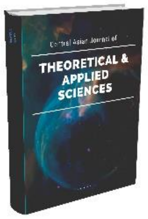

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Instrumental Study of Dynamic Characteristics of Secondary Schools with Different Syllabus and Construction Solutions in Fergana

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Abstract: *The article examines the dynamic characteristics of secondary school buildings of different sizes and constructions in Fergana on the basis of instrumental research.*

Keywords: *dynamic, dynamic characteristics, seismic, mobile engineering seismometric station, volumetric plan, constructive, seismometer, microseismic, longitudinal vibration, transverse vibration, amplifier, vibration period, vibration frequency, extinction coefficient, extinction logarithmic decrement.*

Introduction

To determine the dynamic characteristics of the buildings of secondary schools No. 10 selected in Fergana City, Academy of Sciences of Uzbekistan M.T.The mobile engineering seismometric station developed at the Institute of seismic strength of mechanics and structures named after urozbaoyev was used [1,7,8,9,]. The 10th school under study was constructed on the basis of the requirements of normative documents, which were used in 1937, respectively, and has different layout and constructive solutions. Mobile engineering the methods of preparing the seismometric station for Operation, calibrating the measurement channels for use in dynamic processes, and analyzing the recorded records are presented in a scan [1,14,15,16].

The main part

In the process of determining dynamic characteristics of school buildings in micro seismic mode, SM-3 type seismometers were used as pribor, which recorded in the measurement Complex [1,2,3,4]. Seismometer SM-3 has a high degree of sensitivity, is used in the study of dynamic processes in various objects, recording their vibration. Below is a graph showing the blocks of the mobile engineering station used in recording school buildings' vibrations in microseismic mode in Figure 1.

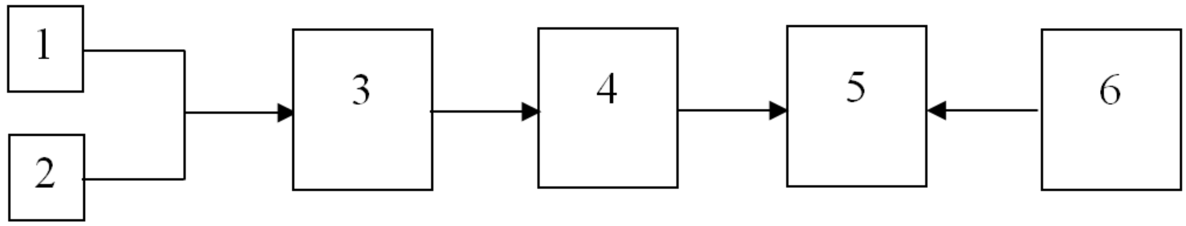


Figure 1. Mobile engineering seismometric station block-drawing:

1 and 2 – seismometers that record longitudinal and transverse vibrations;

3-data beruvchi transmitting device; 4 – (ASP) analog-digital switcher; 5 – laptop; 6 – software

Due to the fact that the mobile stand is equipped with a separate accumulator-batteries, which provide itself with a current, in the process of instrumental research on objects, the location is brought to a state of work at its own speed [10-13]. Usually, in multi-storey buildings, mobile engineering is assembled to record micro seismic vibrations on the last floor of the station and brought to the working condition. Seismometer CM-3s are installed in the rooms of the middle part of the premises (otsecks) or in concrete, tiled, mramed hard floors of the corridors. If the floor is made of wood, it is possible to install on the shelves of the windows in the proyems on the load-bearing wall on the floor. In mobile seismometric work activities, there should not be sources that artificially create additional different vibrations inside and around the building, they should not create any kind of behavior or additional dynamic effects. Mobile stand should record the actual microseismic vibrations of the building.

If the closure of one-story buildings consists of reinforced concrete slabs, then before the installation of seismometers, the top of the slabs is cleaned and then placed in the established order. If the closure of the building consists of wooden beams, then the seismometers are installed on the load-bearing walls [18-23].

