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Abstract: When laying a pipeline, the soil is excavated and a void is formed in it. This affects the density and structure of the soil. After the pipeline is laid, the soil must be compacted. If the compaction is insufficient, the soil will loosen and distribute the load on the pipeline incorrectly. When installing the pipeline, attention should be paid to the processes of soil excavation, compaction and water flow.

Keywords: Pipe, soil, Moisture, compaction, density reduction, water permeability

Enter In water supply, it refers to the transportation pipe required for water transfer projects. Unlike drainage pipes, water supply pipes can withstand a certain water supply pressure. In the past, the pipes used for water supply were cast iron pipes. Open sand mold cast iron pipes, closed galvanized cast iron pipes, and cold (electric) galvanized and hot-dip galvanized pipes were used.

Cast iron pipes. Unlike steel, they are resistant to corrosion, but cast iron is a very heavy material, and this is its main disadvantage. Such pipes have thick walls with a rough inner surface. Cast iron pipes are suitable for use in sewage and water supply systems, they do not rust and last a long time. For example, the service life of a cast iron sewage system is from 80 to 100 years. Cast iron pipes are connected using gaskets and sockets. Depending on the weight of the products, cast iron pipes are of 3 types: very heavy, heavy and medium. They are coated with a special anti-corrosion layer - silicate enamel. Such pipes are characterized by high strength, resistance to temperature extremes and a low coefficient of expansion.

Changes in the mechanical properties of the soil: When a pipeline is laid, the soil is excavated and a void is created in it. This affects the density and structure of the soil. The mechanical properties of the soil are affected by the ratio of different sized particles (sand, silt, clay) in its composition, as well as its properties such as water retention, structure, air exchange and nutrient supply. Changing the mechanical properties of the soil is carried out to improve soil quality and increase agricultural productivity. **Reduced soil density:** Excavation can reduce soil density, which reduces the soil's compressive strength. **Soil compaction:** After the pipes are laid, the soil must be compacted. If the compaction is insufficient, the soil will loosen and distribute the load on the pipe incorrectly. The compaction of the soil, its maximum density, is determined by compaction in a standard manner in laboratory conditions. The graph of the density of the soil skeleton versus moisture content based on the results of standard compaction is shown in Figure 1. As can be seen from the figure, with increasing soil moisture content, its density increases and, after reaching a maximum value, it decreases. The dependence of soil compaction on its moisture content can be explained as follows. Soil with low moisture content is stiff, and the high air content in it, as well as the lack of moisture, leads to the fact that its aggregates are not destroyed during the compaction process, and as a result, the required density is not achieved. As the moisture content of the soil increases, its density increases. For this reason, the mutual resistance of soil particles due to moisture decreases, which leads to a decrease in its volume. When the moisture content reaches 18%, that is, when it is optimal, its density is maximum. When the humidity is higher than the optimum, the density of the soil decreases. Due to this, the air remaining in the soil composition resists its maximum compaction. The factors

characterizing the compaction of the soil can be expressed as its maximum density and optimum humidity. The maximum density of compacted soil can be defined as the order, method, and energy required to achieve the highest possible mass of the soil skeleton per unit volume. The optimum soil moisture content is the moisture content at which the soil reaches its maximum density during compaction. Compacting the soil in a given order under optimum moisture conditions creates the conditions for achieving maximum density with minimal effort. Figure 1 shows that the natural soil moisture content When $W_t = 0.16$ and the plasticity number $J_r = 0.12 \dots 0.13$, its maximum density is $\gamma_{sk.max} = 1.75 \text{ t/m}^3$, and when the optimum moisture content is $W_o = 0.18$, the density is $\gamma_{sk.max} = 1.75 \text{ t/m}^3$ [2,6]

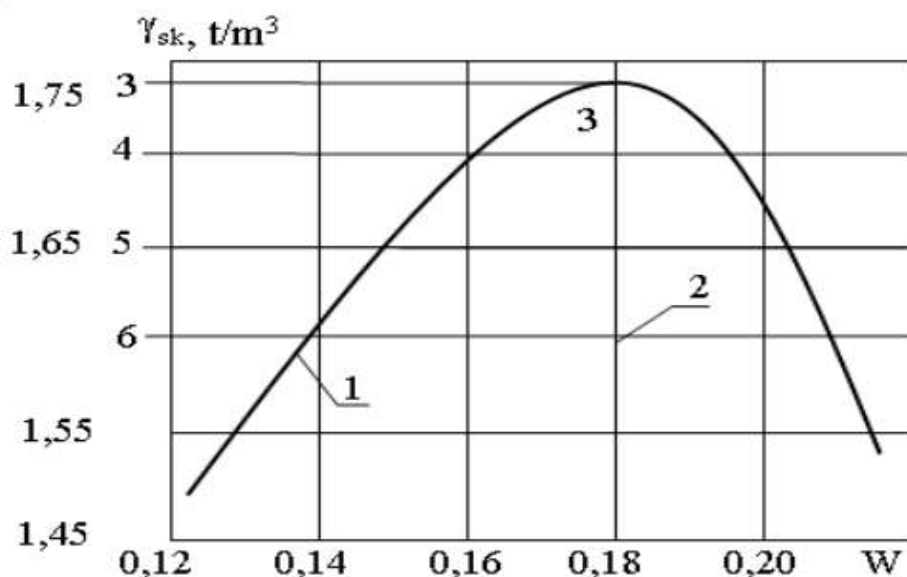


Figure 1. The dependence of the bulk density of the soil skeleton on its moisture content

Impact of water flow: Water flowing from a pipe moistens the soil, which can change the mechanical properties of the soil (e.g., clay soils soften and liquefy).

Risk of erosion and washout: If a pipe leaks, soil can be washed out and erosion can occur. This can reduce the stability of the soil, especially around the pipe. **Water diffusion within the soil:** Water can diffuse within the soil and cause soil liquefaction, especially in calcareous or clayey soils. The effect of soil on load-bearing capacity The load-bearing capacity of the soil in which the pipes are installed changes. If the soil is poorly compacted or the soil is liquefied, this will lead to improper perception of the loads on the pipe. The soil around the pipes forms a "soft zone", which negatively affects the distribution of high loads. Ecological impacts Water pipes can alter the natural movement of soil and groundwater. The natural permeability of the soil can be reduced or increased. [4,5]

Conclusion. The impact of pipelines on the soil is mainly manifested by changing the mechanical and hydrogeological properties of the soil. When installing pipes, it is necessary to pay attention to the processes of soil excavation, compaction and water flow. High-quality and correct installation of water pipes reduces the negative impact on the soil. If you need more specific or technical information on this topic, let me know, I will explain in more detail!

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