SP-150241
(New)

SPECIAL PROVISIONS
FOR
TEMPORARY SHORING

Black Hawk County
NHSX-063-6(96)--3H-07

Effective Date
June 20, 2017

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.

150241.01 DESCRIPTION.

A. This work shall include furnishing, installing, and removing temporary shoring to assist construction of Groundwater Suppression System (GWSS). This work also includes furnishing, installing and removing monitoring points and performing monitoring throughout the construction of temporary shoring, dewatering, and GWSS.

B. Temporary shoring shall consist of soldier pile and lagging wall and sheet pile wall at all locations shown in the plans, which includes temporary shoring SE, SW-1, SW-2, NE, NW-1 and NW-2, auger boring launching pit, and shoring at Edward Street Lift Station Culvert.

C. Sloped excavation for shallow pipe locations specified in the plans are not covered under this special provision and are considered as part of the Excavation item in the Special Provisions for Groundwater Suppression System.

D. The Contractor is responsible for providing earthwork that is necessary to assist the temporary shoring installation.

E. The Contractor is responsible for providing bracing design for the auger boring access portals.

F. Design Criteria: Each member or support element shall be designed to support the maximum loads that can occur during construction. The maximum incurred stresses shall be no greater than 67% of the yield strength of the structural members.

G. Qualifications: The Contractor shall meet the qualification requirements described in this section in order to perform the work.

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 3 years of construction experience in the

installation of soldier pile and lagging walls, 3 years of construction experience in the installation of sheet pile walls (including bracing), and shall have supervised the successful installation of three of each wall type in the past 5 years. The work experience time period is computed by the addition of all documented durations of the work time on construction projects.

2. Operators installing drilled-in soldier piles and sheet piles shall have successfully installed at least three similar systems.

150241.02 MATERIALS.

A. Steel Soldier Pile.

1. Steel soldier pile shall 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. All embedment segments of steel soldier piles shall be wrapped with Yellow Jacket™ (friction reduction pile sleeve), manufactured by Foundation Technologies, Inc.

B. Timber Lagging.

Timber lagging shall be graded for extreme fiber stress of at least 1100 psi and with the full dimension thickness shown in the plans.

C. Sand Backfill for Soldier Pile Drill Hole.

1. Gradation shall conform to one of the following:
- **a.** AASHTO Standard Specifications M43 No. 57 aggregate.
- **b.** Pea-gravel: Comply with Article 4109.02 of the Standard Specifications, Gradation No. 20 or No. 21 in the Aggregate Gradation Table.
- **c.** Well graded sand shall have less than 12% fines.

2. Sand Backfill shall be non-limestone based.

D. Controlled Low Strength Material (CLSM).

1. CLSM shall comply with Article 2552.02, G, 3 of the Standard Specifications.

2. The maximum compressive strength at 28 calendar days shall not exceed 150 psi.

E. Steel Sheet Piles.

1. Steel sheet piles shall conform to Section 4167 of the Standard Specifications.

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

F. Walers and Struts.

1. Walers and struts shall conform to Section 4167 of the Standard Specifications.

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

G. Steel Shims, Stiffener Plates, and End Plates.

Shims, stiffener plates, and end plates shall conform to Sections 2408 and 4152 of the Standard Specifications.

H. Steel Channel.
Steel channels shall conform to Sections 2408 and 4152 of the Standard Specifications.

I. Angle Plate.
Angle plates shall conform to Sections 2408 and 4152 of the Standard Specifications.

J. Monitoring Points.

1. Utility monitoring points shall comply with Standard Road Plan EW-212 and Article 2106.02 of the Standard Specifications, except that 6 inch by 6 inch by 3/16 inch steel plate shall be used for the base plate.

2. Ground surface monitoring points in paved areas shall be hardened steel markers treated or coated to resist corrosion, with an exposed convex head having a minimum diameter of 1/2 inch similar to surveyor's PK nails. Ground surface monitoring points in unpaved areas shall be a 2 inch by 2 inch by 18 inch long hardwood hub driven to grade.

3. Structure monitoring points on buildings or above-grade facilities shall be a durable paint marking on the building or facility.

