

CALCULATION AND DESIGN OF EARTHQUAKE RESISTANT FLOORS

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***Abstract :** This in the article earthquake-prone the floors calculation and design modern methods seeing Earthquake the risk assessment , geotechnical research based on soil layers dynamic features determination and their construction to the facilities the impact calculation principles Construction constructions seismic stability provide for the purpose used national and international normative documents , as well as computational modeling from programs use experiences analysis Research results based on earthquake-prone construction projects done in increasing recommendation attainable constructive and engineering solutions is brought .*

***Key words :** earthquake resistance , seismic risk , geotechnical research , design , soil dynamics , constructive solutions , seismic stability , modern calculation methods .*

ENTRANCE

Earthquake natural disaster from it land of the ball very many districts damage sees . Strong earthquakes dry land of the mountains absorption and Having died of thirst , he disappeared completely . go away and their instead of again and again lakes , swamps , etc. to be , to be , to be themselves fundamentally change and h okazo take If it comes , the sea and in the oceans and strong waves harvest do it surroundings dry leaves wash they leave .

MAIN PART

By itself It is known that such disaster as a result , many manual labor with foundation done The wealth remains , the most danger thousands people h to contact

face they give .

Earthquake the most dangerous side , its suddenly face often give disastrous The earthquake mainly affected building and of buildings broken lies down .

Earthquake the risk to disappear for now not achieved that's it , its impact reduce from the road one to the earthquake resistant building and buildings from hitting q consists of

Earthquake face giving in the districts to be built building and buildings in the future impact to be able possible was seismic to the forces h is justified to be need .

In calculations, the strength of an earthquake is expressed as follows:

$$k_c = \frac{\alpha_{\max}}{g}$$

in this α_{\max} - seismic vibration , mm/s²; g - the mass of the object free landing acceleration mm/s² .

Earthquake strength 12- point scale representing seismic scale indicator there is divided by 6 points small impact building under construction into account not accepted , out of 9 points high earthquake to be in places construction your work take It is forbidden to go .

Earthquake forces inertia in the case of It is a hundred gave on time land upper part of vibration as a result to the body coming . Earthquake hearth in life complicated under the circumstances land of the layer deep in places face who said give thrusts and shifts The center (hypocenter) is usually 20-50 km and from it more than in depth will be placed .

Known in depth face giving shifts , earth layer longitudinally compressible longitudinal and transverse elastic t - waves harvest They do . These are the waves of spread speed depends on the type of ground depending on them average values , water

saturated sands for —150-200 m/ sec , large loose stone, gravel for - 600-800 m/ sec , muddy grunts for 1400-1800 m/ sec , solid mountain sex for —250-4000 m/ sec and x. consists of .

Tirgovich the walls and foundations in design seismic strength into account to take .

In calculations seismic of influence land above to their devices impact and inertia of strength land under to their devices impact on account of is taken .

Tirgovich to the wall impact how much will it cost ? and q_{ps} asset and passive pressures seismic the effect on account of take done is increased .

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

$$q_{pc} = [1 - K_c \cdot tg \cdot (45^\circ - \varphi_{1/2})] \cdot \sigma_p$$

where K_s is seismicity coefficient land to move to the power related For example , 7 points- 0.025 ; 8 points -0.05; 9 points-0.10;

φ_l - ground to stagnation h in the calculation internal work angle ;

σ_a, σ_p - static current asset and passive pressures .

wave propagation , additional horizontal normal $\sigma_{\text{shear stress}}$ is τ generated in the soil . These can be defined as follows:

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

where γ_s is the specific gravity of the soil ;

C_p, C_s - longitudinal and transverse waves speed of diffusion ;

T_0 - earth vibrations the most when there are many vibration time .

In addition, seismic forces are also taken into account:

$$S_{ik} = Q_k \cdot m_i \cdot k_c \cdot \beta_i^0 \cdot \eta_{ik}$$

where Q_k is the value of the load applied to point k;
 m_i - coefficient, which varies from 1 to 1.5 and depends on the responsibility classes of the building;
 $\beta_i^0 \cdot \eta_{ik}$ - cited dynamic coefficient . Tirgovich wall for $\beta_i^0 \cdot \eta_{ik} = 1,5$ Vibration shape on account of takes .

Earthquake resistance of the construction site

In determining the seismic resistance of a building's foundation, the maximum value of seismic vibration (α_{max}) resulting from the action of full-thrusts plays a key role. Therefore, it is important to correctly and accurately determine the maximum value of seismic acceleration. The definition is of great importance.