In the process of conducting experiments, seismometers are mutually perpendicular to the selected location of the building and are installed in accordance with the longitudinal and transverse axes of the building. Bunda SM-3s are brought to the working state and the oscillations of the pendulum are set in such a way that the private oscillation period is equal to “2 sec”. Then through the measurement channels it connects to the laptop through the compressor unit and the analog-to-Digital Switch unit. The laptop is provided with a specially developed program, which is based on the process of recording vibrations and the analysis of received records.

The mobile seismometric engineering station performance system is as follows: “seismometers + transmitter + analog-digital switch + laptop + software". In order to determine the degree of sensitivity of the measurement channels and evaluate the process of operation of the measurement system, several examination records are taken at the mobile seismometric station where seismometers are installed, and on their basis, the sensitivity coefficients of the channels are determined. During the experiments, building vibrations are monitored on a laptop monitor, and in order to increase the accuracy of the results obtained, several times over again micro seismic vibrations of the premises are recorded.

To record the signals of seismometer SM-3s and to view the laptopuk JAVA software product processing 2.1 software was used. The software developed records data received from seismometers through all measurement channels at the same time and allows the recording to be output in a seemingly laptop monitor as well as to work in an Excel editor for complete analysis.

Based on the results of recording micro seismic vibrations of the buildings of the selected number 10 schools using the above-mentioned instrumental method of measurement, periods of private vibrations in longitudinal and transverse directions and extinction coefficients were determined and analysed [24-27].

As a result of the Instrumental measurements, the following dynamic characteristics of buildings were determined:

T1-longitudinal private swing period of buildings;

ω1-longitudinal private vibration frequency of buildings;

δ1-absorption coefficient of longitudinal vibration of buildings;

α1-logarithmic gradient of absorption of longitudinal vibration of buildings;

T2-the period of cross-private vibration of buildings;

ω2-cross-private vibration frequency of buildings;

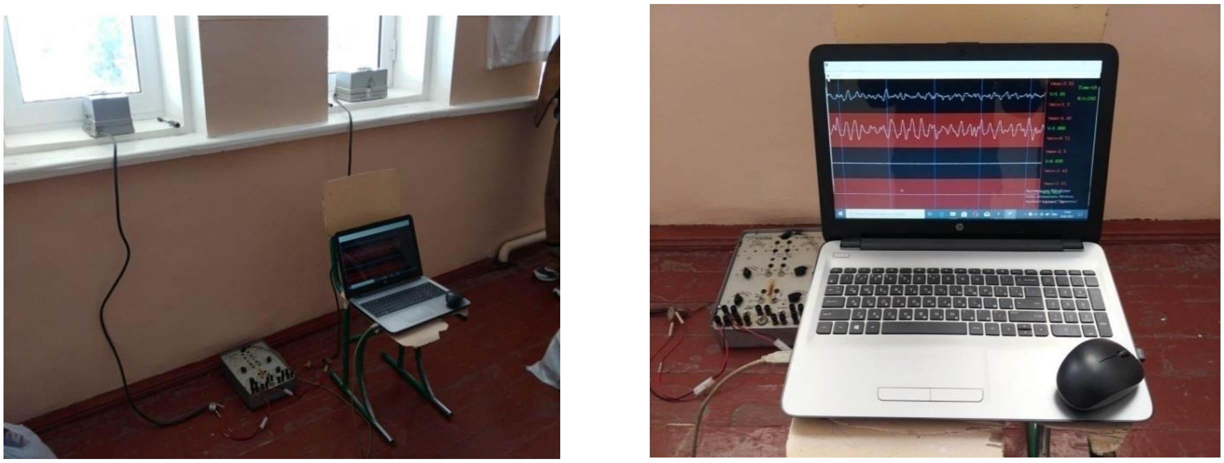
δ2-absorption coefficient of cross-private vibration of buildings;

α2 is the logarithmic gradient of the absorption of the cross-vibration of buildings.