150241.03 CONSTRUCTION.

A. Submittals.

1. Prior to initiating construction of the temporary shoring, the Contractor shall submit to the Engineer a report which identifies the Contractor's personnel who will be performing and supervising the work and meet the requirement under the article Qualification in this Special Provision. The report shall include the names on-site supervisors and operators. The report shall also contain a list of employees' names and telephone numbers, location and dates of previous projects, and the extent of work performed. This information must be verifiable.

2. The Contractor shall submit their proposed soldier pile and lagging (SPL) wall and sheet pile wall installation plans to the Engineer for review and approval. The submission shall consist of details required to completely describe the temporary shoring and shall include the following:

a. Shop drawings for the SPL and Sheet pile walls shall indicate, at a minimum, the following:

1) Coordination with temporary dewatering work and GWSS work.
2) Sequence of construction.
3) Sequence of installation for each type of shoring.
4) Soldier pile layout.
5) Sheet pile layout.
6) Corner details for the proposed sheet pile layout.
7) Connection detail between SPL and sheet piles.
8) Auger boring access portal plans indicating support installed to maintain ground support system integrity and stability of the excavation when commencing auger boring. The plans shall provide details of the portal bracing and seal needed for face stability and auger boring launching.
9) Grade and strength of all construction materials used.
10) Method for installing soldier piles, including pre-drilling procedures.
11) Mix design for the CLSM and procedures for placing the CLSM in accordance with the provisions outlined in this special provision.
12) Details of any earth work to create a working platform (if needed).

b. 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) and sheet piles, install timber lagging, excavate soil, and remove obstructions. All pertinent equipment data shall be submitted, including sizes, weights, capacities, torques, and operating frequencies.

c. Backfill and removal plan for temporary shoring.

d. Monitoring Points Installation Plan.

1) Shop drawings detailing locations (coordinates), depths, types, details, and other pertinent information showing the installation details for each type of monitoring point required.

2) Shop drawings that indicate the locations of control points and benchmarks associated with surveys for monitoring.

3) Description of methods for installing and protecting all monitoring points.

4) Manufacturer's literature describing installation, operation, and maintenance procedures for all instruments, materials, readout units, and accessories.

5) Permits and consents from authority having jurisdiction, if applicable, for drilling holes from ground surface and conducting monitoring activities.

6) Plans for any additional monitoring points to be installed at contractor’s option.

3. Reports and Records of Monitoring Points.

a. Initial/baseline readings shall be submitted at least 15 days prior to the start of any construction or dewatering activity.

b. Weekly monitoring report shall be submitted on a weekly basis. Supply copies of field notes if requested. As a minimum, the weekly monitoring report shall contain construction status (dewatering activity, excavation depth, shoring installation progress etc.), monitoring data (with comparison to the baseline readings), exceedances, and comments.

B. General.

1. The Contractor shall provide earthwork, excavation or fill as needed to provide a suitable working platform at the proposed location where temporary shoring is to be installed.

2. The Contractor shall install and maintain the drilled-in soldier pile and lagging wall, sheet pile wall and necessary bracings in accordance with the design as shown in the plans and on the accepted shop drawings 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.

3. The Contractor shall implement groundwater control measures as required in the Special Provisions for Temporary Dewatering. Installation of excavation support systems shall not be done without groundwater control measures.

4. The Contractor shall ensure no gaps or pockets occur between the retained soil and the temporary shoring.

C. Drilled-in Soldier Pile and Lagging Wall.

1. The Contractor shall predrill holes for soldier pile installation through soil and rock. Temporary steel casing shall be used to advance the drilling and maintain stability of excavation. Use of drilling mud or slurry is not allowed. The diameter of the pre-drilled holes shall meet the dimensions shown in the plans. The bottom of the predrilled holes shall reach the pile tip elevation as specified in the plans.

2.

Rock shall be defined as material in which a drilling machine with minimum crowd thrust of 40,000 pounds and 60,000 pound-foot torque and with fitted rock teeth encounters refusal.

Refusal shall be defined as drilling advancement less than 6 inches in 30 minutes. The Contractor shall notify the Engineer when refusal is reached. The Contractor shall demonstrate to the Engineer in the field that refusal is reached; further drilling in the same drill hole shall be classified as Soldier Pile Drilling in Rock.

