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CALCULATION AND DESIGN OF EARTHQUAKE RESISTANT GROUNDS

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Annotation: In this article, the general rules for the calculation and design of earthquake-related floors, the strength of the construction site to the earthquake, the method of earthquake-related floors, changes in the indicators of strengthening the grunts under the influence of an earthquake, measures aimed at increasing the earthquake stability of the floors.
Keywords: Earthquake, ground, calculation, design, grunt, seismic vibration.

Introduction

Earthquakes are the most dangerous among natural disasters, which can cause significant damage to construction structures. For this reason, the calculation and design of earthquake-prone floors is important. This article will consider the basic principles, methods and important aspects of the calculation and design of earthquake deposits.
The earthquake is a natural disaster, from which too many regions of the globe are damaged. While strong earthquakes cause mountains to be eroded and kissed on land, completely disappearing, and replaced by new lakes, swamps, radical river changes, etc., in the seas and oceans they wash away the surrounding land, creating strong waves.
It is known by itself that as a result of such a disaster, many riches built by manual labor are lost, and the most dangerous is the destruction of thousands of people.
The most dangerous aspect of an earthquake is its sudden and often crowded end. Under the influence of the earthquake lies mainly the demolition of buildings and structures.
As long as the loss of the risk of an earthquake has not yet been achieved, one of the ways to reduce its toll is to build earthquake-resistant buildings and structures.

Main part.

Buildings and structures to be built in earthquake-prone raions must have been calculated to seismic forces that may be affected in the future.
In calculations, the strength of an earthquake is expressed as

$$k_c = \frac{\alpha_{\max}}{g} \qquad (1)$$

in this $\alpha_{\max}$ - seismic vibration, mm/s^2; g - body free fall acceleration mm/s^2.
There is a seismic scale indicator of 12 points, representing the intensity of the earthquake, and the impact of less than 6 points is not taken into account in the construction of the structure, in places where there is an earthquake above 9 points, construction work is prohibited.
The forces of the earthquake are in a state of inertia, which is caused by the vibration of the Earth's superstructure at the time of its occurrence. The center of surges and shifts (hypocenter), which occurs in deep areas of the Earth's layer in extremely complex conditions, usually settles at a depth of 20-50 km or more.
Displacements occurring at a certain depth produce longitudinal and transverse flexural waves

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that are compressible along the ground layer. The rate of propagation of these waves depends on the type of grunt, the average values of which, for water—saturated sands-150 - 200 m/sec, for large soluble rock, gravel—600-800 m/sec, for Clay grunts-1400-1800 m/sec, for monolithic rocks-250-4000 m/sec and X. to.
Taking into account the seismic force in the design of the walls and foundations of Tirgovich. Calculations take into account the effect of seismic impact on ground devices and the effect of inertial force on ground devices.
Tirgovich wall exposure q_{ac} and q_{ps} active and passive pressures are carried out taking into account seismic impact.

$$q_{ac} = \left[1 + K_c \cdot tg \cdot \left(45^0 + \varphi_{1/2}\right)\right] \cdot \sigma_a \qquad (2)$$

$$q_{pc} = \left[1 - K_c \cdot tg \cdot \left(45^0 - \varphi_{1/2}\right)\right] \cdot \sigma_p \qquad (3)$$

in this K_s - the coefficient of seismicity will depend on the force of the Earth's tremor. For example, 7 points-0.025; 8 points-0.05; 9 points-0.10;
φ_1 - the angle of internal friction in calculating the grunt to turbidity;
σ_a, σ_p - active and passive pressures in a static state.
active and passive pressures in a static state. τ_h voltage is generated, which can be defined as follows.:

$$\left.\begin{aligned} \sigma_h &= \pm\frac{1}{2\pi}\cdot K_c \cdot \gamma_s \cdot C_p \cdot T_0 \\ \tau_h &= \pm\frac{1}{2\pi}\cdot K_c \cdot \gamma_c \cdot C_s \cdot T_0 \end{aligned}\right\} \qquad (4)$$

