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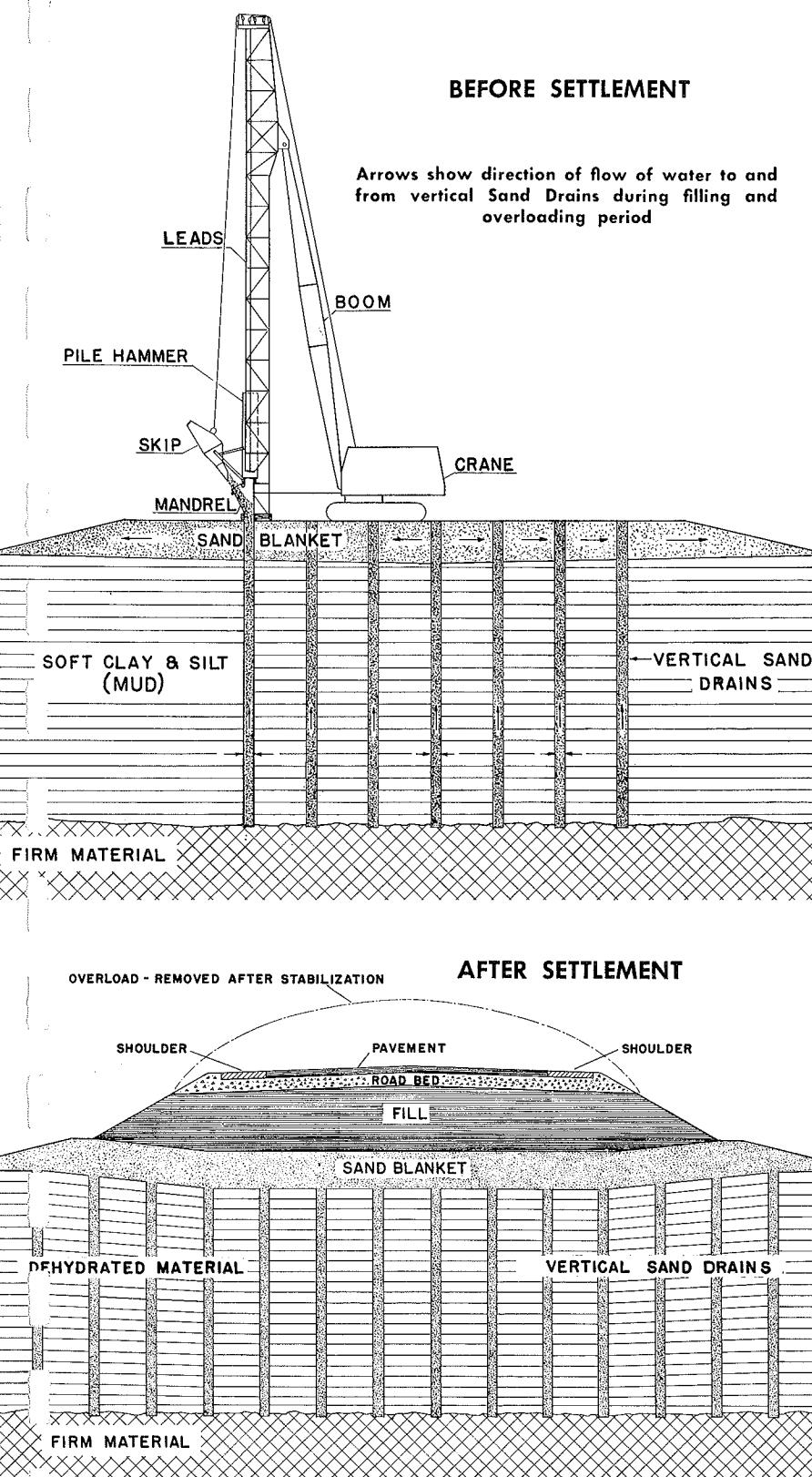
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McKiernan-Terry SAND DRAIN EQUIPMENT



HOW VERTICAL SAND DRAINS WORK

After the texture of the soil has been determined and the depth of the clay pan or hard pan has been found, a blanket of sand varying from 2 to 8 feet deep is spread over the surface of the marsh land. This sand blanket serves two purposes; first, to support the crane, compression leads, trucks and other equipment; and second, to drain away, in a horizontal direction, the water rising in the vertical sand columns.

With the equipment erected and in operating position, the lower end of the mandrel, made of straight pipe, 12 inch up to 24 inch in diameter, is closed by a specially designed hinged, flat plate or a conical concrete point.

