping equipment to be used.
  - c. Details of overall construction operation sequence and the sequence of auger cast pile installation.
  - d. Details of auger cast pile excavation methods.

- e. Details of method used to prevent excess pile spoil material from being brought to surface.
  - f. Details of reinforcement placement, including support and cage centering methods.
  - g. Reinforcing steel cage splicing method, if proposed, including details of dimensions, installation, splice location, support and cage centering methods, and estimated time required for splicing.
  - h. Details of grout pumping method.
  - i. Grout mix proposal and statement of compliance that all materials furnished conform to the materials specifications referenced herein. Demonstration that the proposed mix will meet the specified strength requirements by laboratory tests of trial mixes.
  - j. Description of pile load test protocol including dimensioned sketch of the pile load test setup illustrating sizes of primary members.
  - k. Submit manufacturer's certification that loading jack, settlement monitoring gauges, and grout monitoring gauge have been calibrated within the last 6 months.
  - l. Submit complete record of each augured pile indicating any deviation in actual location of central lines at top, length, diameter, final elevation of tip and top, alignment, quantity of grout used, pressure used during grouting procedure, and starting and finishing time. Include records of any unusual conditions encountered during pile installation.
3. The Engineer will evaluate the auger cast pile installation plan for conformance with the contract documents. Within 14 calendar days after receipt of the plan, the Engineer will notify the Contractor of additional information required or changes necessary to meet the contract requirements, or both. Field test the Engineer's procedural approvals. These approvals do not relieve the Contractor of the responsibility to satisfactorily complete the work as detailed in the contract documents.
  4. A pre-drilling conference, in which the Contracting Authority, Contractor, Engineer, and drilling staff discuss the anticipated auger cast pile process, will be required for this work prior to the start of auger cast pile excavation.

**C. Control and Disposal of Materials.**

Dispose of excavated material, as well as grout or other material removed from the shaft excavation. Collect and properly dispose off site untreated water displaced during grout pumping. Open pits for collection of materials will not be allowed. As specified in the Site Materials Management Plan, any contaminated materials that are encountered during the auger cast pile installation shall be handled under the provisions set forth under that special provision. Control all excavated material, excess grout, water, and other matter so that at no time it enters or encroaches upon the adjacent travel lanes, water ways, private property, and so forth.

**D. Auger Cast Pile Installation.**

1. No production piles shall be placed until the results of the demonstration piles have been approved by the Engineer.
2. Place piles by rotating a hollow shaft auger at a continuous rate that prevents removal of excess soil to the elevations/depths shown on the drawings. Close the hole in the bottom of the auger with suitable plug to prevent intrusion of soil into the auger while drilling.
3. At the start of pumping grout, raise the auger 6 to 12 inches to facilitate removal of plug. After grout pressure builds sufficiently, redrill auger to previous tip elevation.
4. Maintain grout pressure between 100 to 200 psi and grout head of at least 10 feet above the injection point during raising of the auger. Maintain positive rotation of the auger during the raising operation. Coordinate rate of grout injection and rate of auger removal to maintain specified grout head at all times.

5. If the grout pumping is interrupted or grout head drops below minimum specified, reinsert the auger at least 5 feet below position of auger when interruption occurred and continue grout operation.
6. Remove auger in a smooth continuous motion, without jumping to ensure pile shaft is continuous and of the diameter shown on the drawings.
7. Verify that the total volume of grout placed is a minimum of 130% of the theoretical volume of the pile. If the volume of grout falls below 130% of theoretical in any 10 feet segment, reinsert auger by drilling the lesser of 15 feet or the pile tip elevation and regrout.
8. If placement of grout is suspended for any reason, the pile will need to be re-drilled. The pile may be re-drilled in the same location if the grout is still fluid enough for the drill rig to penetrate. If the grout has set, the pile will need to be re-drilled in a new location. Contractor shall submit a revised pile installation plan to the Engineer for approval prior to re-drilling the pile.
9. Place the reinforcing cages as indicated on the drawings immediately after removal of the auger while the grout is still plastic. Locate cages to maintain embedment and projection. Use centering devices or spacers to maintain cages in the correct location.
10. Place piles so that no interconnection between adjacent piles will occur while the grout is in a fluid state. Place no piles within 5 feet of adjacent augered piles until grout in the augered has set for 24 hours.
11. Minimal spoils are anticipated, but for the amount that are brought to the surface clear spoils around auger during injection of grout promptly. Spoils shall be monitored to ensure that no contaminated materials are present. Care shall be taken to prevent spoils and runoff from entering Ralston Creek. The Site Materials Management Plan shall apply for any spoils that are present.