Dynamic characteristics of the school building № 10. Below is a picture of the 1.2-th rate received by the 10-th school took a two-storey building built in 1937 year. This building was built in seismic zones until the adoption of the normative documents on the design of buildings and structures, and does not meet the requirements for the construction of seismic reinforcement on many parameters. In particular, in buildings with two floors and higher, oraupmas are required to consist of reinforced concrete slabs and be connected with seismic belts. During the technical examination, it became known that the orayopms consisted of wooden beams, and the seismic belt was not used.

Figure 2. Appearance before the school building № 10

In order to record the micro seismic vibrations taking into account the constructive solution of the building, the mobile seismometric station was established at the 1st measuring point-the middle of the building and the 2nd measuring point - at the edge of the building. In the middle of the staining (1st measuring point), the seismometer CM-3s was installed on the windows proyeme on the longitudinal wall (Fig.3), and then on the edge of the staining (2nd measuring point) was formed on the floor of the stairs (Fig.4).



a) *b*)

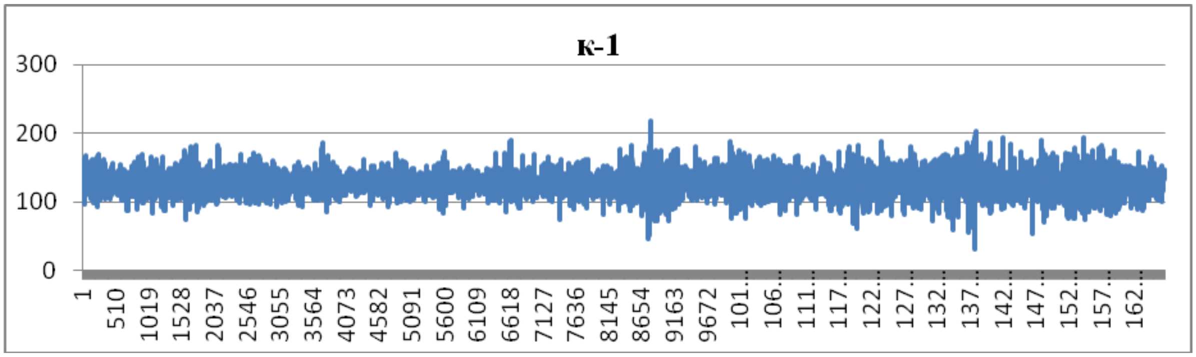
Figure 3. The moment of recording of micro seismic vibrations in the building: a-mobile engineering station; b – fluctuations recording appearance on the laptop monitor

a) b)

Figure 4. Recording moment of microseismic vibrations on the building stairs: a-mobile engineering station; b – fluctuations recording appearance on the laptop monitor

For a few minutes, several marotaba building vibrations were recorded in the microseismic mode and they were analysed. The main purpose of recording miroseismic vibrations for a long time is to record the vibrations of the building in its own private period, that is, to determine the private period and the absorption coefficients from the vibrations in the case of staining resonance [31-37]. To do this, it will be necessary to continue experiments until this event occurs.

As an example, in figure 5, the longitudinal and transverse microseismic vibrations of the building are recorded respectively using the first measuring channel (k-1) of the mobile seismometric station and the second measuring channel (k-2) during 70 SEC.