The mandrel is driven through the sand blanket and muck by a McKiernan-Terry Pile Hammer to the desired depth. The sand column may vary from 10 feet to over 100 feet deep.

Coarse sand is dumped from a batch truck into the sand skip in sufficient amount to fill the mandrel, after which the sand skip is hoisted up the front of the compression leads. At the proper height, the sand skip door is opened allowing the sand to flow through the trap door into the Sand Drain mandrel. The Sand Drain mandrel trap door is closed and air pressure is applied on top of the sand. At the same time, the crane starts pulling the mandrel out of the ground. The air pressure holds the sand in the hole while the mandrel is pulled. The flat plate at the lower end of the pipe is tipped vertically and recovered, or the conical concrete point is left in the ground, thus leaving a vertical column of sand.

When the end of the pipe is clear of the top of the ground, the crane booms up the Compression Leads and moves to the next spot for driving. The vertical sand columns are usually placed on 6- to 20-foot centers depending upon the character of the soil and the time available for construction and stabilization.

The blanket of sand is overloaded to add weight to the surface of the marsh land and compress the liquid muck. The vertical sand columns act as drains and allow the excess water to escape rapidly, thus permitting the filled weight to rest on the soil particles instead of on the water within the soil. Through this action the underlying silt has been known to consolidate or settle vertically as much as 20 feet without causing lateral soil displacement or "Mud Waves." The sand blanket becomes a part of the fill necessary to replace the displaced water. The weight of overload governs the consolidation of the ground being compacted. The overload is removed after stabilization.

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DESIGN FEATURES OF McKIERNAN-TERRY SAND DRAIN EQUIPMENT

ORIGIN AND USE OF SAND DRAINS

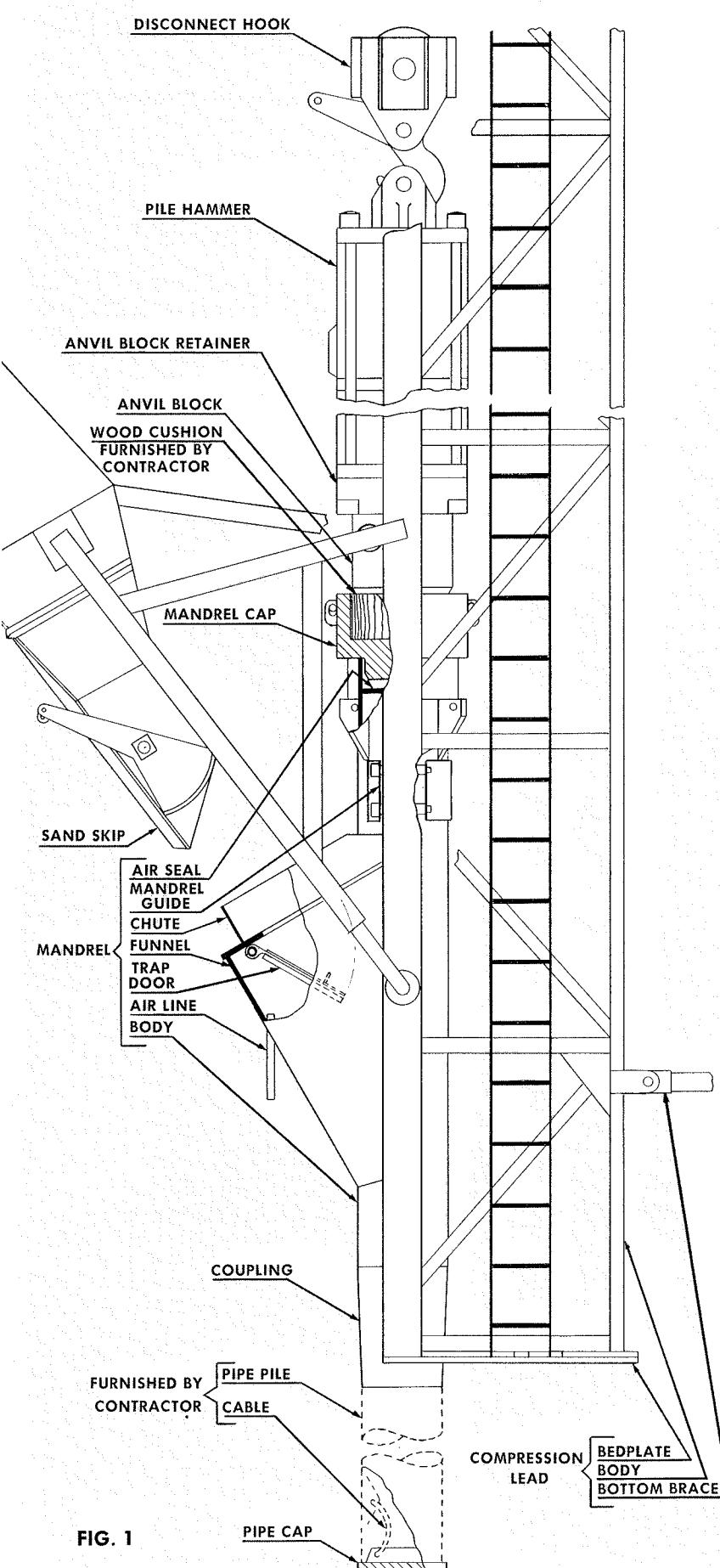
Mr. O. J. Porter of Sacramento, California, originated and developed Sand Drains for commercial use in 1934. Since 1935, hundreds of thousands of vertical Sand Drains have been utilized to stabilize underlying silt on California State Highway Projects, Navy Bases in California, and Highways in Puerto Rico. In 1947, Sand Drains were introduced to the Eastern Seaboard by Mr. Porter, when The Port of New York Authority decided to use this method to rehabilitate La Guardia Airport, which was settling due to rubbish fill on swampy ground. In 1947, the State of New Jersey awarded contracts for Sand Drain work on their Route 100 State Highway Project and an extension of the approach to the Lincoln Tunnel, which would by-pass the town of Secaucus, New Jersey. Hundreds of 90-foot, 80-foot and 70-foot (16-inch) Sand Drains were driven in Secaucus using Compression Leads of 115 feet and a single-acting S-5 McKiernan-Terry Pile Hammer; and 20-foot and 15-foot Sand Drains were driven, using 60-foot Compression Leads and a double-acting 9-B-3 McKiernan-Terry Pile Hammer. This work was done by George M. Brewster and Son, Contractors, of Bogota, New Jersey.

