SPECIAL PROVISIONS
FOR
PERMANENT DRILLED-IN SOLDIER PILE AND LAGGING WALL

Madison County
ER-169-3(46)--28-61

Effective Date
December 15, 2015

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.

150039.01 DESCRIPTION.

A. This work shall consist of furnishing and constructing drilled-in soldier pile and lagging walls in accordance with this special provision and with the lines, grades and dimensions shown on the plans and per the shop drawings prepared by the specialty wall contractor.

B. A drilled-in soldier pile and lagging wall is a cut retaining wall system composed of drilled-in steel soldier piles placed in pre-bored holes. The portion of the piles that will be embedded below the excavation are encased in structural concrete while controlled low strength material (CLSM) or approved equivalent encase the portion of the soldier piles above the proposed bottom of excavation. After the soldier piles are installed, treated timber lagging is placed between the soldier piles to transfer lateral loads from the soil to the soldier piles. A prefabricated geocomposite drainage is also placed behind the timber lagging during excavation and placement of the lagging.

C. Sequence of construction for the drilled-in soldier pile and lagging wall is shown on the plans. The soldier piles will be drilled in from the existing grade to the tip elevation (provided in the plans), followed by filling of the pre-drilled hole with structural concrete and CLSM around the steel element. Sequential excavation and placement of the timber lagging will follow. As necessary, granular fill or approved equivalent will be used to fill any voids between the timber lagging and retained soil.

D. The subsurface conditions comprise of a mix of clay, sand, boulders extending throughout the soil profile underlain by highly weathered shale, shale and limestone bedrock. The site is characterized by a subsurface that has been heavily altered by previous construction and slide repair activity. The Contractor should familiarize himself with the available subsurface information and information about the previous repair work carried out in the slide area between Sta. 179+50 to Sta. 182+00. Rock buttresses were installed as part of this repair activity. The Contractor is responsible for having necessary equipment in place to excavate the holes through any obstructions encountered.

E. The Contractor shall excavate at the pipe locations to ascertain the location, type and size of the pipes prior to drilling adjacent shafts. The engineer may change the top of berm elevation based on the location of the pipes.

150039.02 MATERIALS.

A. Steel Soldier Pile.

1. Conform to Section 4167 of the Standard Specifications.

2. Storing, transporting, and handling shall be performed in a manner to prevent bending stresses or other damage.

3. Steel soldier piles shall be galvanized in accordance with Article 4100.07 of the Standard Specifications.

B. Concrete for Drilled in Soldier Piles.

1. All materials, proportioning, air entraining, mixing, slump, and transporting of PCC shall be according to Section 2403 of the Standard Specifications, except as modified herein.

2. Water/cement ratio: not to exceed 0.45.

3. Drilled-in soldier pile construction: use Class D PCC mixture with a slump of 8 inches ±1.5 inches.

4. Portland cement: meet the requirements of ASTM C 150 Type I / II and Section 4101 of the Standard Specifications.

5. Air entrainment: apply Section 2403 of the Standard Specifications.

6. Mid-range water reducer is required according to Materials I.M. 403.

7. Retarder is required according to Materials I.M. 403 to maintain workable concrete.

8. Do not use Ground Granulated Blast Furnace Slag (GGBFS).

C. Treated Timber Lagging.

Graded for extreme fiber stress of at least 1000 psi and with the full dimension thickness shown on the shop drawings. Lagging shall be treated timber meeting the requirements of Sections 4163 and 4161 of the Standard Specifications. Creosote wood treatment shall be used.

D. Granular Backfill Material.

Ensure the backfill material meets the requirements of Section 4133 of the Standard Specifications, except that the percent passing the No. 200 sieve is not to exceed 5.0%.

E. Controlled Low Strength Material (CLSM).

Apply Article 2552.02 of the Standard Specifications.

F. Geocomposite Drainage Material.

Geocomposite drainage material shall be Miradrain 9000 drainage panels or equivalent material approved by the Engineer.