3. The Contractor shall continuously monitor the drilling to ensure that the hole is drilled to the depth of embedment that correctly corresponds to the site conditions. Depth of soldier pile embedment shall be as per the requirements delineated in the plans.

4. Once the design depth has been reached and loose soil has been 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. Prior to inserting the soldier pile, the Contractor shall make the necessary provisions to allow the Engineer to sound each hole to confirm that loose soil has been removed to the Engineer's satisfaction.

5. The soldier pile steel section shall be lowered into the bottom of the hole. Yellow Jacket™ (friction reduction pile sleeve) shall be installed alone the steel soldier pile embedment segments and ensure the firm contact between the Yellow Jacket™ and the steel pile section prior to lowering into the hole. The steel section shall be placed within 8 hours of the completion of the excavation. The steel section shall be placed and maintained in the center of the excavation.

6. CLSM shall be tremied from the bottom of the hole to the elevation specified in the plans. The remaining water in the hole above the top of the CLSM shall be pumped out. Sand backfill shall be placed from the top of the CLSM up to the existing ground. The sand backfill shall be placed in an even manner to prevent any loose pockets. The casing shall be gradually removed as CLSM and sand backfill placement progresses. Drilling for adjacent soldier piles shall not be permitted until CLSM in adjacent drilled holes has set for a period of at least 24 hours.

7. The Contractor shall furnish soldier pile steel section in lengths based on the estimated tip elevation provided in the plans. The Contractor shall furnish contingent soldier pile steel section based on the quantity specified in the plans. In cases where the depth of embedment is deeper than estimated, a maximum of one splice shall be used to provide the necessary additional length; the splice shall be performed in accordance with Article 2501.03, P of the Standard Specifications.

8. Excavation shall be done in lifts to allow lagging installation. Each excavation lift thickness shall depend on the actual ground standup time observed in the field. No more than 5 feet of unsupported excavation shall be allowed prior to lagging placement. If water seeps or flows from the face of the excavation or if the face of the excavation becomes unstable, the unlagged face shall not exceed 2 feet. Lagging shall be installed as detailed in the plans.

9. The Contractor shall fill any gap between the soldier pile and lagging wall and the retained soil with the same sand backfill material specified for soldier pile drill holes.

D. Construction Tolerances for Drilled-in Soldier Pile and Lagging Walls.

1. The drilled-in soldier piles shall be installed within 3 inches of plan position.

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

3. Excavations and installed soldier piles not constructed within the required tolerances will be considered unacceptable. The Contractor shall correct all unacceptable excavations and completed soldier piles to the Engineer's satisfaction. The Contractor shall furnish materials

and work necessary, including engineering analysis and redesign, to complete corrections for out-of-tolerance excavations without cost to the Contracting Authority or extension of the completion dates of the project.

E. Driven Steel Sheet Pile Walls.

1. The Contractor shall pothole three locations to expose the east edge of Virden Creek Enclosure prior to driving sheet piles of temporary shoring NW-1. Pothole locations shall be at the east edge of Virden Creek Enclosure next to the temporary shoring NW-1, between shoring baseline stationing 4000+22 and 4003+00. Potholing shall consist of vacuum excavating or low pressure water jetting and vacuum excavating to advance holes with low risk of utility damage.

2. At the following locations, sheet pile installation shall begin from the location closest to the existing structures: Edward Street Lift Station Culvert and Virden Creek Enclosure. This is required to reduce the impact on the existing structures from the vibration of sheet pile driving.

3. Before positioning sheet piles for driving, the Contractor shall clean the sheet piles and inspect for defects and proper interlock dimensions. Temporary guides or templates may be used at the Contractor's option to maintain the accuracy of the sheet pile position. Sufficient clearance shall be provided in the interlocks to allow sheet piles to slide, under sheet pile's own weight, in the interlock of the sheet pile previously placed until the top of existing ground is reached by the tip of the sliding sheet pile. The use of vibratory or impact hammer to force the interlocking of sheet piles is not permitted.

4. Before driving is started, the Contractor shall check sheet piles for position and alignment. Sheet pile top shall be located within 2 inches of the planned location. Sheet piles shall be installed in rotating stages such that the tip of any sheet pile is not more than 5 feet below the tip of any adjacent sheet pile. Sheet piles shall be driven to the approved tip elevations. Piles that are raised during the process of driving adjacent piles shall be driven down. If refusal is reached before driving to the specified tip elevation, an impact hammer may be used.