In thish: γ_s - the specific gravity of the grunt is;
C_p, C_s - longitudinal and transverse wave propagation speed;
T_o - the period of oscillation at most of the Earth's oscillations is.
In addition seismic force is also taken into account:

$$S_{ik} = Q_k \cdot m_i \cdot k_c \cdot \beta_i^0 \cdot \eta_{ik} \qquad (5)$$

In this: Q_k - value of the load placed on point k;
m_i - Coefficient that varies from 1 to 1.5 and depends on the responsibility classes of the building;
$\beta_i^o \cdot \eta_{ik}$ _ quoted dynamic coefficient.
Tirgovich for the wall $\beta_i^0 \cdot \eta_{ik} = 1{,}5$ Takes into account the form of vibration.

The strength of the construction site to the earthquake.
In determining the strength of the structure floor to an earthquake, the high value of seismic vibration (amax) generated by wave action plays a key role. Therefore, the correct and accurate determination of the high value of seismic acceleration is of great importance.
For this purpose, special geological and hydrogeological exploration is carried out in large

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populated settlements, as well as in industrial and hydrotechnical construction sites of great importance. As a result of this search work, a large-scale map is compiled for the observed rayon, in which different grunts are represented by specific scores. Seismic haritas are formed by relying on a common base. In this case, the seemic properties of grunts are taken as a basis, taking into account the above. Such haritas, called" seismomicrayon " Harita, are used to measure the strength of the field in relation to the earthquake and the area that is convenient for carrying out construction work.
In determining the earthquake score of the grunts found at this limit, S.V.The following expression is used, proposed by Medvedev:

$$k = 1{,}67\left[\lg\left(U_м \cdot \rho_м\right) - \lg\left(U_x \cdot \rho_k\right)\right] \qquad (6)$$

In this, k - the calculation score is greater or less than the criterion grunt;
U_k U_m - the speed of propagation of earthquake waves in observation and Meson grunts;
R_k R_m - the observation is carried out and the criterion is the density of particles of grunts.

"Earthquake floors" method

It is the main task to ensure their seismicity due to the construction of many different structures in areas where strong earthquakes occur at the next time.
When determining the strength condition of any floor for an earthquake, it became advisable to use the physical-mechanical and strength indicators of grunts.
The strength of the construction site to the earthquake is found in the method of "earthquake ground" [6]. Based on this method, the earthquake resistance of any construction site is determined taking into account the physical and mechanical and strength indicators of the grunt in which this area is formed and the value of the pressure acting on the ground in the structure. In this case, the calculation of the construction site earthquake score for the region in which this area is located is expressed by the coefficient of seismic strength greater than or less than the established score:

$$k_м = \frac{\alpha_м}{\alpha_c}, \qquad (7)$$

In this, a_s - the strongest earthquake acceleration set for the land on which the thrust field is located; a_m - equilibrium acceleration.
An earthquake is said to oscillate in such a way that the grunt vibrating under its influence maintains its strength. Therefore, if the earthquake acceleration value affecting the ground is higher than the equilibrium acceleration, then the grunt loses its strength and mutual compaction occurs between the particles. The equilibrium acceleration is defined as:

$$a_м = \frac{2\pi \cdot g \cdot \left(\sigma \cdot tg\varphi_w + c_v\right)}{\gamma_w \cdot T \cdot U_м} \qquad (8)$$

In this: G is the free-fall acceleration of the body; σ is the load pressure value that affects the weight of the grunt and the level at which the observation is made from the facility;
In earthquake-resistant field fencing, importance is mainly given to favorable or unfavorable grunt conditions.
Generally, favorable earthquake-resistant grunts include intact monolithic rocks, densely packed, low-moisture large and small-particle grunts. At the same time, steep slopes, zakh

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depressions and plains, so-called thoroughly moistened fine-grained sands, clays in a plastic State, sedimentary grunts are considered uncomfortable with earthquake humor.

Changes in the indicators of grunt strengthening under the influence of an earthquake

At the time of the earthquake, various longitudinal, transverse and earth-surface spreading waves form along the grunt layers, resulting in compression-stretching and thrust stresses as a result of their impact on the grunt particles and the water and gases between them. At this time, along with the fact that the grunt is under the influence of malleable deformation, in some cases it is also possible for particles with a breakdown of its structure to be compacted among themselves.