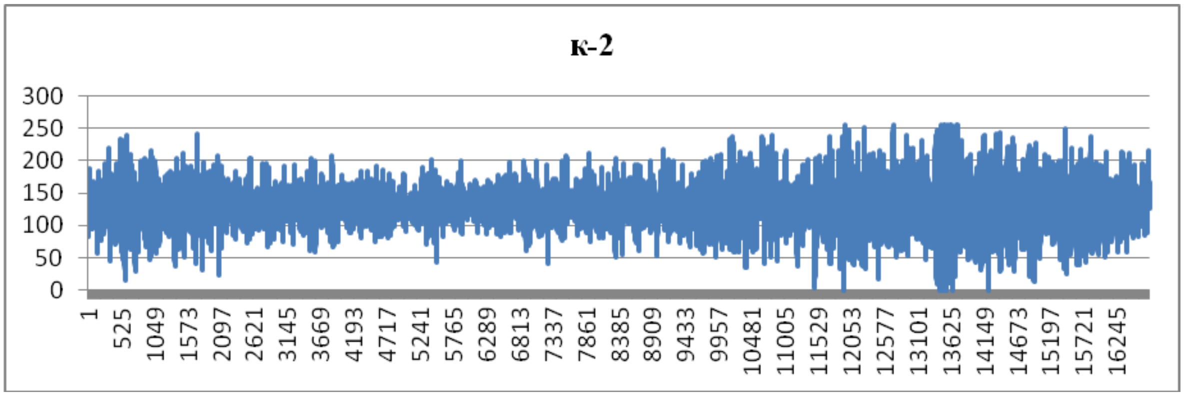


Figure 5. Coloring microseismic longitudinal (k-1) and transverse (k-2) notes of vibrations

The longitudinal (k - 1) and transverse (k-2) microseismic oscillations records recorded in the middle of the staining and on the stairs on the measurement channels on the 6 and 7-pictures are presented in the form of a short section uzayed processed in Excel editor.

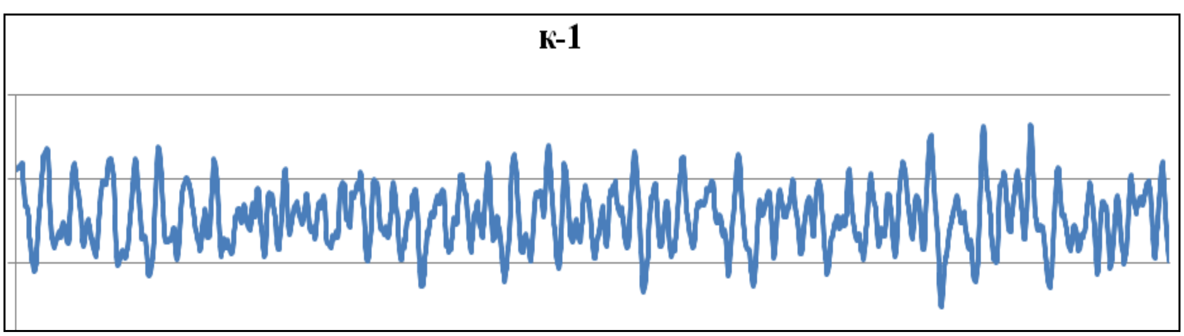
The results of the conducted experimental studies revealed the following dynamic characteristics of the building:

a) *Results obtained at 1-nchi measurement point*

$$T_1 = 0{,}18\ sek;\ \omega_1 = 5{,}6\ Gs;\ \delta_1 = 0{,}67;\ \alpha_1 = -0{,}40; T_2 = 0{,}20\ sek;$$
$$\omega_1 = 5{,}0\ Gs;\ \delta_1 = 0{,}65;\ \alpha_2 = -0{,}43; \tag{1}$$

b) *Results obtained at 2-nchi measurement point*

$$T_1 = 0{,}16\ sek;\ \omega_1 = 5{,}25\ Gs;\ \delta_1 = 0{,}66;\ \alpha_1 = -0{,}42;$$
$$T_2 = 0{,}17\ sek;\ \omega_1 = 5{,}9\ Gs;\ \delta_1 = 0{,}67;\ \alpha_2 = -0{,}40. \tag{2}$$



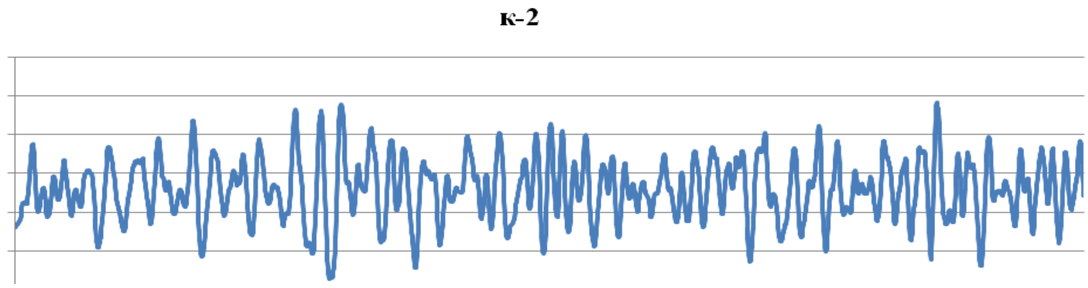


Figure 1.6. Coloring longitudinal (k-1) and transverse (k-2) microseismic a short part of fluctuations notes

