2. The use of washing mud based on sodium silicate, which eliminates slump-type settlement of the soils during pile fabrication and reduces the friction against their lateral on surface by 10-15% within the limits of the stratum prone to slump-type settlement, lowering the negative loads on the pile, is effective when piles are injected into predrilled holes in soils prone to slump-type settlement.

3. Drill-and-inject piles 250-400 mm in diameter and up to 50 m long have a design bearing capacity of from 0.50 to 2.50 MN and can be recommended for the installation of new, and the strengthening of existing foundations for civil and industrial projects in soils prone to slump-type settlement.

4. A special set of equipment, which makes it possible to ensure the continuous production of work that includes the drilling of holes, assembly of reinforcing cages, and the filling of the holes with a hardening grout, should be used for the installation of these piles.

LITERATURE CITED


5. GOST 5686-78. Piles and Methods of Field Testing [in Russian].


EXPERIENCE WITH THE CHEMICAL STABILIZATION OF LOESS SOIL PRONE TO SLUMP-TYPE SETTLEMENT USING AN AUGER-INJECTOR

B. N. Isaev, M. V. Soshin,
S. Yu. Badeev, and V. F. Dorokhin

The most rapid implementation of actual innovations and rational proposals is an effective means of accelerating technical progress in construction practice. Such an innovation in the field of chemical soil stabilization, which ensures a reduction in the consumption of scarce stabilizing materials and labor outlays with a simultaneous increase in the quality of stabilization, is cited below.

The Scientific-Research Institute of Mechanics and Applied Mathematics at the Rostov State University, in conjunction with the Volgodonsk Special Administration "Gidrospetsstroi," has developed and tested under field conditions a new procedure for soil stabilization [1], the essence of which consists in a combination of operations involving the drilling, injection, and plugging of a hole using a special auger-injector [2]. During the operation, a plug formed from soil loosened during the drilling, which is drawn into the upper portion of the hole and then compacted in the gap between the bar and the wall of the hole, is placed to prevent the grout from being driven out. The auger-injection (Fig. 1) includes conical tip 1 on the upper segment of injection pipe 2 on which are installed spiral blades 3 of the auger and interchangeable bushings 4 with helical blades-vanes 5 and protective deflectors.

TABLE 1

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Change in parameter with time, min</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0...3</td>
</tr>
<tr>
<td>Grout-injection pressure, MPa</td>
<td>0...0.02</td>
</tr>
<tr>
<td>Amount of grout (liters) when injected through</td>
<td>0...15</td>
</tr>
<tr>
<td>Auger-injector driven injector</td>
<td>0...15</td>
</tr>
<tr>
<td>Consumption of grout (liters/min) when injected via:</td>
<td>3</td>
</tr>
<tr>
<td>Angular injector driven injector</td>
<td>3</td>
</tr>
</tbody>
</table>

Fig. 1. General appearance of auger-injector.

Valves 7, which are drawn together in pairs by elastic element 8, are placed in annular housing 6, which is built onto the injection pipe. Channel 9 for the passage of grout is formed on the internal surface of the bushing. Drill tip 10 is mounted on the lower section of the injection pipe. The grout is fed through hollow bars 11, which are joined by a coupling that provides for forward and reverse rotation of the auger-injector.

The auger-injector operates in the following sequence. Using injector drill tip 1, the soil is drilled to the elevation of the start of stabilization (Fig. 2a). The waste soil falls into the gap between the injection pipe and the wall of the hole, is broken up, and is drawn upward by helical blades-vanes to auger section 2 of the injector. The auger gathers the soil and delivers it beyond the conical tip into the gap between drill bar 3 and the wall of the hole. After the drill tip has achieved the required elevation, the soil in the gap is ultimately compacted by the conical tip by raising the injector 10-15 cm without rotating the drilling implement. The stabilizing grout, which stretches the elastic elements under pressure, opening valves 4 for the passage of grout, is then fed to the hollow bars. The grout proceeds into the gap between the injector pipe and the wall of the hole via the annular housing, impregnating, in turn, the soil mass within the bounds of setting 6, which is limited from above by soil plug 5. After this, we proceed to the next setting (Fig. 2b and c). As is apparent from Fig. 2, the soil plug builds up during drilling as the drilling implement is embedded. In this case, its height is increased each time by the height of a single setting. After the soil plug has been established above each of the settings, the stabilizing grout is delivered through the hollow bars.

It should be noted that the soil implement is raised within the limits of each setting without halting its rotation. Thus, the drilling, plugging, and grout-injection operations are combined without drawing soil to the surface.

To work out a procedure for delivering the stabilizing material through the auger-injector and confirming the quality of stabilization, we performed a set of studies involving the