#### **E. Obstructions.**

1. Should an obstruction be encountered causing the pile to drift from the required location or causing the pile not to maintain proper vertical alignment, complete the pile with payment in accordance with the established unit price applied to the pile length drilled.
2. If obstructions are encountered within 10 feet of the ground surface, such obstructions shall be removed by other excavation methods and the area backfilled to the ground surface; and the pile installed in the normal manner.
3. If auger refusal is encountered at depths greater than 10 feet, but well above the target lengths identified on the drawings, the short pile shall be completed and paid for at the contract unit price. The Engineer will review the short pile for determination of load capacity.
4. Auger refusal shall be defined as penetration of the auger at a rate of 1 foot or less per minute for a maximum of 5 minutes when the full weight of the auger and gear box are supported by the auger and the auger is rotating at production speed.
5. If needed, provide replacement piles as directed and located by the Engineer.

#### **F. Pile Tops.**

1. Cut off top of piles square with pile axis and at the elevation indicated on the drawings by removing fresh grout from the top of the pile.

2. Where the pile cutoff is at or above the surrounding ground surface or the top of the hole cannot be maintained open, place metal sleeves or casing of proper diameter and 24 inches minimum length around the pile top.

#### **G. Reinforcing Steel Cage Construction and Placement.**

1. Assemble the reinforcing steel cage (consisting of longitudinal bars, ties, cage stiffener bars, spacers, cage centering devices, and other necessary appurtenances). Place the steel cage immediately after the pumping operation while grout column is fluid.
2. Ensure the reinforcing steel in the shaft is tied at intersections and supported in such a way that the reinforcing steel will remain within allowable tolerances given in this specification. Use concrete spacers or other approved non-corrosive spacing devices at sufficient intervals near the top and bottom, and at intervals not exceeding 10 feet along the shaft, to ensure concentric spacing for the entire cage length. Ensure spacers are:
  - Constructed of approved material equal in quality and durability to the concrete specified for the shaft.
  - Of adequate dimension to ensure a minimum distance of 3 inches, or as specified in plan details, between the cage and the excavated hole.
3. Check the elevation of the top of the steel cage after final placement and grout has set. If the reinforcing cage is not maintained within the specified tolerances, make necessary corrections to the satisfaction of the Engineer. Do not construct additional auger cast piles until after modifying the reinforcing cage support in a manner satisfactory to the Engineer.

#### **H. Drilling Records**

The Contractor shall maintain accurate records for each pile constructed. Similar records will be maintained by the Engineer. These records shall show:

1. Pile location;
2. Ground surface elevation (reference grade for pile length);
3. Pile toe (bottom) depth and elevation;
4. Elevation of top of grout or concrete;
5. Pile length;
6. Auger diameter;
7. Details of the reinforcing steel (number, size, and grade of longitudinal bars, size and spacing of transverse steel; outside diameter and length of cage);
8. Flowcone efflux time and volume of grout placed or slump and volume of concrete placed
9. Theoretical volume of drilled hole (theoretical diameter = diameter of auger);
10. Depth to which reinforcing steel was placed;
11. Date/Time of beginning of drilling;
12. Date/Time of completion of drilling;
13. Date/Time grout or concrete was mixed;

14. Date/Time ready-mix grout or concrete truck arrived at project site, and copies of all grout or concrete batch tickets used for the pile construction;
15. Date/Time of beginning of grout or concrete pumping;
16. Date/Time of completion of grout or concrete pumping;
17. Date/Time of placement of reinforcing steel;
18. Weather conditions, including air temperature, at time of grout or concrete placement;
19. Identification of all grout or concrete samples taken from the pile;
20. Amount of drop in grout level in 24 hours;
21. All other pertinent data relative to the pile installation; and
22. All readings made by the automated measuring and recording equipment to include as a minimum:
  - a. Auger rotation verses depth for every 2 foot increment, or less, of pile advancement during the drilling process, and during placement of grout or concrete (if auger is rotated during this placement);
  - b. Volume of grout or concrete placed versus depth of outlet orifice for every 2 foot increment, or less, of pile placed;
  - c. Average maximum and minimum pump stroke pressures at ground level for every 2 foot increment, or less, of pile placed;
  - d. Average maximum and minimum pump stroke pressure at or near the auger head for every 2 foot increment, or less, of pile placed, if directed by the Engineer; and
  - e. Additionally, the Engineer may also specify that torque and crowd force (downward thrust on auger) measurements be made for every 2 foot increment, or less, of pile advancement during the drilling process. These data shall be provided to the Engineer within 24 hours of the completion of the pile. Data collected by automated measuring and recording equipment shall be provided in numerical or graphical form.