Vertical Sand Drains were installed in Kentucky in 1948 to stabilize a wet clay foundation to support a large earth fill structure. In the Fall of 1948, R. B. Jaggard Engineering Company of Westmont, New Jersey, started work on the approaches for the Point Pleasant-Brielle Bridge, where 50-foot (18-inch) Sand Drains were sunk, using a single-acting S-5 McKiernan-Terry Pile Hammer and 80-foot Compression Leads.

Over 3,000,000 lineal feet of Sand Drains were specified in the building of the New Jersey Turnpike from the George Washington Bridge to Linden, New Jersey and from Woodbury to Deepwater, New Jersey.

Most recently vertical Sand Drains have been used to consolidate the right-of-way of many of the nation's highways: the New Jersey Garden State Parkway; the approaches to the Philadelphia, Walt Whitman Bridge; U. S. 99, Marysville, Washington; the New York Thruway; Ohio Interstate Route #71; Washington, D. C. Parkway System at the Anacostia River; the Connecticut Turnpike; Utah Interstate Route 15 and California State Highways in the Delta and San Francisco Bay area.

Sand Drains were used to prepare the ground before realignment of railroads at O'Hare Airport, Chicago, Illinois and relocation of runways at La Guardia Airport, New York.



A complete set of equipment for driving Sand Drains (see Fig. 1) as manufactured by McKiernan-Terry Corporation will consist of the following items:

Compression Leads complete with:
Sheave Head
Boom Connection
Bed Plate
Boom Brace
Pile Hammer Disconnect Hook
Sand Drain Pile Hammer
Sand Skip
Sand Drain Mandrel Cap
Sand Drain Mandrel
Sand Pipe Cap

Compression Leads

McKiernan-Terry Compression Leads are designed to be stiff when guiding the Sand Pipe and Mandrel, Mandrel Cap and Pile Hammer, and both strong and stiff to resist compression and column action when the tremendous pull is applied to extract the Sand Pipe from the ground. Yet, with all this strength and stiffness, the Leads are light in weight so that they can be easily handled by the crane as it moves from location to location.

Compression Leads come complete with Sheave Head, supplied with bronze-bushed, cast-steel Sheaves, Bottom Brace, Bed Plate, Ladder and Boom Connection. The Leads are built in sections to permit erection of various heights and to facilitate transportation from job to job.

