MICHIGAN

DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION

FOR

**TEMPORARY RETAINING WALL**

DET:MS 1 of 3 APPR:SCK:RWS:05-16-22

**a. Description.** This work consists of designing, furnishing, fabricating, installing, maintaining, and cutting off temporary retaining walls.

**b. Materials.** Furnish materials in accordance with the standard specifications. Materials not addressed in the standard specifications must meet the approval of the Engineer. Lagging for soldier pile walls may be fabricated from either timber, concrete, or steel. Timber lagging must be kiln-dried, treated structural grade lumber in accordance with subsection 912.05 of the Standard Specifications for Construction except as amended by the contract.

**c. Construction.**

1. Wall Type. Select a wall type that will facilitate the construction shown on the plans. Consider wall types such as, but not limited to, drilled soldier pile walls, secant pile walls and tangent pile walls. The wall type selected must not produce vibrations during installation.

2. Design. Perform the design of the temporary retaining wall in accordance with the *AASHTO Standard Specifications for Highway Bridges, 17th Edition*. Design cantilever or braced temporary retaining walls interaction with the soil using the following software: SPW 911 by PileBuck International Inc.; SupportIT by GTSoft Ltd.; or CivilTech Software Shoring Suite. The use of other software will be reviewed by the Department and requires approval by the Engineer prior to use. Hand calculations and/or spreadsheet calculations will not be accepted for temporary retaining wall design unless special conditions are present, which will require approval by the Engineer prior to use. Hand calculations and/or spreadsheet calculations (with example hand calculations) for design of anchors, deadman, bracing sections, weld details and connections are acceptable.

Design the temporary retaining wall using a unit weight of soil not less than 120 pcf and an equivalent height of soil for vehicular load (heq) not less than 3 feet when calculating the horizontal earth pressure due to live load surcharge. The calculated and measured horizontal deflection of the temporary retaining wall must not exceed 1 inch during any stage of construction. The calculated and measured maximum deflection of the temporary retaining wall must not exceed 1/2 inch when the temporary retaining wall is supporting buildings. The design must account for pressures from existing structures that influence the temporary retaining wall. Pressures from existing structures will be listed on the plans or provided by the Engineer. Include the effects of construction equipment and material stockpiling in the design.

Ensure the design of the temporary retaining wall is prepared by a Professional Engineer licensed in the State of Michigan who is hired by the Contractor. The design must include, but not be limited to: ground anchors, deadman, concrete mix design, lagging, bracing, welded connection details, bolted connection details, wale and wale splice details, embedment of piles, and calculated deflections. Include a description of the construction sequence with the design. Consider temporary retaining wall limits shown on the plans to be approximate. Determine and depict the actual limits of the temporary retaining wall in the design and working drawings. Furnish profile views and plan views with cross sections.

If ground anchors are used, submit a load testing program for review by the Department with the design submittal. The Contractor’s designer must reference *FHWA Publication No. FHWA-IF-99-015 (Geotechnical Engineering Circular No. 4, Ground Anchors and Anchored System)* in the design and load testing program. Load test all ground anchors, regardless of anchor type. Prestress and lock off all ground anchors and deadman. Ground anchors and deadman that cannot be prestressed to the required load and locked off cannot be used. When helical anchors are used for ground anchors, the design load must not exceed 50 kips.

Ensure that the design is prepared by the Contractor’s designer; and the designer is a Professional Engineer, licensed in the State of Michigan (Designer). Ensure the design is checked by a second Professional Engineer licensed in the State of Michigan (Checker). The Designer and Checker must not be the same person. The calculations must have the initials of the Designer and Checker. Electronically submit the design and supporting calculations to the Engineer for review and approval not less than 14 calendar days prior to beginning of work. All submittals are to be as a PDF file to the Engineer. Paper sets are prohibited. Obtain the Engineer’s approval of the temporary retaining wall design prior to beginning installation. The Engineer will require 10 calendar days for each review cycle and revisions may be required following each review. No extension of time or additional compensation will be granted due to delays in preparing the final working drawings, calculations and material specifications or securing approval from the Engineer. An exception may be granted for an extension of time only in the case that the Engineer’s review of a submittal exceeded 10 calendar days and if it can be shown that such a delay impacts the final project completion date.

