

[54] **METHOD OF STABILIZING SAND FOUNDATIONS UNDER BUILDING WORKS SUBMERGED IN WATER**

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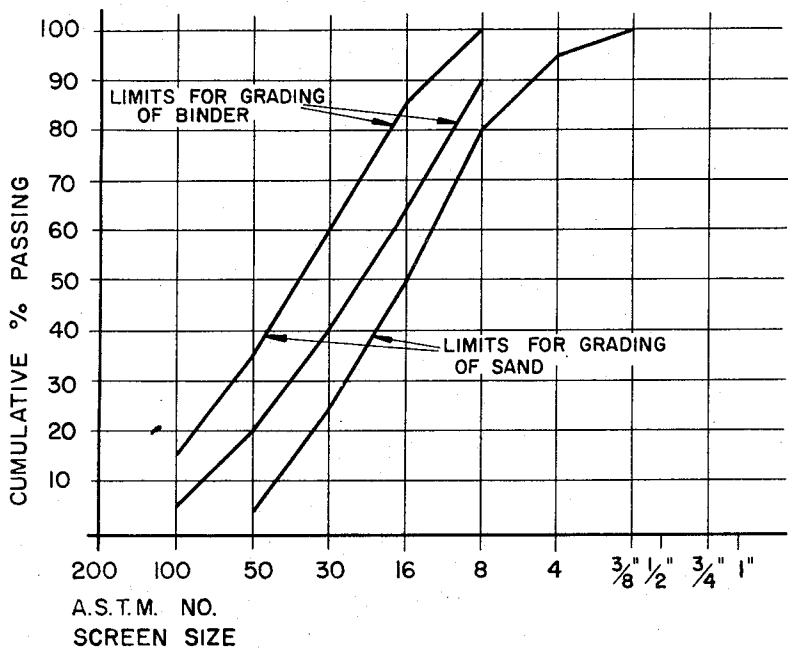
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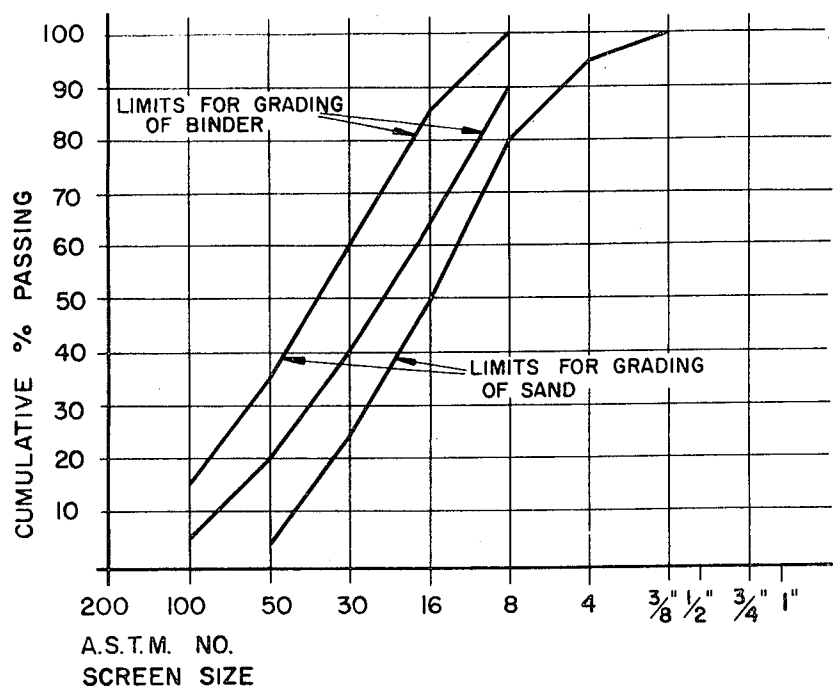
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[57] **ABSTRACT**

A method of stabilizing sand foundations under building works submerged in water including pumping in sand to which a small percentage of hydraulic binder is added under the building work, utilizing a grain-size distribution of the hydraulic binder adjusted to the grain-size distribution of the sand to avoid separation of the binder from the sand, wherein the hydraulic binder, by hydration, cements the sand grains into a strong coherent conglomerate which will remain unaffected by earthquakes.

4 Claims, 1 Drawing Figure





METHOD OF STABILIZING SAND FOUNDATIONS UNDER BUILDING WORKS SUBMERGED IN WATER

This invention relates to a method of stabilizing sand foundations under building works submerged in water, constructed by pumping in the sand under the building work.

It is known that the strength and resistance of a sand foundation situated on ground above water level can be improved by adding a small amount of cement to the sand.

When a sand foundation is to be constructed under a building work resting on a submarine bottom on temporary supports, the excavation having been extended somewhat below the bottom of the building work, it is known practice to fill in the sand by means of a special apparatus and special pumping methods such as covered by U.S. Pats., No. 2,191,845 to Bretting and No. 3,577,738 to Havnø. It is known that foundations are obtained in this way, for instance for subaqueous tunnels.

It is also known that heavy earthquakes can cause an increase in the density of the sand in natural sand-strata and in constructed sand foundations, perhaps after previous liquefaction of the sand, by which a building work founded on the sand can be subject to settlement and perhaps damage.

The purpose of the invention is to provide a method of stabilizing sand foundations submerged in water so that the foundation will withstand earthquakes without settlement, and the method of the invention is characterized by the fact that a certain small percentage of hydraulic binder is added to the sand to be pumped in to form the foundation, the grain-size distribution of the hydraulic binder being adjusted to the grain-size distribution of the sand in such a way that separation of the hydraulic binder from the sand is avoided, so that the hydraulic binder, by hydration, cements the sand grains into a coherent conglomerate, the strength and structure of which will remain unaffected by earthquakes. The grain-size distribution of the hydraulic binder being adjusted to the grain-size distribution of the sand in such a way that separation is avoided, the foundation will have a uniformly distributed content of hydraulic binder, which by hydration will cement the sand grains into a coherent conglomerate, which will remain unaffected by earthquakes and in which the risk of liquefaction is eliminated.

The hydraulic binder used is, according to the invention, preferably a coarse-grained cement product having substantially the same grain-size distribution curve as the sand.

EXAMPLE

Sand for filling in under a building work submerged in water is mixed with 2-5 percent by weight of a coarse-grained cement product. The grain-size distribution of this material is substantially the same as that of the sand, as shown from the curves of the drawing. Such coarsely grained cement is not the product of standard cement mills but can be obtained from specialized plants.

The finished foundation is subjected to heavy shocks which it turns out to withstand perfectly.

It will be obvious to those skilled in the art that various changes may be made without departing from the scope of the invention and the invention is not to be considered limited to what is shown in the drawing and described in the specification.

What is claimed is:

1. A method of stabilizing sand foundations under building works submerged in water, constructed by pumping in the sand under the building work, characterized by the fact that a certain small percentage of hydraulic binder is added to the sand to be pumped in, the grain-size distribution of the hydraulic binder being adjusted to the grain-size distribution of the sand in such a way that separation of the hydraulic binder from the sand is avoided, so that the hydraulic binder, by hydration, cements the sand grains into a coherent conglomerate, the strength and structure of which will remain unaffected by earthquakes.

2. The method according to claim 1, characterized by the fact, that the added hydraulic binder is a coarse-grained cement product having substantially the same grain-size distribution as the sand.

3. A method in accordance with claim 1 wherein said small percentage of hydraulic binder added to the sand comprises 2-5 percent by weight.

4. A method in accordance with claim 1 wherein said grain-size distribution of said binder and said sand is as shown in the Figure.

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