State of Ohio

Department of Transportation

SPECIAL PROVISION

Installation of Wick Drains

February 25, 2021

**Item 203 Special - Wick Drain**

**1.0 Description**

Furnish all necessary labor, equipment, and materials, and perform all operations necessary for the installation of wick drains, also known as prefabricated vertical drains, in accordance with the details shown in the plans and with the requirements of these specifications. Space and arrange the drains as shown on the plans or as otherwise accepted by the Engineer.

**2.0 Material Specification**

Furnish wick drain consisting of a continuous prefabricated plastic drainage core wrapped in a non-woven geotextile material. Provide wick drains free of defects, rips, holes, or flaws.

Ensure that the wick drain meets the following material specifications:

1. Flow capacity through the core of not less than 0.5 gallons per minute as measured under a normal stress of 5000 psf after a period of 24 hours using a hydraulic gradient of 1.0.
2. Permeability of the geotextile greater than 0.01 centimeters per second as determined by ASTM D4491.
3. Geotextile with an AOS of not greater than 0.30 millimeters and not less than 0.10 millimeters.
4. Minimum tensile strength without distress or separation of each separate component (geotextile and core) and the composite wick drain of 15 pounds per inch width by clamping over the full width and testing in accordance with ASTM D-4595 (i.e. 4-inch gauge length tested in a constant rate of extension test machine at 10 percent strain per minute).

**2.1 Source Acceptance**

Prior to delivery of the wick drain product, submit to the Engineer a copy of an affidavit signed by a legally authorized official from the company manufacturing the wick drain core and the geotextile wrap. Attest in the affidavit that the products meet the physical and mechanical requirements stated in the specification and include test results. Submit a wick drain sample of at least 5 lineal feet for evaluation at least 15 working days prior to delivery to the project. Obtain acceptance of the wick drain by the Engineer prior to site delivery.

**2.2 Control Testing**

The Engineer will collect samples of the wick drain periodically during construction for review and confirmation testing.

**2.3 Shipment and Storage**

During periods of shipment and storage, wrap the wick drains in a heavy-duty protective coating. Protect the wick drains from sunlight, mud, dirt, dust, debris, and detrimental substances.

**3.0 Equipment**

Install the wick drains with equipment which will cause a minimum of disturbance of the subsoil during the installation. Unless the Engineer accepts that soil conditions do not allow, install the wick drains using a mandrel or sleeve advanced through the granular material comprising the work platform and lower portion of the drainage blanket, and into the underlying soils to the required depth, using vibratory, constant load, or constant rate of advancement methods. Do not use falling weight impact hammers or jetting for installation of the drains. Use the mandrel to protect the wick drain from tears, cuts, and abrasions during installation and withdraw the mandrel after installation of the drain. Provide the wick drain with an anchor plate or rod at the bottom to anchor the bottom of the drain at the required depth at the time of mandrel removal. Ensure that the projected cross-sectional area of the mandrel and anchor combination is not greater than that suggested by the manufacturer and accepted by the Engineer.

Examine the site and all geotechnical information to determine the equipment required for the support conditions anticipated. The Contractor is solely responsible for selection of the equipment. If required, modify the equipment or provide construction platforms with adequate support to install the wick drains in accordance with this specification.

At least 3 weeks prior to the installation of the wick drains, submit to the Engineer, for review and acceptance, details of the sequence and method of installation. At a minimum, include the following information in the submittal:

1. Size, type, weight, maximum pushing force, vibratory hammer rated energy, and configuration of the installation rig;
2. Dimensions and length of mandrel;
3. Details of drain anchorage;
4. Detailed description of proposed installation procedures, including methods of installing wick drains through known or anticipated hard materials;
5. Proposed method(s) for overcoming obstructions;
6. Proposed method(s) for splicing drains.

Acceptance by the Engineer does not relieve the Contractor of the responsibility to install wick drains in accordance with the plans and specifications. If, at any time, the Engineer considers the method of installation incapable of producing a satisfactory drain, alter the installation method or equipment as necessary to comply with the plans and specifications.

**4.0 Construction Requirements**

Install wick drains at the locations and to the tip elevations shown on the plans, unless otherwise accepted by the Engineer.

Prior to the installation of the wick drains, perform any specified embankment undercuts, intermediate foundation improvements, and lower portion of drainage blanket installations. Place the drainage blanket to the elevation of the top of the work platform over the entire foundation area to be treated with wick drains.

Prior to the installation of the wick drains, stake out the proposed locations of the drains and then preserve the stakes. Do not vary the locations of the stakes by more than 6 inches from the locations indicated on the plans or as accepted by the Engineer. Prepare and submit a map, on a daily basis, to the Engineer which depicts the tip elevation of each drain installed.

Demonstrate that the selected equipment, method, and materials produce a satisfactory installation in accordance with this specification. For this purpose, install several trial drains at locations within the work area as accepted by the Engineer. The Department will pay for trial drains conforming to this specification at the same unit price as the production drains.

Install wick drains to the tip elevations shown in the plans or as accepted by the Engineer. The Engineer will reject drains that deviate from the plan location by more than 6 inches, are damaged, or are improperly installed. Remove the rejected drains or abandon them in-place and install replacement drains offset approximately 18 inches from the location of the rejected drains. The Department will make no payment for rejected drains. The Department will pay for replacement drains conforming to this specification at the same unit price as the production drains.