#### **I. Pile Load Test.**

1. Perform 1 abutment and 1 pier load test. Abutment and pier test piles shall be installed on opposite sides of the stream. Pier test piles shall be installed as near permanent pier location as practicable or in such a way to eliminate skin friction above streambed elevation. The abutment test piles shall be located as near permanent abutment location as practicable of in such a way to eliminate skin friction above the bottom of footing elevation. Use the procedure detailed in ASTM D1143-81, Procedure "B". Submit a plan detailing the load testing procedure, methods, materials, equipment, layout, and other pertinent details to the Engineer 2 weeks in advance of load testing operations. Perform load testing under the supervision of the Engineer. Load testing shall not be performed until the compressive strength of the grout installed in the test piles has been verified by an independent compressive strength test to be at least the design strength of 4000 psi. Installation of the piles associated with the load test shall be monitored by the Engineer. Provide documentation that testing equipment has been recently calibrated by an approved source.
2. Load the test pile to a minimum of 200% of the service loads unless failure occurs first. The Contractor shall exercise reasonable care to apply the testing load concentrically to the pile section. After completion of the test, reload the test pile to failure or 300% the service load, whichever occurs first using an acceptable procedure described in ASTM D1143. Load test results shall be provided 24 hours after completion of the test. Results from the load tests

shall be reviewed by the Engineer prior to commencement of the installation of production piles.

3. Load test piles shall not be used as permanent foundation piles.
4. The test pile will be considered as acceptable for stipulated bearing capacity if total net settlement, after deducting rebound, does not exceed 0.01 inch per ton of service load.
5. If the Engineer determines the test pile to be unacceptable, submit a plan for remedial action to the Engineer for approval. The Engineer may require another load test on another pile, at no additional expense to the Contracting Authority.
6. Do not begin construction of the production shafts until the Engineer approves the methodology and reviews load test results.
7. The Engineer will complete the review process within 14 calendar days of the load test report submittal.
8. Once the load test has been completed and the Engineer has approved it, clean up the test pile site. The entire test pile setup shall be removed to 3 feet below final ground level and clean the area according to Article 1104.08 of the Standard Specifications.

**156241.04 METHOD OF MEASUREMENT.**

Measurement will be as follows:

- A. **Auger Cast Pile.**  
Feet, to the nearest 6 inches, constructed.
- B. **Reinforcing Steel.**  
Section 2404 of the Standard Specifications applies.
- C. **Pile Load Test.**  
By EACH pile load test installed and completed.

**156241.05 BASIS OF PAYMENT.**

Payment will be the contract unit price as follows:

- A. **Auger Cast Pile.**
  1. Per foot.
  2. Payment is full compensation for all equipment, labor, and materials (except reinforcing steel) necessary to satisfactorily construct the piles including:
    - Augering and excavation of pile,
    - Furnishing and pumping grout,
  3. Removal of obstructions during excavation is considered as extra work and payment will be as provided in Article 1109.03, B of the Standard Specifications.
- B. **Reinforcing Steel.**  
Section 2404 of the Standard Specifications applies.
- C. **Pile Load Test.**
  1. Each.



2. Payment is full compensation for all equipment, labor, and materials necessary to satisfactorily construct the approved pile and perform load testing including:
  - Augering and excavation of test and anchor piles,
  - Furnishing and placing reinforcing bars,
  - Furnishing and pumping grout,
  - Disposal of excavated materials and water, and all other materials,
  - Installation, performing load testing, and removal of testing equipment,
  - Production of load test results,
  - Removal of entire setup as detailed above if not used as a production pile.