The "boom connection" for each set of leads is "tailor made" to fit the Boom Point of the specific make and model of crane with which the Leads are to be used.

Pile Hammer Disconnect Hook

The Pile Hammer must be free to follow the Sand Drain Mandrel when it falls through the "muck." The "fall through" has been observed to be as much as 30 feet. Unless the Hammer can freely follow the Sand Drain Mandrel, great damage can be self-inflicted on the Hammer parts. Since it is not always possible to keep the Pile Hammer line slack enough, McKiernan-Terry has designed and can supply a Pile Hammer Disconnect Hook.

A Pile Hammer Disconnect Hook provides a method of wholly disconnecting the Pile Hammer, guided in Leads, from the hoisting line during the driving operation. The Pile Hammer Disconnect Hook is interposed between the Pile Hammer hoisting line and the Pile Hammer. (This item not necessary with "C" Type hammers which are self-stopping when not supported by a pile.)

Sand Drain Pile Hammers

The new McKiernan-Terry "C" Type Pile Hammer is particularly applicable to Sand Drain operation. The only special part needed to convert a "C" Pile Hammer to Sand Drain use is a Sand Drain Anvil Block. This Anvil is cabled to the Bottom Head.

Single-acting or double-acting McKiernan-Terry pile hammers are convertible to sand drain use.

Single-Acting Sand Drain Pile Hammer. The only special part needed to convert a standard Single-Acting Pile Hammer to a Sand Drain type is a Sand Drain Anvil Block. This Anvil is cabled to the Bottom Cylinder.

Double-Acting Sand Drain Pile Hammer. To convert a Double-Acting Pile Hammer to a Sand Drain Hammer, it is necessary to replace the standard Flat Anvil and the Anvil Retainer with a special Sand Drain Anvil Block and Sand

Drain Anvil Block Retainer. When using an 11B3 Pile Hammer, it is necessary to replace the standard Top Head with a strengthened Sand Drain Top Head.

Sand Skip

The Sand Skip is filled with sand while it rests on the ground and, after being charged with the right amount, is tilted into the discharge position and hoisted up the front of the Leads. When the discharge chute of the Sand Skip is lined up with the chute of the Sand Drain Mandrel, the curved door of the Sand Skip is pulled open by rope from the ground. When the sand has completely left the Skip, the Skip is lowered to the ground to be re-loaded.

At the present time, Sand Skips are made in two sizes: 3 cu. yd. for Sand Drains up to 50 ft. long, and 6 cu. yd. for Sand Drains up to 100 ft. long.

To enable tilting the Sand Skip and move it up and down the Leads, the Skip has two Main Wheels which fit into tracks on the sides of the Leads and two Bumper Wheels which contact the front of the Leads. One cable from the crane goes over the Sheave Head of the Lead to the Sand Skip to effect hoisting and tipping. A second line is attached to the Disconnect Hook or the Pile Hammer for hoisting and lowering the Hammer, Mandrel Cap, Mandrel and Sand Pipe. Only two crane lines are required for the operation of McKiernan-Terry Sand Drain Equipment.

Sand Drain Mandrel Cap

The Mandrel Cap is an alloy-steel casting interposed between the Sand Drain Mandrel and the Anvil Block of the Pile Hammer. It is constructed with a large cavity in its top surface to receive cushioning material.