Install the drains vertically. Provide the Engineer with a suitable means of verifying the plumbness of the mandrel and determining the depth of the drain at any time. Check the equipment for plumbness and ensure deviation of no more than 0.25 inches per foot from vertical.

Perform splices or connections in the wick drain material so that the spliced wicks conform to all of the material specification requirements, and so as to ensure continuity of the wick material. Cut the wick drain such that at least a 12-inch length protrudes above the top of the work platform at each wick drain location.

Where obstructions are encountered within the compressible material, abandon the wick drain. Note that known or anticipated areas of hard materials are not considered obstructions. With the acceptance of the Engineer, install a replacement drain within 18 inches of the obstructed drain. Make a maximum of 2 replacement drain attempts for each obstructed drain. If the drain still cannot be installed to the design tip elevation, abandon the drain location, and move the installation equipment to the next drain location.

If more than 10 wick drain locations in the same general area must be abandoned without reaching the tip elevation specified, notify the Engineer. In such cases, seek acceptance of the Engineer for installing drains to a different tip elevation or for using different installation methods.

Coordinate the installation of the drains with any geotechnical instrumentation. Install drains in such a manner so as not to disturb any instrumentation that is already in place. The Contractor is responsible for replacement of instrumentation damaged as a result of the construction activities.

**5.0 Method of Measurement**

The Department will make measurements for payment referenced to the elevation of the top of the work platform, defined as the surface of the installed lower portion of the drainage blanket. Determine the elevation of the top of the working platform as the average of 3 surveyed spot elevations per 10,000 square feet of finished working platform. Space the points uniformly.

The Department will measure the quantity of wick drain as the number of linear feet of wick drain satisfactorily installed from the top of the work platform elevation to the design tip elevation of the wick drain shown on the plans or accepted by the Engineer. In case of obstructions, the Department will measure the quantity of wick drain as the number of lineal feet of wick drain satisfactorily installed from the top of the work platform elevation to the elevation at which the obstruction was encountered.

**6.0 Basis of Payment**

The Department will pay for wick drains at the contract unit price bid per lineal foot, for Item 203 Special - Wick Drain. Payment for wick drains includes the cost of furnishing the full length of wick drain material, installing the drain, altering the installation methods or equipment as necessary to comply with the plans and specifications, and the cost of furnishing all tools, materials, labor, equipment, and all other costs necessary to complete the required work. The Department will make no payment for unacceptable drains or for any delays or expenses due to changes necessitated by improper or unacceptable material or equipment.

The Department will pay for accepted quantities at the contract unit price as follows:

**Item Unit Description**

203E07504 Foot Special - Wick Drain

**Designer Notes:**

Provide the following plan note and table in the plans:

Item 203 Special - Wick Drain

Install wick drains at the locations shown in the plans and according to the project Special Provisions. Each wick drain covers an area of \_\_\_\_\_ square feet (\_\_\_\_' x \_\_\_\_' / tan 30°). The following table provides a summary of the wick drains specified for installation:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| WICK DRAIN SCHEDULE | | | | | | |
| LOCATION | FROM STA. | TO STA. | AREA S.F. | BOT. TIP EL. | NO. OF DRAINS | WICK DRAINS FT. |
| \_\_\_\_\_\_\_ | \_\_+\_\_ | \_\_+\_\_ | \_\_\_\_\_ | \_\_\_ | \_\_\_ | \_\_\_\_\_ |

Detail a minimum 36-inch thick drainage blanket of granular material in the project plans, conforming to 703.02.A, over the entire area to be treated with wick drains, and beyond in all directions by one wick drain spacing or a minimum of 6 feet. Specify the drainage blanket as Item 203E35001 Granular Embankment, As Per Plan for payment. The top 12 inches of the drainage blanket is to be placed after installation of the wick drains; the lower portion placed prior to installation of the wick drains constitutes the working platform. Grade the bottom of the drainage blanket to drain, with a minimum 1% slope, to an outlet location. If a direct outlet is not possible, provide an outlet pipe, conforming to 707.33; the outlet pipe is incidental to the Item 203 Granular Embankment, As Per Plan. Provide the following plan note in the plans:

Item 203 GRANULAR EMBANKMENT, AS PER PLAN

Prior to the installation of wick drains, provide a minimum (1) -inch thick layer of granular material, conforming to 703.02.A, over the area detailed in (2) to the top of working platform elevation. Prior to placement of the granular material, grade the bottom of the placement area to drain as shown in the detail. Provide a (3) -inch diameter outlet pipe conforming to 707.33 at the location shown in the detail; payment for the outlet pipe is incidental to this item. After installation of the wick drains, place an additional 12 inches of granular material overtop of the cut off wick drains. Place and compact the granular material in accordance with Item 203.

(1) This is typically 24-inch thick. Increase the platform thickness as necessary to ensure a stable working platform for the equipment.

(2) Provide a plan view of the drainage blanket placement area and specify the detail or figure in the plan note. Specify the elevation of the top of the working platform. Detail the grading of the bottom of the placement area for drainage, and the outlet location. Provide additional details as necessary.

(3) Provide a diameter for the outlet pipe, if an outlet pipe is necessary. Otherwise, delete this sentence from the plan note.