150039.03 CONSTRUCTION.

A. Contractor Qualifications.

Prior to initiating construction of the drilled-in soldier pile and lagging wall, submit to the Engineer a report which identifies the personnel who will be performing and supervising the work. The report shall include the names of an engineer-in-charge, on-site supervisors, and drill operators. The report shall also contain a list of employer's names and telephone numbers, location and dates of previous projects, and the extent of work performed. This information must be verifiable.

1. An on-site supervisor shall be present at the job site at all times during the performance of the work. The on-site supervisor shall have at least 1 year of construction experience in the installation of soldier pile and lagging walls and shall have supervised the successful installation of at least three walls. The work experience time period is computed by the addition of all documented durations of the work time on construction projects.

2. Drill operators shall have successfully installed at least three soldier pile and lagging walls.

B. Submittals.

Submit proposed drilled-in soldier pile and lagging wall installation plans to the Engineer for review and approval. The submission shall consist of details required to completely describe the retaining wall system and shall include the following:

1. Shop drawings for the drilled-in soldier pile and lagging wall shown on the plans at least 2 weeks before beginning the work, which indicate at a minimum, the following:
- **a.** Grade and strengths of all construction materials used.
- **b.** Materials, details, arrangement, and method of construction of the proposed soldier pile and lagging retaining wall system.
- **c.** Details for the timber lagging.
- **d.** Method for installing soldier piles, including pre-drilling procedures. Driven soldier piles are not permitted.
- **e.** Mix designs for structural concrete and procedures for placing and verifying installation elevations of the structural concrete in accordance with the plans and provisions outlined in Article 150039.02, B.
- **f.** Mix design for the CLSM and procedures for placing the CLSM in accordance with the provisions outlined in Article 150039.02, E.
- **g.** Details outlining additional grading to create a working platform (if needed).
- **h.** Details outlining traffic control (if needed) to maintain at least one lane of traffic in each direction on US 169.
- **i.** Sequence of construction.

2. Descriptive data and operating procedure for all equipment to be used. This shall include, at a minimum; machinery required to install soldier piles (including drilling procedures), timber lagging, excavate soil, and remove obstructions. Submit all pertinent equipment data including sizes, weights, capacities, torques, and operating frequencies.

3. Review and approval of the above submittals for the soldier pile and lagging retaining wall by the Engineer will not relieve the Contractor from the responsibility for the adequacy of the construction of drilled-in soldier pile and lagging wall to achieve the required results.

C. General Construction Methods.

1. Install and maintain the drilled-in soldier pile and lagging wall in accordance with the design as shown on the plans and on the accepted shop drawings, and in such a manner as to minimize movement, settlement, loss of ground, removal of fines from adjacent ground, and damage to or movement of adjacent structures or utilities.

2. Ensure no gaps or pockets occur between the retained fill and timber lagging.

D. Drilled-in Soldier Pile and Lagging Construction.

1. Excavate or fill as needed to provide a suitable working pad at the proposed location where each soldier pile is to be installed, as shown on the plans.

2. Predrill holes for soldier pile installation. If needed use temporary steel casing to prevent collapse of the hole. Diameter of the pre-drilled holes shall meet the dimensions shown on the plans. Prior to inserting the soldier pile, make the necessary provisions to allow the Engineer to sound each hole to assure that loose soil has been removed to the Engineer's satisfaction. Once the design depth has been reached and loose soil removed from the bottom of the hole, the bottom of the hole shall be cleaned such that no more than 1 inch of loose/soft soil remains at the bottom. The soldier pile section shall then be lowered into the hole to the tip elevation specified on the plans and structural concrete shall be immediately tremied to the proposed elevation shown on the plans. CLSM is then to be tremied from the top elevation of the structural concrete to the existing grade. If casing is used for the construction of the soldier pile excavation, remove the casing as concrete placement progresses and throughout concrete placement. The Contractor shall maintain the bottom of the casing at least 3 feet below the level of structural concrete. Drilling for adjacent soldier piles shall not be permitted until concrete and CLSM in adjacent drilled holes has set for a period of at least 24 hours.