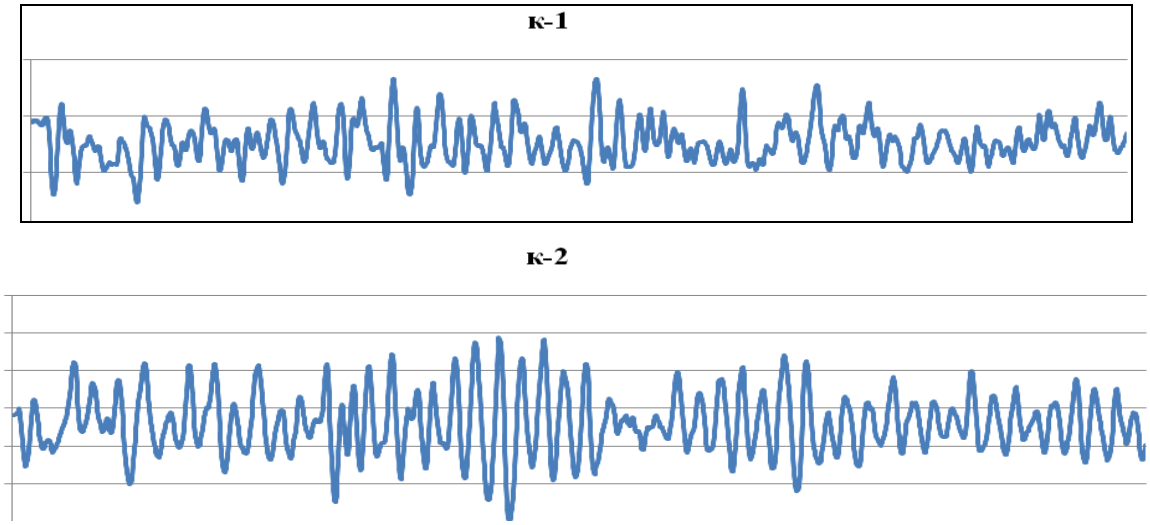


Figure 1.7. Building stairs longitudinal (k-1) and transverse (k-2) microseismic a short part of fluctuations notes

Conclusion

With the help of mobile engineering seismometric station, experimental studies were conducted to study the dynamic characteristics of the buildings of secondary schools built in different years. Two-storey building of the school № 10, built in 1937, before the introduction of normative documents on the design of construction in seismic zones for conducting experimental research, normative documents, which began to be applied in practice since November 1, 1951, were built of brick in 1953 on the basis of the requirements of PSP 101-51. It should be borne in mind that these buildings, in addition to the carcass building, the normative documents, which are practically applicable in their parameters, partially meet the requirements of MMC 2.01.03-19.

Based on the results of recording micro seismic vibrations of selected school buildings, Special periods and frequencies of vibrations in longitudinal and transverse directions, as well as extinction coefficients and logarithmic decrements were determined.

As a result of the experimental studies, the orayopmas of the 2-storey building of the school № 10, built in 1937, consisted of beams and connected with the seismic belt, the elements of the construction completely do not work together. For this reason, it has been shown that the dynamic characteristics obtained in different parts of the building differ from each other as a result of the fact that the building construction does not constitute a single spatial stutter.

The results of the conducted experimental studies are recommended to be used in the examination of construction structures of buildings and dynamic calculations of buildings on the influence of seismic forces.

