

Section 2112. Wick Drains

2112.01 DESCRIPTION.

- A. Furnish all necessary labor, equipment, and materials and perform operations necessary for installation of prefabricated vertical drainage wicks (wick drains) according to the contract documents.
- B. Wick drains consist of a band-shaped plastic case which permits continuous vertical drainage, wrapped in a filter material, installed in the subsoils by displacement methods, and spaced and arranged as shown on the plans.

2112.02 MATERIALS AND EQUIPMENT.

At least two weeks prior to construction, submit wick drain samples and certification indicating the source and material properties of the drain materials. At the Preconstruction Conference, submit to the Engineer for review and approval details of the sequence and method of installation. Approval by the Engineer does not relieve the Contractor of the responsibility of installing the wick drains according to the contract documents.

A. Materials.

Install prefabricated wick drains consisting of a plastic drainage core encased in or integrated with a filter jacket. Ensure it is band-shaped with an aspect ratio (width divided by thickness) not exceeding 50. Prefabricated wick drains meeting this specification are listed in [Materials I.M. 442.01](#).

1. Core

Meet the following requirements:

- Provide continuous vertical drainage.
- Continuous plastic material fabricated to promote drainage along the axis of the vertical drain.

2. Jacket.

- a. Install a jacket that allows free passage of pore water to the core without loss of soil material or piping. Meet the following requirements for jacket material:
 - Manufactured from a synthetic non-woven geotextile capable of resisting all bending, punching, and tensile forces imposed during installation and during the design life of the drain.
 - Sufficiently rigid to withstand lateral earth pressures due to embedment and surcharge so that the vertical flow capacity through the core will not be adversely affected.
 - Sufficiently flexible to bend smoothly during installation and induced consolidation settlement without damage.
 - Comply with the following specifications:

<u>Test Item</u>	<u>Designation</u> <u>Minimum Roll Value*</u>	
Grab Tensile Strength	ASTM D 4632	80 lb. (355 N)
Trapezoidal Tear	ASTM D 4533	25 lb. (110 N)
Puncture Strength	ASTM D 4833	50 lb. (220 N)
Burst Strength	ASTM D 3796	130 psi (900 kPa)

Permittivity	ASTM D 4491	100 gal/min/ft ² (4285 L/min/m ²)
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*Ensure the jacket material is tested in saturated and dry conditions.

- b. Do not allow the jacket material to be subject to localized damage (for example, punching through the filter by sand/gravel particles). Ensure the jacket material does not undergo cracking and peeling during installation of the drain.

3. Assembled Drain.

Meet the requirements below. The Engineer may reject material that is damaged during shipment, storage, or handling, or which does not meet the minimum requirements of the drain material.

- One single type of assembled drain used on the project, unless the Engineer approves otherwise.
- Mechanical properties (strength and modulus) of the assembled vertical drain equal to or greater than those specified for the component jacket and core.
- Resistant against wet rot, mildew, bacterial action, insects, salts in solution in the groundwater, acids, alkalis, solvents, and any other significant components in the site groundwater.
- Minimum discharge capacity of 3500 cubic feet per year (100 m³/yr) when measured under a gradient of one at a lateral confining pressure of 25 psi (172 kPa).
- Minimum equivalent diameter of 2 inches (50 mm) using the following definition of equivalent diameter:
 - $dw = (a+b)/2$.
 - dw = diameter of a circular drain equivalent to the band shaped drain (inches (mm)).
 - a = width of the band shaped drain (inches (mm)).
 - b = thickness of the band shaped drain (inches (mm)).
- Drain material labeled or tagged in such a manner that the information for sample identification and other quality control purposes can be read from the label. Ensure, as a minimum, each roll is identified by the manufacturer as to lot or control numbers, individual roll number, date of manufacture, manufacturer, and product identification of the jacket and core.
- Ensure during shipment and storage the drain is wrapped in heavy paper, burlap, or similar heavy duty protective covering and according to the manufacturer's recommendations.

B. Equipment.

1. Install wick drains using equipment of a type that will cause minimum disturbance of the subsoil during the installation operation.
2. Install the wick drains using a mandrel. Push (in one continuous movement) the mandrel through the sand blanket and into the soil. Vibrating or driving are options if the Engineer approves. Ensure the mandrel:
 - Protects the wick material from tears, cuts, and abrasions during installation,

- Is rectangular in shape and of a cross sectional area not to exceed 10 square inches (6500 mm²), and
- Is provided with an “anchor” rod or plate at the bottom to prevent soil from entering the bottom of the mandrel during installation of the drain and to anchor the bottom of the drain at the required depth at the time of mandrel removal.