5. The Contractor shall extend sheet piles to required grade by welding on additional full length sheet piles. Sheet piles with damaged heads shall be cut off to permit further driving. Sheet piles adjoining spliced sheet piles shall be full length.

6. The Contractor shall install bracing system consisting of walers and struts as specified in the plans and approved shop drawings. Steel supports shall be installed true to the line and grades as per the plans and approved shop drawings. The Contractor shall install steel shim to ensure firm contact between walers and the sheet piles.

F. Construction Tolerances for Driven Sheet Pile Walls.

1. The driving tolerance shall be 1% of the vertical in all directions.

2. The centroid of a sheet pile at cutoff elevation shall not vary from design position shown by more than 3 inches after driving.

3. Driven steel sheet piles not constructed within the required tolerances will be considered unacceptable. The Contractor shall correct all unacceptable sheet piles to the Engineer's satisfaction. The Contractor shall furnish materials and work necessary, including engineering analysis and redesign, to complete corrections for out of tolerance construction (without either cost to the Contracting Authority or an extension of the completion dates of the project).

G. Bracing at the Access Portals of the Auger Boring Operation.

1. The Contractor shall design and install the bracing as per the approved shop drawings.

2. The auger boring operations shall not commence until the bracing is completely installed.

H. Removal of Temporary Shoring.

1. The Contractor shall remove all elements of excavation support systems from the ground, except CLSM encasement of the soldier piles. Removal of the temporary shoring elements is to ensure the function of the GWSS.

2. The Contractor shall repair any settlement or damage to the work or to adjacent property as a result of removing temporary shoring.

3. If backfill material is loosened to an extent that it settles more than 1 inch as a result of attempts to remove sheeting or other ground support members, the Contractor shall be responsible for remedial measures to re-compact or consolidate the loosened backfill. Restoration of any damage and the cost of remediating disturbed backfill or adjacent property damage caused by removal of ground support systems shall be at the Contractor's expense.

4. The Contractor shall be prepared to remove soldier piles by static method or by using a vibratory hammer.

I. Installation of Monitoring Points.

1. The Contractor shall install monitoring points as specified per the plans and the approved submittals.

2. The Contractor shall remove all monitoring points upon completion of the work.

3. All instruments shall be clearly marked, permanently labeled, and protected to avoid being obstructed or otherwise damaged by construction operations or the general public. Protective covers shall be marked.

4. After installation of each type of monitoring points, the Contractor shall survey the as-built location to define the vertical and lateral positions of the exposed parts.

5. The Contractor shall replace, at no cost to the Contracting Authority, monitoring points in place that become damaged, inaccessible, or unreadable as a result of the Contractor's means and methods of construction. The locations of replacement instruments shall be jointly determined by the Engineer and the Contractor. The Contractor shall complete the repair or replacement as soon as practical.

6. Utility monitoring point installation:
   a. Utility monitoring points shall be installed to the top of Virden Creek Enclose. The Contractor shall pothole or excavate a pit to the top of Virden Creek Enclosure for utility monitoring point installation.
   b. The base plate shall be in firm contact with the top of Virden Creek Enclosure.
   c. The Contractor shall backfill around the utility monitoring points with excavated material.

7. The method of installing Ground surface monitoring point shall be the Contractor's option. The marker shall be rigidly affixed so as not to move relative to the surface to which it is attached.

J. Monitoring of Monitoring Points.

1. Horizontal and vertical survey accuracy shall be 1/8 inch or less.

2. Monitoring frequency shall be:
   a. Once per day when temporary shoring installation, excavation, ground improvement, or auger boring operation is within 100 feet from the monitoring point.
   b. Once per week for all other construction period until the temporary excavation is backfilled.

3. Threshold limits shall be:
   a. Edward Street Lift Station: 1 inch movement in any direction.
   b. CNRR tracks and bridge: 1 inch movement in any direction.
   c. Virden Creek Enclosure: 2 inches movement in any direction.

4. When the threshold limit is exceeded, the Contractor shall notify the Engineer immediately. The Engineer will evaluate the exceedance event and provide instructions to the Contractor.

