

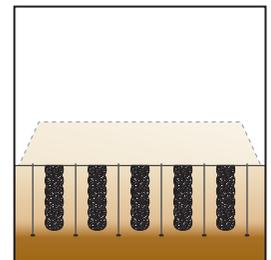
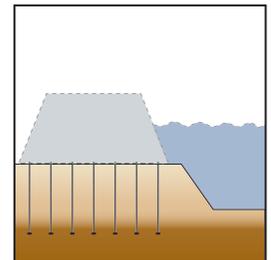
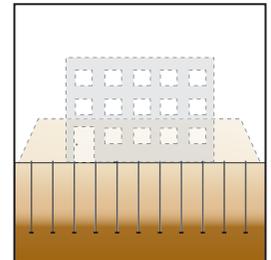
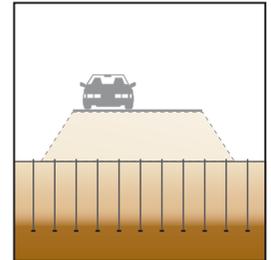
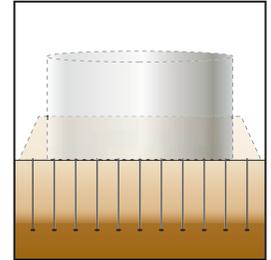
WICK DRAINS

Wick drains accelerate the consolidation of compressible soils, in turn accelerating your project schedule.



Above: Horizontal strip drains being placed after installation of wicks for a new maintenance facility on the Mississippi River floodplain in Memphis, TN.

Right: Two of three rigs used to install 1,700,000 linear feet of wick drain to a maximum depth of 75 feet, and 55,000 feet of strip drain for a new housing development in Yorba Linda, CA.



Wick drains are prefabricated vertical drains installed to accelerate the consolidation of compressible soils. The drain consists of a geotextile filter-wrapped plastic strip with extruded channels that allow water to drain from soft soil as it consolidates under an applied surcharge load. The geotextile filter prevents soil particles from entering the channels and clogging the drain. The time required for the consolidation to occur depends on the permeability of the soft strata, the existence of sand layers in the strata, the weight of the surcharge, and the spacing of the wicks.

Wick Drain Technology...

The prefabricated wick drain was invented in the mid-1930s by Walter Kjellman at the Swedish Geotechnical Institute. The first drain consisted of two cardboard sheets glued together, with internal channels. The modern wick drain consisting of geotextile filter-wrapped plastic with extruded channels was developed in 1971, also at the Swedish Geotechnical Institute. The plastic wick drain allowed for faster installation and increased flow rate volume over the early cardboard style. HB Wick Drains uses the Mebra™ brand of wick drains, the most effective and efficient design in the industry.

Applications

- ◆ Rapid consolidation of soft soils in conjunction with a preload fill (or applied negative pressure)
- ◆ Accelerated construction schedule for staged loading or staged construction on soft soils

Wick drains can be applied to any site that requires consolidation, including sites for:

- ◆ Roadway embankments
- ◆ Airports and seaports
- ◆ Bridge approaches and overpasses
- ◆ Storage tanks
- ◆ Dams and levees
- ◆ Commercial and residential buildings
- ◆ Railway embankments
- ◆ Mining wastes and tailings

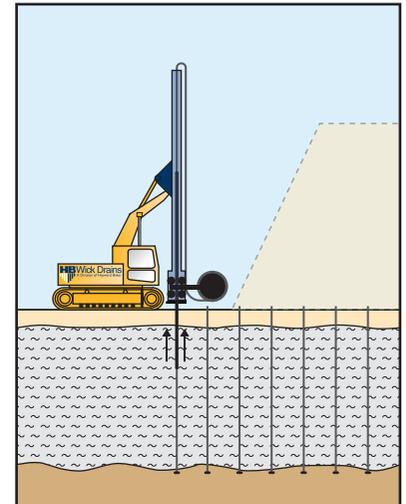
Installation

Before installation can begin, the working surface must be prepared to ensure a stable working platform. Since wick drain sites are typically soft, a sand or gravel blanket may be needed to provide support for the equipment. The sand and gravel will also act as a drainage blanket to direct water away from the treatment area.

A specialized mast consisting of drain material and a mandrel is mounted on either a track-mounted excavator or crane, depending on the installation depth. Drains can be installed up to 140 feet deep from a track-mounted excavator. Drains deeper than 140 feet often require the mast to be mounted on a crane for stability.

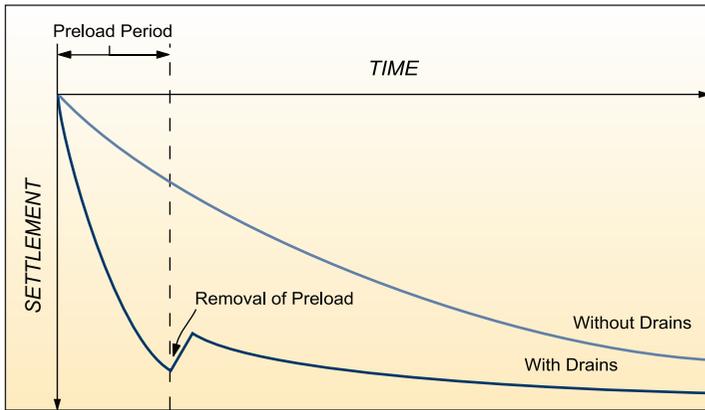
The wick drain is threaded through the mandrel, which protects it from damage as it is installed through the soil. The installation force is typically provided by vibratory hammers, static force methods, or a combination of these methods depending on the soil conditions. Water may be utilized to lubricate the mandrel during installation to reduce the friction on the mandrel. An anchor attached to the bottom of the drain keeps it in place during withdrawal of the mandrel. The drain is then cut several inches above ground, and a new anchor is fastened to the wick at the bottom of the mandrel in preparation for the next installation point.