3. After installation of the soldier piles, excavate along the proposed wall face in stages to the elevation shown on the plans.

4. Allow no more than 5 feet of unsupported excavation prior to placing lagging. Install lagging as detailed in the plans. At each stage, place lagging and geocomposite drainage as detailed in the plans.

5. Fill any gap between the soldier pile and lagging wall and the retained fill with granular backfill specified in Article 150039.02, F.

E. Construction Tolerances.

1. Ensure the drilled-in soldier pile is within 1.5 inches of plan position.

2. Ensure the vertical alignment of soldier pile excavation does not vary from the plan alignment by more than 1/4 inch per foot.

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

150039.04 METHOD OF MEASUREMENT.

A. Piles, Steel, W24X104 will be measured from the finished tip elevation to the top of the soldier pile elevation for payment in units of linear feet, as shown on the plans.

B. Drilled-in Pile, 36 Inch Diameter will be measured for payment in units of linear feet along the axis of the drilled-in pile from the top of the concrete encasement to the bottom of the drilled-in pile, as shown on the plans.

C. Geocomposite Drainage System will be measured by area in units of square feet, as shown on the plans.

D. Timber Lagging, 6 Inch Thick will be measured by area in units of square yards, as shown on the plans.

E. Excavation, Class 20, will be measured by volume in units of cubic yards, as shown on the plans. This includes only the excavation of soil immediately in front (a maximum of 2 feet in front of the finished face of the wall) of the soldier pile wall to install the timber precast concrete lagging. Excavation does not include the excavation quantity for grading earthwork that will take place to construct the proposed embankment and foreslope in front of the wall.

F. Reinforced Concrete Coping will be measured in units of linear feet along the centerline axis of the coping from end to end of the retaining wall as shown on the plans.

150039.05 BASIS OF PAYMENT.

A. The unit price payment for Piles, Steel, W24X104 shall be made at the contract unit price per linear foot. The unit price bid per vertical linear foot of pile shall include all labor, material, and equipment for furnishing the pile and the cost of one splice per pile (if required).

B. The unit price payment for Drilled-in Pile, 36 Inch Diameter shall be made at the contract unit price per linear foot. The unit price bid shall include all labor, material and equipment for drilling and installing the drilled-in pile, including structural concrete, and incidental items include CLSM and the cost of centralizers (if necessary). The cost shall include drilled-in pile excavation from ground surface to tip of the pile, including temporary casing (if necessary), disposal of excavated material, water, installing the pile and all other materials, providing equipment for checking the dimensions, and alignment of each hole. No additional payment will be given for site preparation, establishing a working platform, or maintenance of traffic.

C. Payment for the Geocomposite Drainage System, will be made at the contract unit price per square foot. The unit price will constitute full compensation for providing all labor, material, accessories, and equipment required for installation of the drainage system. No additional payment will be provided for repairs or replacement of damaged drainage board or for overlap of drainage elements.

D. Payment for the Timber Lagging, 6 Inch Thick will be made at the contract unit price per square yard. Includes all costs of furnishing and installing timber lagging, including hardwood shimming, wood spacer plates, nails and clips. No additional payment will be provided to furnish damaged or otherwise unsuitable lagging boards

E. Payment for Excavation, Class 20, will be made at the contract unit price per cubic yard. The unit price will constitute full compensation for providing all labor, material, and equipment. Incidental items are to include furnishing and placing of granular material defined in Article 150039.02, F to fill voids between retained fill and timber lagging as a result of over excavation.

G. Payment for Reinforced Concrete Coping will be made at the contract unit price per linear foot. Includes all costs (labor and materials) of furnishing and installing forming, reinforcing steel, and structural concrete as shown in the plans.