2112.03 CONSTRUCTION.

- A.** Familiarity with site conditions and the available geotechnical information is a necessity. Prior to installation of the wick drains, demonstrate the equipment, method, and materials produce a satisfactory drain installation. Drill at least two borings within the area designated on the plans in order to select the equipment, method, and materials: 1) suitable for the existing site conditions; and 2) capable of producing a satisfactory drain installation to the minimum elevation. Installation of up to ten trial drains may be required in each of two to four test locations designated by the Engineer. Compensation will be made for each trial drain if the installation satisfies the requirements of the contract documents. No compensation will be allowed for installing unsatisfactory trial drains.
- B.** The Engineer's approval of the method and equipment used to install the trial drains does not constitute acceptance of the method for the remainder of the project. If the Engineer considers that the method of installation does not produce a wick drain that satisfies the requirements of the contract documents, alter the method or equipment, or both, in order to achieve compliance.
- C.** Prior to installing the drains, grade the site sufficiently level (at no additional cost to the Contracting Authority) to allow vertical and proper drain installation.
- D.** Install the wick drains following placement of the sand blanket. Install a granular blanket of sufficiently coarse material and compact to provide a stable working surface.
- E.** Locate, number, and stake wick drains. Take all reasonable precautions to preserve the stakes. Ensure drain locations vary by no more than 3 inches (75 mm) from the locations indicated on the drawings. Two weeks prior to construction, submit drawings to the Engineer for approval showing the method of field locations, drain layout, and numbering plan.
- F.** Auguring or other methods may be used to loosen stiff upper soils prior to the installation of the drains, provided such operations do not extend more than 2 feet (600 mm) below the bottom of the sand blanket. After the wick drain has been satisfactorily installed, fill all holes or voids created by such operations with sand.
- G.** Check the installation equipment for plumbness prior to advancing each drain. Ensure the plumbness of the mandrel does not deviate more than 1/4 inch per foot (50 mm per meter) from vertical. Install the drains to the minimum elevation as shown on the plans. If the penetration shown on the

plans is more than 1 foot (300 mm) into the underlying foundation layer and difficulties are encountered prior to achieving the indicated depths, install the drains to a depth of 1 foot (300 mm) below the bottom of the soil layer(s) being improved by wick drain installation as shown on the plans.

- H. The Engineer will reject wick drains that vary from their proper location by more than 6 inches (150 mm) at the ground surface, drains that are damaged during installation or subsequent construction, or drains that are improperly completed. No compensation will be allowed for any materials furnished or for any work performed on such drains.
- I. During installation, provide the Engineer with suitable means of measuring the vertical length of each wick drain installed at a given location and deriving a tip elevation for each drain.
- J. Splices or connections in the wick drain material will not be allowed.
- K. When obstructions that cannot be penetrated by the drain installation equipment are encountered below the working surface, notify the Engineer and complete the drain from the elevation of the obstruction to the working surface. At the direction of the Engineer, attempt to install a new drain (maximum of two attempts, as directed by the Engineer) within an 18 inch (450 mm) radius from the obstructed drain. The Contractor will be compensated for each obstructed drain unless the drain is improperly completed, in which case no compensation will be allowed.
- L. After installation, cut each drain horizontally such that approximately 6 inches (150 mm) of drain material extends above the top of the sand blanket.
- M. The Engineer will keep a daily log which lists for each drain the date of installation, top elevation, tip elevation, and pay length. A copy of each daily log will be provided to the Contractor.

2112.04 METHOD OF MEASUREMENT.

- A. Measurement for Wick Drain (including trial wick drains) will be feet (meters) installed according to the contract documents, calculated from measurements taken from the top of the drain to the tip elevation of the drain.
- B. In the case of obstructions, the Engineer will calculate the number of feet (meters) from measurements taken from the top of the drain to the elevation at which the obstruction was encountered.

2112.05 BASIS OF PAYMENT.

- A. Payment for Wick Drain will be the contract unit price per foot (meter).
- B. Payment includes:
 - Field staking for the location of wick drains, and

- All labor, equipment, and materials necessary to complete the installation according to the contract documents.
- C.** No payment will be made for unacceptable drain or trial drain installations.
- D.** In instances where pre-auguring is permitted, the cost of pre-auguring and subsequent placing of sand backfill material is incidental to the price bid for Wick Drains.
- E.** The cost of borings drilled to select the equipment, method, and materials suitable for the existing site conditions to produce a satisfactory drain installation is incidental to the price bid for Wick Drains.