Based on X.Z.Rasulov's theory of "earthquake-induced degradation of the structure of wetted grunts", when superheated particles are exposed to interleaved grunts by an earthquake, this effect is first assumed by a force that holds the grunt particles together. As long as this force is invincible under the influence of shifting seismic stresses, grunt will continue to oscillate as a quasi-solid body, and the bonds between grunt particles will only have a flexible nature.

In doing so, the conclusion follows that the nature of the disturbance caused by seismic stress of the structure of the grunts whose particles are interconnected will depend on changes in the grunt's anti-slip strength indicators during the oscillation period.

The anti-slip indicators of grunts are their primary strength relative to the sliding external forces, which are variable depending on any pressure and the mutual boiting States of the grunt particles.

The question of the anti-slip strength of grunts is much more complicated than that of grunts whose particles are not connected in cross-linked grunts. This complexity is due to the fact that particles of such grunts in general are bound by soft plastic (colloidal Cw) and Ss binding forces in the solid crystal state, the nature of which has not been sufficiently studied.

At the same time under certain conditions, soft plastic in such grunts is sometimes known to play a major role in determining the strength of hard crystal bonds to slip.

From the results of numerous investigations on different grunts, it follows that the anti-slip strength of wetted and super-wetted grunts is often solved by bonds in the soft plastic case. Therefore, in the study of grunt resistance under the influence of sliding seismic voltages, it is often necessary to give more importance to softplastic bonding. The main force of soft plastic borings is due to the mutual gravity of the water layers surrounding the surface of the grunt particles.

Activities aimed at increasing the earthquake stability of the floors.

Measures aimed at increasing the earthquake resistance of soils are varied. Some of them are aimed at increasing the earthquake resistance of the soil (by artificially increasing the strength indicators of the soil, i.e. φ and C values), while others are aimed at increasing the earthquake resistance of the structure (by increasing the vertical stresses transmitted from the structure and the depth of the foundation).

For this purpose, the following activities are carried out:

- densification of the loose soil layer;
- increasing the value of the adhesion force between soil particles by chemical means;
- increasing the strength of adhesion between soil particles under the influence of heat;
- removal of underground water from around the ground, etc

Activities related to the construction project. Earthquake resistance of soils can be increased by

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additional loading around the structure and by reducing the layer of loose porous soils. The method of additional loading around the structure is based on the property of strength of the part of the floor under the influence of the load compared to the surrounding parts. It is known that the pit dug for the foundation is often filled with soil taken from this place.

It is advisable to load the soil around the foundation with more earthquake-resistant materials. Such an event increases the equilibrium acceleration of the spilled soils and increases their strength against earthquakes.

In order to additionally load around the structure, some buildings, which are often placed around this structure, or for this purpose, large stones and compacted soil can also be useful.

Measures that reduce the layer of loose and porous soils include increasing the depth of the foundation or using a piled foundation.

Deep foundations are very useful for any structure, industrial and public, bridge supports, water structures, etc. In this case, with the help of deep foundations, additional basements are formed, which may be appropriate considering the benefits they bring.

It should also be mentioned that when deep foundations are used, the pressure falling from the structure is transmitted to the deep and mature layers of the ground, which undoubtedly ensure the overall strength of the structure;

Thus, the main purpose of using deep foundations and vertical piles is to increase the earthquake resistance of soils by reducing the layer of loose and porous soils.

In conclusion, it should be said that the measures mentioned above to increase the earthquake resistance of the soil are some of the measures used in the construction experience, and their number may increase according to each individual situation.

Conclusion.

In conclusion, the calculation and design of earthquake - prone floors is an important part of modern construction and is of great importance in ensuring the safety and durability of structures. The results of the study confirm the effectiveness of modern methods and approaches to the design of earthquake-prone floors. Through the use of these methods, it will be possible to protect construction structures from seismic hazards and ensure the safety of the population.

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