Install the temporary retaining wall for this project in stages that match the staged construction of the project. The limits and sequence of temporary retaining wall are shown conceptually on the plans however, the Contractor’s design and installation plan will take precedence.

3. Installation. Do not begin installation until the Engineer has approved the design and working drawings. Submit a Drilled Pile Installation Plan for approval by the Engineer as described in subsection 718.03.A of the Standard Specifications for Construction. Install the temporary retaining wall in a manner that matches the construction staging shown on the plans. Cut off wall components when no longer needed. For wall components within the footprint of footings the cut off is to be 1 foot below bottom of footing elevation. For wall components outside of the footprint of the footing the cut off is to be at least 3 feet below the finish grade elevation. Use casings when using drilled excavations adjacent to existing spread footings. Unless otherwise specified in the contract, do not use vibratory equipment within 25 feet of a spread footing, critical utilities, or in-service pavements. Unless otherwise specified in the contract, do not use vibratory equipment within 100 feet of historic or vibration sensitive structures. Remove excess temporary retaining wall materials from MDOT right-of-way.

During lagging installation, prevent the loss of soil using a soil stabilization technique and by limiting the depth of each increment of excavation. Install lagging using top-down type construction. Do not perform open cut excavations to install lagging. Immediately fill voids behind the wall and under spread footings using grout or other approved methods. Repair damage to structures, pavement, shoulder, etc. that result from the installation and performance of the temporary retaining wall. The cost of such repairs will be borne by the Contractor.

Remove surface and subsurface obstructions encountered. Such obstructions may include materials such as old concrete, steel, or timber foundations or abandoned utilities. Materials such as cobbles, boulders or riprap as depicted on the design plans are not classified under this category and are included within the retaining wall pay item set forth. Employ special procedures and/or tools after the excavation cannot be advanced using conventional augers fitted with soil or rock teeth, drilling buckets and/or under-reaming tools. Such special procedures/tools may include, but are not limited to: chisels, boulder breakers, core barrels, air tools (i.e. down hole air hammer), hand excavation, temporary casing, and enlarging the hole diameter of drilled piles. Payment for unexpected obstruction removal will occur only when such special procedures/tools are utilized and approved by the Engineer.

Do not consider drilling tools lost in the excavation as obstructions. Promptly remove lost tools at no cost to the contract. Costs due to lost tool removal include costs associated with the repair of hole degradation resulting from the removal operation or the excessive time the hole remains open.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay items.

**Pay Item Pay Unit**

Retaining Wall, Temp, Left in Place Square Foot

Obstruction Rem, Unexpected Dollar

1. **Retaining Wall, Temp, Left in Place** quantities will be computed on the area of required earth retention. The vertical dimension for computing area will be the difference in ground elevation at the wall centerline or the planned foundation excavation limit at the wall centerline, whichever is less. The lateral limits will be determined by the design requirements contained herein.

All horizontal measurements will be made along the temporary retaining wall centerline alignment without allowance for the structural shapes of the separate sections.

When earth is retained on both sides of the same temporary retaining wall during different construction stages, the quantity will be computed from the stage requiring the largest area of earth retention and not the sum of the area of required earth retention for each stage.

**Retaining Wall, Temp, Left in Place** includes designing, furnishing, fabricating installing, maintaining, and cutting off the temporary retaining wall and bracing, ground anchors, deadman, walers, related materials, and equipment required to maintain support of the temporary retaining wall. Soil stabilization and the filling of voids is also included in the pay item **Retaining Wall, Temp, Left in Place**.

2. **Obstruction Rem, Unexpected** will be paid by the Department for removing obstructions if the Contractor uses the special procedures and tools specified herein and is approved by the Engineer. The Engineer will designate obstructions for the Contractor’s removal. If the Contractor and Engineer do not agree on a unit or lump sum price, the Engineer may order the work performed on a force account basis in accordance with subsection 109.05.D of the Standard Specification for Construction.