References

1. ТУ-58-48. Технические условия проектирования зданий и сооружений для сейсмических районов. Министерство строительства предприятий тяжелой индустрии СССР. - М: Стройиздат, 1949 год. Дата начала действия: 30 декабря 1948 г.
2. ПСП 101-51. Положение по строительству в сейсмических районах. Госстройиздат, 1951. Введен в 01.11.1951 г
3. СН–8–57. Нормы и правила строительства в сейсмических районах. Госстройиздат, 1957. Введен в 01.11.1957 г.
4. СНиП II-А.12-62. Строительство в сейсмических районах. Госстройиздат, 1963. Введен в 01.03.1963 г.
5. СНиП II-А.12-69. Строительство в сейсмических районах. Госстрой СССР. М.: Стройиздат, 1970. Введен в 01.07.1970 г
6. СНиП II-7-81. Строительство в сейсмических районах. Госстрой СССР. М.: Стройиздат, 1982. Введен в 01.01.1982 г.
7. КМК 2.01.03-96. Строительство в сейсмических районах. Госкомархитектстрой РУз. Ташкент: 1996. Введен в 01.03.1996 г.
8. Muminjon, N., & Dilshodjonugli, N. S. (2020). Improvement of transformer protection elements. *Academicia: An International Multidisciplinary Research Journal*, *10*(6), 394-398.
9. Goncharova, N. I., Raxmanov, B. K., Mirzaev, B. K., & Xusainova, F. O. (2018). Properties of concrete with polymer additives-wastes products. *Scientific-technical journal*, *1*(2), 149-152.
10. Гончарова, Н. И., Абобакирова, З. А., Абдурахмонов, Д. М., & Хазраткулов, У. У. (2016). Разработка солестойкого бетона для конструкций с большим модулем открытой поверхности. *Молодой ученый*, (7-2), 53-57.
11. Бахромов, М. М., & Рахмонов, У. Ж. (2019). Дефекты при проектировании и строительстве оснований и фундаментов. *Проблемы современной науки и образования*, (3 (136)).
12. Абдуллаев, И. Н., Юнусалиев, Э. М., & Рахманов, Б. К. (2020). Вопросы жилищно-гражданского строительства в ферганской долине. In *Наука и инновации в строительстве* (pp. 207-215).
13. Бахромов, М. М., Отакулов, Б. А., & Рахимов, Э. Х. У. (2019). Определение сил негативного трения при оттаивании околосвайного грунта. *European science*, (1 (43)).
14. Goncharova, N. I., & Turopov, M. (2019). Optimization of the structure of cement concrete with activated liquid medium. *Scientific-technical journal*, *22*(3), 60-64.
15. Tolkin, A. (2020). Reconstruction of 5-storey large panel buildings, use of atmospheric precipitation water for technical purposes in the building. *The American Journal of Applied sciences*, *2*(12), 86-89.
16. Махкамов, Й. М., & Мирзабабаева, С. М. (2019). Температурные прогибы железобетонных балок в условиях воздействия технологических температур. *Проблемы современной науки и образования*, (11-1 (144)).

