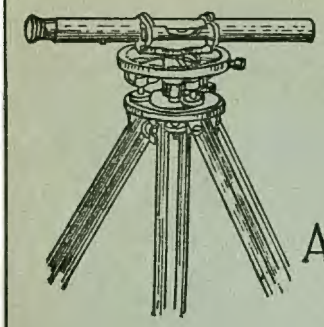


AGRICULTURAL ENGINEERING NEWS LETTER

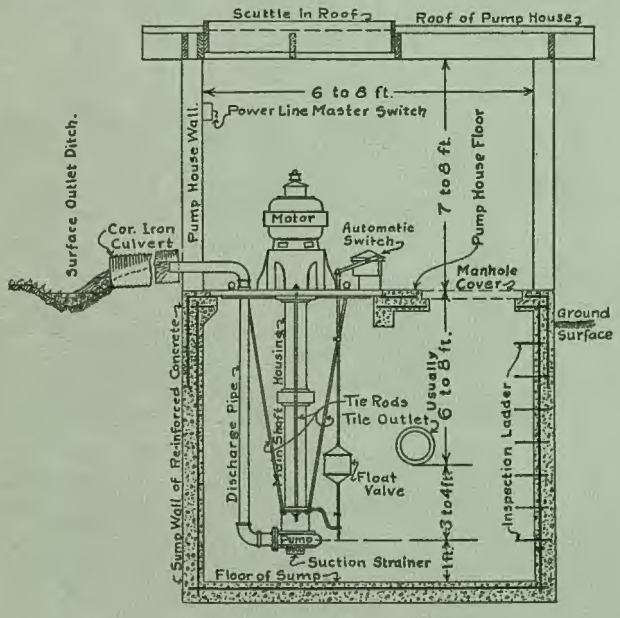
AGRICULTURAL EXTENSION DIVISION
UNIVERSITY OF MINNESOTA

UNIVERSITY FARM, ST. PAUL—SEPTEMBER 15, 1936—NO. 54

Pumping Outlets For Tile Drainage Systems

H. B. ROE

In spite of general drouth conditions an acute tile drainage problem exists on low areas on many farms owing to lack of outlet channels of sufficient depth to receive the water from tile drains. Opposition to large public ditches and the heavy overhead cost of public ditch proceedings aggravate the problem. Another way out for the farmer with electric power available is a pumping outlet which makes possible the use of existing *shallow* surface channels and road ditches for carrying the water away to the ultimate outlet streams. Pump drainage outlets are effectively and extensively used with growing frequency in conjunction with irrigation in the irrigated west, and also in the central and lower Mississippi Valley where drainage alone is the problem. A few relatively small private plants are proving effective in eastern Minnesota within 50 miles of University Farm. These may be visited by interested people.



Typical Layout—Not to Scale

ESSENTIAL FEATURES

These, shown diagrammatically in the illustration, in their proper relative positions, are as follows:

A sump or cistern 6 to 8 feet square with reinforced concrete walls, bottom and cover, and of sufficient depth to receive the water from the tile main, to permit setting the pump 3 feet or more below the mouth of the main and a foot above the bottom of the sump: (The sump should be located on the higher ground at the margin of the low area to prevent danger of flooding of pump house and motor.)

A vertical centrifugal pump, electrically driven, that will easily remove the maximum run-off from the main as fast at it comes.

An electric motor of sufficient horsepower to operate the pump easily under maximum load.

A float valve connecting with the master switch of the motor, adjustable to enable it to start the motor automatically at any desired height of water in the sump, and, when it drops below this point, to throw the switch and shut off the motor.

A conduit of a capacity several times that needed to carry the water, to receive it from the pump discharge and conduct it quietly to the final outlet stream or basin. (For durability, this conduit may be an open, concrete lined channel or a length of corrugated iron culvert pipe of a diameter several times that of the pump discharge and lying on a sharp gradient toward the final outlet channel. This arrangement greatly reduces the energy of the water as it comes from the pump, thus preventing washing and undermining.)

A pump house of any suitable building material and equipped, either with a large scuttle in the roof directly over the motor or with a sliding roof to permit of drawing the pump for repairs. (The walls of the sump serve as a foundation for the pump house whose floor is the cover of the sump.)

A manhole and inspection ladder to the bottom of the sump.

SOME GENERAL PRINCIPLES OF DESIGN

Specifications for general use, of size and capacity, cannot be given as each case is an individual problem, the design for which should be worked out by an experienced engineer.

Economy calls for ample capacity to carry an overload for short periods during unusual floods and to provide for further extensions of the drainage system not originally contemplated.

Where winter operation is required, special provisions against freezing must be made.

Size and capacity of pump and of motor are largely determined by capacity of the drainage main, degree of drainage required, and the necessary lift; but a 3-inch pump and a 5 h.p. motor are about the minimum sizes desirable even where the theoretically required capacity may be less. Motor and pump are built as a combination unit by several nationally known makers whose efficient engineering staffs are often available for design, and for counsel both before and after installation of plant. It is possible to get multiple unit pumps on which the successive units cut in at different stages of water in the sump. Such a pump is apt to be desirable where the rainfall is usually moderate but where short periods of intense floods also occur at infrequent intervals; but the extra cost of such pumps is relatively high.

COST

First cost of such a plant is considerable. It may be different in every case, but, for ordinary farm areas, will usually run from $600 to $1200 with a common average of about $800. However, it will usually pay for itself in from 1 to 3 years. Operating and maintenance costs will be small. The normal life of such a plant is 25 to 30 years.

ADVANTAGES

It gives the farmer an independent drainage outlet and, by proper adjustment of the automatic feature, he can control the water level in the drained area to a considerable extent and, in dry years, retain the water in those low areas which yield the best crops.

Note: Copies of the figure, for publication purposes, are available on request.

Published in furtherance of Agricultural Extension Acts of May 8 and June 30, 1914, F. W. Peck, Director, Agricultural Extension Division, Department of Agriculture, University of Minnesota, cooperating with U. S. Department of Agriculture