, special geological and hydrogeological explorations are carried out in large populated areas, as well as in industrial and hydraulic engineering construction sites of great importance . As a result of these explorations, a large-scale map is compiled for the observed region, in which various soils are expressed with specific points . Seismic maps are compiled on a general basis. In this case, the seismic properties of the soils are taken into account, taking into account the above . Such maps, called "seismic microregion" maps, are used to determine the earthquake resistance of the area and search for areas convenient for construction work.

The following expression proposed by SVMedvedev is used to determine the seismicity score of soils occurring within this boundary :

$$k = 1,67 [\lg(U_{\text{н}} \cdot \rho_{\text{н}}) - \lg(U_{\text{г}} \cdot \rho_{\text{г}})]$$

where k is the excess or deficiency of the calculated score relative to the criterion score;

$U_k U_m$ - the propagation velocity of earthquake waves in the observed and reference soils ;

$R_k R_m$ - the density of the particles of the tested and reference soils .

The "earthquake-prone ground" method

many different structures will be built in areas prone to strong earthquakes in the future, ensuring their seismic strength is a key task.

It has become appropriate to use physical, mechanical and strength indicators of soils to accurately determine the earthquake resistance of any soil .

resistance of a construction site is determined by the "Earthquake-resistant soils" method [6]. According to this method, the seismic resistance of any construction site is determined taking into account the physical-mechanical and strength indicators of the soils of which this site is formed and the value of the pressure acting on the ground in the structure. In this case, the difference between the calculated earthquake point of the construction site and the point established for the region in which this site is located is expressed by the seismic resistance coefficient:

$$k_m = \frac{a_m}{a_s}$$

where a_s is the strongest force determined for the location of the thrust area earthquake acceleration ; a_m - equilibrium acceleration .

Balance That's what acceleration is . earthquake to the vibration let's say , its under the influence the vibrating ground strength keeps . Therefore for to the ground impact arriving earthquake acceleration value craft from acceleration high If so , then the ground is strength y solidify , particles in the middle mutual

densification face gives . Balance acceleration as at home is defined as :

$$a_m = \frac{2\pi \cdot g \cdot (\sigma \cdot \operatorname{tg} \varphi_w + c_v)}{\gamma_w \cdot T \cdot U_m}$$

where : g - the mass of the body free fall acceleration ; σ - gravity and observation from the building take the value of the load acting on the surface of the earth ;

φ_w - the angle of internal friction of the soil;

s_v - friction force;

T - vibration period ;

U_M - earthquake transverse of the waves speed .

When searching for an earthquake-resistant site, the main consideration is favorable or unfavorable soil conditions .

Typically, favorable earthquake-resistant soils include intact , intact rock, dense, low-moisture, coarse- and fine-grained soils. However, steep slopes, depressions and plains, as well as fully moistened fine-grained sands, plastic clays, and sedimentary soils are considered unfavorable from an earthquake perspective .

SOIL REINFORCEMENT UNDER EARTHQUAKE EFFECTS

Changes in soil reinforcement parameters under earthquake impact

During an earthquake, various longitudinal, transverse, and surface waves are generated along the soil layers, and their impact on soil particles and the water and gases between them causes compression-extension and shear stresses. At this time, the soil is subject to elastic deformation, and in some cases its structure may be damaged and the particles may become compacted.

According to the theory of "Destruction of the Structure of Wetted Soils Under Earthquake Influence" developed by X.3. Rasulov, when an earthquake affects soils with highly wetted particles interconnected, this effect is primarily perceived

through the force that binds the soil particles together . When this force is not overcome by the action of shearing seismic stresses, the soil continues to vibrate as a quasi-rigid body , and the bonds between the soil particles have only elastic properties.

leads to the conclusion that the nature of the failure of the structure of interconnected soil particles under the influence of seismic stress depends on the change in the soil's shear strength during the shaking period.

The shear strength of soils is their basic resistance to shearing external forces, and they vary depending on any pressure and the state of mutual compaction of soil particles .

The issue of the shear strength of soils is more complex in soils with interconnected particles than in soils without interconnected particles . This complexity is due to the fact that the particles of such soils are generally associated with soft plastic (colloidal C_w) and hard crystalline S_s bonding forces, the nature of which is not sufficiently studied.

However, it is known that under certain conditions, soft plastic and sometimes hard crystalline bonds in such soils play a key role in determining the shear strength of the bond.

Numerous studies on various soils have shown that the shear strength of wetted and over-wetted soils is often determined by the bonds in the soft plastic state. Therefore, when studying the resistance of soils to shear seismic stresses, it is often necessary to give more importance to the soft plastic bonds. The main strength of soft plastic bonds depends on the mutual attraction of water layers surrounding the surface of soil particles .