17. Мирзаахмедов, А. Т., Мирзаахмедова, У. А., & Максумова, С. Р. (2019). Алгоритм расчета предварительно напряженной железобетонной фермы с учетом нелинейной работы железобетона. *Актуальная наука*, (9), 15-19.
18. Abdukhalimjohnovna, M. U. (2021). Technology of Elimination Damage And Deformation In Construction Structures. *The American Journal of Applied sciences*, *3*(5), 224-228.
19. Abobakirova, Z. A. (2021). Regulation Of The Resistance Of Cement Concrete With Polymer Additive And Activated Liquid Medium. *The American Journal of Applied sciences*, *3*(04), 172-177.
20. Abobakirova, Z. A. (2021). Reasonable design of cement compositionfor refactory concrete. *Asian Journal of Multidimensional Research*, *10*(9), 556-563.
21. Mirzaakhmedova, U. A. (2021). Inspection of concrete in reinforced concrete elements. *Asian Journal of Multidimensional Research*, *10*(9), 621-628.
22. Мамажонов, А. У., Юнусалиев, Э. М., & Абобакирова, З. А. (2020). Об опыте применения добавки ацф-3м при производстве сборных железобетонных изделий. In *Энерго-ресурсосберегающие технологии и оборудование в дорожной и строительной отраслях* (pp. 216-220).
23. Akhrarovich, A. X., & Mamajonovich, M. Y. (2021). Abdugofurovich US Development Of Deformations In The Reinforcement Of Beams With Composite Reinforcement. *The American Journal Of Applied Sciences*, *3*(5), 196-202.
24. Umarov, S. A. (2021). Development of deformations in the reinforcement of beams with composite reinforcement. *Asian Journal of Multidimensional Research*, *10*(9), 511-517.
25. Djurayevna, T. N. (2020). Influence Of Surface Additives On Strength Indicators Of Cement Systems. *The American Journal of Applied sciences*, *2*(12), 81-85.
26. Mirzajonovich, Q. G., Ogli, A. U. A., & Ogli, X. AM (2020). Influence Of Hydro Phobizing Additives On Thermophysical Properties And Long-Term Life Of KeramzitObetona In An Aggressive Medium. *The American Journal of Engineering and Technology*, *2*(11), 101-107.
27. Gayradjonovich, G. S., Mirzajonovich, Q. G., Tursunalievich, S. B., & Ogli, X. A. M. (2021). Corrosion State Of Reinforced Concrete Structures. *The American Journal of Engineering and Technology*, *3*(06), 88-91.
28. Ogli, X. A. M. (2021). Construction Of Flexible Concrete Elements In Buildings. *The American Journal of Engineering and Technology*, *3*(06), 101-105.
29. Ashurov, M., Sadirov, B. T., Xaydarov, A. M., Ganiyev, A. A., Sodikhonov, S. S., & Khaydarova Kh, Q. (2021). Prospects for the use of polymer composite fittings in building structures in the republic of Uzbekistan. *The American Journal*.
30. Ogli, X. A. M. Development of effective cement additives for the production of heat-resistant concrete based on technogenic waste" International Journal of Researchculture Society. *India (2019. 12. 12)*.
31. Davlyatov, S. M., & Makhsudov, B. A. (2020). Technologies for producing high-strength gypsum from gypsum-containing wastes of sulfur production-flotation tailings. *Academicia: An International Multidisciplinary Research Journal*, *10*(10), 724-728.
32. Mirzaahmedov, A. T. (2020). Algorithm For Calculation Of Multi Span Uncut Beams Taking Into Account The Nonlinear Work Of Reinforced Concrete. *The American Journal of Applied sciences*, *2*(12), 26-35.

33. Adilhodzhaev, A., Igamberdiev, B., Kodirova, D., Davlyatov, S., Marufjonov, A., & Shaumarov, S. (2020). The study of the interaction of adhesive with the substrate surface in a new composite material based on modified gypsum and treated rice straw. *European Journal of Molecular & Clinical Medicine*, *7*(2), 683-689.

34. Akhrarovich, A. K., & Muradovich, D. S. (2016). Calculation of cylindrical shells of tower type, reinforced along the generatrix by circular panels. *European science review*, (3-4).

35. Акрамов, Х. А., Давлятов, Ш. М., & Хазраткулов, У. У. (2016). Методы расчета общей устойчивости цилиндрических оболочек, подкрепленных в продольном направлении цилиндрическими панелями. *Молодой ученый*, (7-2), 29-34.

36. Usarov, M. K., & Mamatisaev, G. I. (2020, November). Calculation on seismic resistance of box-shaped structures of large-panel buildings. In *IOP Conference Series: Materials Science and Engineering* (Vol. 971, No. 3, p. 032041). IOP Publishing.

37. Usarov, M., Ayubov, G., Mamatisaev, G., & Normuminov, B. (2020, July). Building oscillations based on a plate model. In *IOP Conference Series: Materials Science and Engineering* (Vol. 883, No. 1, p. 012211). IOP Publishing.