Layout usually consists of triangular or square grid patterns. Typical spacing ranges from 2.5 to 8 feet on center.

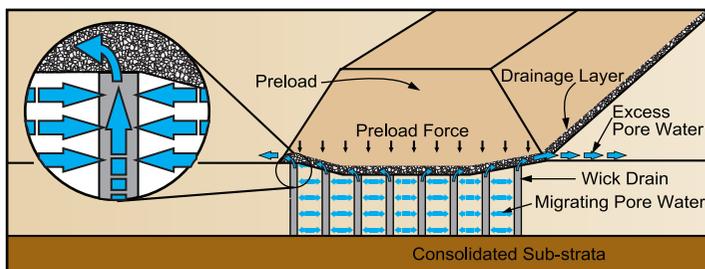


A total of 2,300,000 linear feet of wick drain was installed offshore (top photo) through as much as 40 feet of water, to depths up to 120 feet, and 8,800,000 linear feet of wick drain was installed on land (bottom photo), to depths of 98 feet, for the Port of Los Angeles Channel Deepening.

As a division of Hayward Baker, North America's leader in geotechnical construction, HB Wick Drains has direct contact with experts in other ground improvement methods that might be a suitable complement for your site.



Settlement/Time Curve



Pore Water Drainage Flow Path



Mebra™ wick drains, designed and fabricated by HB Wick Drains, are composed of a central core surrounded by a filter sleeve.

Design Considerations

Wick drains are typically used in soft saturated fine-grained soils, such as silts, clays, organic silts, organic clays, peat, sludges, mine tailings, and dredge fills.

The geotechnical investigation should include continuous sampling to identify any sand drainage layers that may contribute to faster consolidation. Appropriate consolidation tests should be performed on the soft material strata to estimate the magnitude and rate of the settlement.

Soft soils, when loaded by surcharge, will undergo:

- ◆ Initial elastic compression
- ◆ Consolidation
- ◆ Secondary compression

Geotechnical Considerations

Wick drains are effective in the following soil conditions:

- ◆ Moderate to highly compressible
- ◆ Low permeability
- ◆ Saturated soils
- ◆ Maximum past consolidation stress less than load induced stress

Some site and soil conditions that require evaluation prior to determining the economic and technical feasibility of wick drain systems include:

- ◆ Working surface stability
- ◆ Overhead and below grade obstructions
- ◆ Stiff to very stiff layers (may be addressed with pre-drilling)
- ◆ Softness of anchoring layer
- ◆ Site accessibility

Environmental Considerations

Water removed by wick drains will need to be collected and treated if the in situ soils are contaminated. For contaminated sites, the drain design length should not fully penetrate into an underlying aquifer.

Quality Assurance/Quality Control

Pore pressures may be monitored along with settlement and loading. Ground movement can be monitored by settlement plates, gauges, and inclinometers. Extensometers can be installed to evaluate settlement versus depth.

Advantages of HB Wick Drains

- ◆ *Fast mobilization and installation*
- ◆ *Reduced construction time*
- ◆ *Minimal post-construction settlement*
- ◆ *Increased strength gain rate due to consolidation of soft soils*
- ◆ *Several types of rigs with different capabilities that can be matched to the soil conditions to provide the best installation*



A total of 180,000 linear feet of wick drain was installed to 50 feet in sub-zero temperatures to accelerate drainage of soft compressible clay for the construction of an oil drilling platform in Prudhoe Bay, Alaska.

Why Should You Choose HB Wick Drains?

As a division of North America's leader in geotechnical construction, HB Wick Drains has the resources to build your project. Our network of offices and full-service equipment yards means fast mobilization and reduced start-up costs.

From job start-up to installation of the last drain, our attention to quality control helps to

ensure that project specifications are achieved. We customize and design our equipment and tooling, helping to ensure that performance and reliability are the best in the industry.

HB Wick Drains has the experience and innovation to assist engineers, contractors, and owners with identifying, developing, and implementing the best wick drain solution.

HB Wick Drains

A Division of Hayward Baker

Denver, Colorado Headquarters

7989 Cherrywood Loop
Kiowa, CO 80117
U.S.A.
Phone 303-627-1100
Fax 303-951-5800

Edmonton, Alberta

2816 Ellwood Drive SW
Edmonton, AB T6X 0A9
Canada
Phone 780-465-3200
Fax 780-465-3288

Baltimore, Maryland

7550 Teague Road
Suite 300
Hanover, Maryland 21076
U.S.A.
Phone 410-551-8200
Fax 410-799-3786

Website www.HBWickDrains.com

Email wickdrains@HaywardBaker.com

Hayward Baker Inc.

A member of the Keller Worldwide Group of Companies
Phone 800-456-6548
Website www.HaywardBaker.com
Email info@HaywardBaker.com

© Hayward Baker Inc.

W1-MAR-10001-JW

Rev 06/13