Measures aimed at increasing the seismic resistance of soils

There are various measures aimed at increasing the seismic resistance of soils . Some of them are aimed at increasing the seismic resistance of the soil (by artificially increasing the strength indicators of the soil, i.e., the values of A

and C), while others are aimed at increasing the seismic resistance of the structure (by increasing the vertical stresses transmitted from the structure and the depth of the foundation).

Measures to increase the strength of soils .

Increasing α the soil strength index , S, directly ϕ increases the equilibrium acceleration α_m and the soil strength coefficient k_m [6]:

$$k_m = \frac{\alpha_m}{\alpha_c}$$

where α_c is the strongest earthquake acceleration α determined for the location of the construction site ; α_m is the equilibrium acceleration.

To this end , the following activities will be carried out:

- the soil layer compaction ;
- increasing the value of the frictional force between soil particles by chemical means;
- increasing the bonding strength between soil particles under the influence of heat ;
- land under waters ground from around exclusion and others

Facility project with all right was events . Floors earthquake resistance building around additional loading and b o' sh pore grunts the floor shortening way with increase possible . Construction around additional loading method load effect of floors under part of surroundings into parts relatively lack of need to the property based on . It is known that foundation for excavated deep often this from the place The soil is killed by the soil taken .

Foundation around worn out of the ground over to the earthquake more resistant things with loading to the goal appropriate Such event spilled of the ground balance acceleration increasing their to the earthquake against lack of need It also increases .

Facility around additional loading for the purpose , often this of the structure around deployable some buildings or this for the purpose large stones and condensed grunts both benefits to give possible .

Empty and pore grunts layer reducing to events construction in experience wide applicable methods foundation depth increase or piled foundation application enters .

Deep located foundations each how building for , industry and public , bridge support , water facilities and others for very good too comes . In this deep located foundations using additional cellars h axis are , they are causing profit in mind when it is over to the goal appropriate to be possible .

It should also be noted that when deep foundations are used, the pressure from the structure is transferred to the deep and dense, more load-bearing layers of the soil , thereby ensuring the overall strength of the structure;

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

CONCLUSION

In conclusion, it should be said that the above-mentioned measures to increase the seismic resistance of soils are some of the measures used in construction practice, and their number may increase depending on each specific condition. Calculation and design of seismic soils, especially in seismically active areas, is an integral part of the safe construction process. Studies show that it is possible to more accurately assess the seismic behavior of soil layers using modern geotechnical analysis and computer modeling methods. The selection of structural and engineering solutions appropriate to seismic risk, based on national regulatory documents, serves to ensure the long-term stability of structures. Therefore, the use of a deep scientific approach and technological solutions at the calculation and design stage is of great importance.

REFERENCES USED

1. S. Zoxidov, "Engineering Geology", T., "Teacher", 1988.

2. RE Eshboev , M.Sh. Rahimboboeva . — Geology , mineralogy and petrography "Fundamentals of Education " . manual . Tashkent-2011.
3. Shermukhamedov , UZ, Karimova, AB, Khakimova , YT, & Abdusattorov , AA (2022). Construction technology of new types of continuous reinforced concrete (monolithic) bridges and overpasses. Scientific Impulse, 1(4), 1023-1032.
4. Shermukhamedov UZ, Karimova AB, Hakimova Ya.T. Real seismogram records under the influence continuous monolithic bridge constructions dynamic analysis . International scientific magazine "Scientific Impulse", No. 3 (100), issue 1, October , 2022. - pp. 291-296. PEDAGOGICAL SCIENCES AND TEACHING METHODS / 2024 – PART 31 /29
5. Shermukhamedov , UZ, Karimova, AB, Abdullaev , AR, & Khakimova , YT (2023). Comparison of operating costs of reinforced concrete bridges and overpasses with different static schemes. In E3S Web of Conferences (Vol. 401, p. 02035). EDP Sciences.
6. Shermukhamedov , U., Karimova, A., Khakimova , Y., & Abdusattorov , A. (2022). Modern techniques for the construction of monolithic bridges. Science and innovation, 1(A8), 790-799.
7. Khakimova YT, Ozodjonov JT Soils densification indicators and them compaction methods SCIENTIFIC ONLINE JOURNAL, (2023)
8. Khakimova Ya . T . , Urazov H. U . , Zakirova D. J. Calculation stability and stability intermediate supports sign iron concrete Mosta , raspolojenny no peregone A ndijan - A saka PK 123+456, SCIENTIFIC APPROACH TO THE MODERN EDUCATION SYSTEM (2023)