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SOME FEATURES OF THE CONSTRUCTIONS OF DRILLING RIGS

***Аннотация:** в статье рассматриваются особенности конструкций буровых вышек, предназначенных для бурения вертикальных и наклонных скважин. Представлены трехопорные и четырехопорные буровые вышки, также их сооружение, монтаж и перевозка. Раскрываются основные параметры, характеризующие буровые вышки, а также эксплуатационные требования, предъявляемые к ним.*

***Ключевые слова:** скважины, трехопорные буровые вышки, четырехопорные буровые вышки, основные параметры буровой вышки, типы буровых мачт, конструкции буровых мачт, монтаж, транспортировка буровых вышек.*

***Abstract:** This article considers the design features of drilling rigs intended for drilling vertical and inclined boreholes. Three-bearing and four-bearing drilling rigs are presented, as well as their construction, installation and transportation. The main parameters characterizing the drilling rigs, as well as the operational requirements to them, are described.*

***Keywords:** installation, boreholes, three-bearing and four-bearing drilling rigs, basic parameters of the drilling rig, types and design of drilling rigs, transportation of drilling rigs.*

Drilling rigs serve for lowering into the well and lifting of drilling and casing pipes from it. The drilling rigs can be wooden (from logs or planks) and metal (from

pipes). Three-legged rigs are used to drill inclined and vertical wells with a depth of 200–300 meters. For drilling vertical wells four-legged tower rigs are used.

Wooden rigs are used in forest areas. More often metal rigs are used. They are quickly assembled and disassembled, durable, and can be transported by tractors without dismantling over relatively flat area.

The height of the rigs is different and depends on the depth of the wells. For drilling deep wells, higher rigs are used. They accelerate the descent and rise of the drilling tool, since they allow the column of drill pipes to be separated into longer parts [1, с. 237].

Triggering and lifting operations on self-propelled and mobile drilling rigs are performed using metal masts, which, when transported, are laid in a horizontal position. The use of such plants shortens the time for installation, dismantling and transportation of equipment. But self-propelled plants usually do not have warmed-up drilling facilities and therefore can not be used in the cold season. For this purpose mobile drilling rigs are produced, which consist of a metal mast and a drilling building mounted on a welded metal base.

The main parameters characterizing the drilling rig are: its height (the distance along the well axis from the plane of the lower base to the axis of the crown block); the dimensions of the upper and lower bases; the height of the working shelf and the load capacity of the tower.

The type and design of the rig should be chosen depending on the depth of the well, the angle of its placement, the accepted drilling equipment taking into account specific local conditions and economic feasibility.

When choosing a rig by its height, it is necessary to start from the design depth of the well and the approximate duration of its drilling, which depends on the physical and mechanical properties of the rocks.

Three-bearing drilling rigs are used to drill vertical and inclined wells with a depth of 200–300 meters. The height of such rigs does not exceed 15 meters. The supports are made of casing pipes or logs with a diameter of 25–30 centimeters. The upper ends of the supports are connected by a king pin on which a metal earring suspended from

it by a block. To prevent the log support from splitting, the upper part of them must have a forging in the form of two metal hoops or clamps. The block suspended from the pin of the king pin must be broken by a steel rope or chain so that in the event of a break in the earring, the block can fall no more than 1 meter.

Four-bearing drilling rigs have greater stability and load-bearing capacity than three-bearing ones, which makes it possible to use them when drilling deep wells. On geological prospecting, metal rigs of 18 to 32 meters in height are used.

The construction of drilling rigs is preceded by the selection and preparation of a working platform. The location of the well is determined by the geological department and is consistent with the technical department of the enterprise. This takes into account a number of circumstances that affect drilling operations (availability of water, access roads, minimum volume of excavation in site planning, etc.). Choosing a site for the site, you should avoid wet lands and clay slopes that can lead to landslides, make the tower inaccessible to vehicles during the rainy season. In the summer, it is advisable to place the rig on an elevated part of the area, where there will be no accumulation of rain and melted water. In winter, you need to select places protected from strong winds and snow drifts. In areas of permafrost, it must not be allowed to be overtaken on the site and, if possible, not to remove the vegetation cover of the earth in order not to violate the thermal regime of the frozen rock, which is the base for the construction.

Mounting of the metal rigs can be carried out by the consecutive connection of the details of the tower structure, built up from the bottom upwards, or by assembling in a horizontal position with the subsequent lifting (Dukhnin's method).

Transportation of stationary drilling rigs with complete dismantling requires a lot of time for their dismantling and assembly at a new point. The coefficient of utilization of equipment is reduced, and the cost of work becomes more expensive. Therefore, the rigs are completely transported in hard-to-reach areas or on sites with a severely broken topography. In open areas with a calm relief, it is advisable to transport towers on sled-type bases without dismantling. The route of movement of the rig should be scheduled in advance. It should not have abrupt transitions from descent to ascent and vice versa. One-sided slope of the territory should not exceed 30° [2, c. 165].

Mobile drilling rigs are structures consisting of a mast of a folding type and a drilling building, which are installed on a common base, made as a sledge. Before transportation, the mast is placed in a horizontal position with the help of a winch, tractor or hydraulic system of the installation and transported to a new point with all equipment inside the building, tools and inventory. In accordance with the purpose of the mast, it is completed with the necessary basic and auxiliary equipment for drilling. The mast itself is a three-dimensional latticed metal structure or a tubular column structure.

Requirements for mobile drilling rigs can be divided into the following groups: a) operational; b) assembly and transport; c) production and technological; d) reliability and safety of drilling and installation work [3, с. 189].

As a conclusion we would like to consider the operational requirements to the drilling rigs. The design of the drilling rig and the location of its elements should provide: the possibility of installing the rig in vertical and inclined positions (within the specified limits) while drilling exploratory wells; good visibility of the trajectory of the travel block; free working space (near the mouth of the well in a radius of 1.5–2 meters, near the controls of the machine tool in a radius of 1–1.5 meters); the possibility of fast and convenient installation of the tower at a given drilling angle; the possibility of using a tower for the completion of drilling units having different drives (electric, diesel and diesel-electric); the most economical carrying out of lifting operations; the possibility of freeing the working space inside the drilling building from the supporting elements of the rig and preserving its relative integrity; normal deviation of the trailing rope from the center line of the winch drum by an amount not exceeding 1/50.

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