150241.04 METHOD OF MEASUREMENT.

A. Soldier Pile Drilling in Soil.
Measurement for Soldier Pile Drilling in Soil will be by linear feet of drilling in soil.

B. Soldier Pile Drilling in Rock.
Measurement for Soldier Pile Drilling in Rock will be by linear feet of drilling in rock as defined in this special provision.

C. Soldier Pile.
Measurement for Soldier Pile, in linear feet, will be the quantity shown in the contract documents. Measurement is based on soldier pile length along soldier pile section center from top of soldier piles to tip of soldier piles.

D. Timber Lagging between Soldier Piles.
Measurement for Timber Lagging between Soldier Pile, in square feet, will be the quantity shown in the contract documents. Measurement is based on areas between soldier pile webs.

E. Controlled Low Strength Material (CLSM) for Soldier Pile Drill Hole.
Measurement for CLSM for Soldier Pile Drill Hole will be by cubic yards of CLSM placed in the drill hole for soldier pile embedment.

F. Sand Backfill for Soldier Pile Drill Hole.
Measurement for Sand Backfill for Soldier Pile Drill Hole, in cubic yard, will be the quantity shown in the contract documents.

G. Sheet Piles.
Measurement for Sheet Pile, in square feet, will be the quantity shown in the contract documents. Measurement is based on sheet pile length along the baseline of the sheet pile and height from top of sheet piles to tip of sheet piles shown in plans.

H. Monitoring Points.
Monitoring point will be counted based on each point shown in the plans.

150241.05 BASIS OF PAYMENT.

A. Soldier Pile Drilling in Soil.

1. Payment for Soldier Pile Drilling in Soil will be at the contract unit price per linear foot.

2. Payment is full compensation for:
- Performing additional earth work necessary to prepare a working platform,
- Perform drilling in soil,
- Furnishing, installing and removal of temporary steel casings for full length of drilling in soil, and
- Disposal of soil cuttings.

B. Soldier Pile Drilling in Rock.

1. Payment for Soldier Pile Drilling in Rock will be at the contract unit price per linear foot.

2. Payment is full compensation for performing drilling in rock and disposal of cuttings.

C. Soldier Pile.

1. Payment for Soldier Pile will be at the contract unit price per linear foot.

2. Payment is full compensation for:
- Furnishing and placing steel pile section,
- Furnishing and placing Yellow Jacket™,
- Splicing piles,
- Cutting off excessive pile lengths to the specified top of pile elevation, and
- Removal of all soldier piles.

D. Timber Lagging between Soldier Piles.

1. Payment for Timber Lagging between Soldier Pile will be at the contract unit price per square foot.

2. Payment is full compensation for furnishing, installing and removal of timber lagging, and filling gaps between the timber lagging and the retained soil.

E. Controlled Low Strength Material (CLSM) for Soldier Pile Drill Hole.

1. Payment for CLSM for Soldier Pile will be at the contract unit price per cubic yard.

2. Payment is full compensation for furnishing, and placing CLSM in the drill hole for soldier pile embedment. The Contractor shall not be compensated for any unused CLSM.

F. Sand Backfill for Soldier Pile Drill Hole.

1. Payment for Sand Backfill for Soldier Pile will be at the contract unit price per cubic yard.

2. Payment is full compensation for furnishing, and placing sand backfill in the drill hole above the CLSM elevation. The Contractor shall not be compensated for any unused sand backfill.

G. Sheet Pile.

1. Payment for Sheet Pile will be at the contract unit price per square foot.

2. Payment is full compensation for:
- Furnishing and installing sheet piles including the sheet pile corner welding and angle plates,
- Design, furnishing and installing bracing at auger boring access portals,

- Furnishing and installing bracing including the end plates and stiffeners for all locations specified in the plans and approved shop drawings,
- Furnishing and installing timber lagging and steel channels between sheet pile gaps
- Cutting off excessive pile lengths to the specified top of pile elevation, and
- Removal of all sheet piles and bracing elements.

H. Monitoring Points.

2. Per each.

3. Payment is full compensation for:
- Furnishing and installing monitoring points,
- Performing baseline readings,
- Monitoring, and
- Removal of monitoring points.