Sand Drain Mandrel

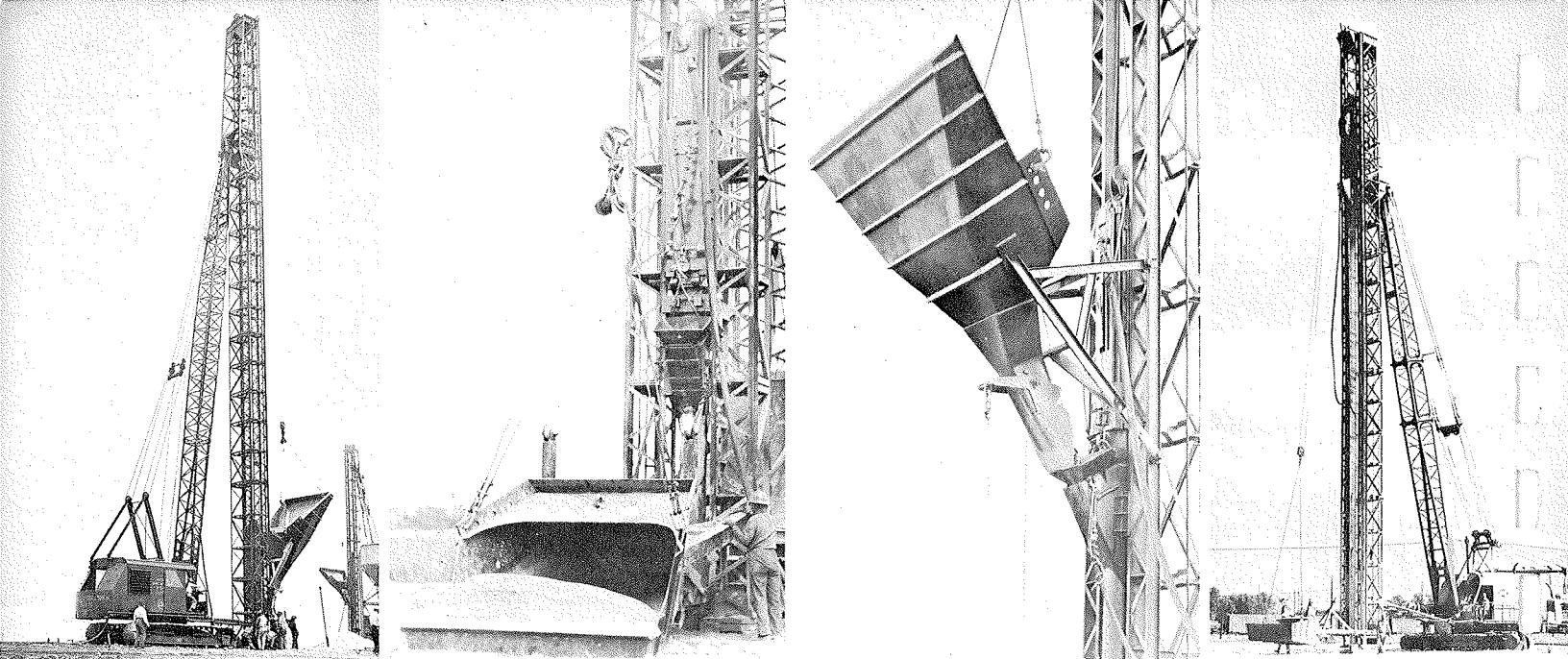
Through many field tests, a Sand Drain Mandrel has been designed to give long and enduring service. The Mandrel, as supplied by McKiernan-Terry, is a heavy wall pipe especially constructed in the form of a "Y" so that sand can be introduced to it to fill the Sand Pipe. The "Y" or chute through which the sand passes is fitted with an air-tight trap door. When the Sand Pipe is filled, the trap door is closed; 100 p.s.i. air pressure is introduced into the Mandrel to hold the sand down while the Sand Pipe is pulled out of the ground. On most jobs the compressor used for running the hammer, which is not in operation during the extracting of the pipe, is of sufficient capacity.

The Sand Drain Mandrel is welded to the Sand Pipe in the field by the Contractor. Usually the Mandrel is made to the same outside diameter as the outside diameter of the Sand Pipe. This outside diameter can vary from 14 inches to 20 inches. If another job should specify a larger or smaller Sand Pipe than the original Mandrel, the same Mandrel can be used with a Coupling, manufactured by McKiernan-Terry, to make the Mandrel fit the new Sand Pipe.

The Sand Drain Mandrel is approximately 10 feet long. The Sand Pipe, which is usually thinner walled than the Mandrel, is not supplied by McKiernan-Terry Corporation.

Sand Pipe Cap

The Pipe Cap is a circular flat plate held over the open end at the bottom of the Sand Pipe to keep the muck out. Usually a Pipe Cap is made 1 in. larger in diameter than the Sand Pipe. Plates welded to the Pipe Cap fit up inside of the Sand Pipe to keep the Pipe Cap from shifting.



GUARANTEE

McKiernan-Terry Corporation guarantees its new pile hammer, extractor and sand drain units to the original purchaser (user) against defective material or workmanship for a period of one (1) year after the date of shipment from the factory. Material returned to the factory, transportation charges prepaid, and found to be defective after examination or test will be replaced or its purchase price refunded, F.O.B. factory, at the discretion of McKiernan-Terry Corporation.

CONSTRUCTION EQUIPMENT DEPARTMENT **505 Manor Ave., Harrison, New Jersey**

Single-Acting, Double-Acting, and Diesel Pile Hammers, Leads,
Extractors, Base Attachments, and Sand Drain Equipment.



McKIERNAN-TERRY CORPORATION

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