The American Journal of Engineering and Technology
(ISSN – 2689-0984)
Published: December 22, 2021 | **Pages:** 52-60
Doi: https://doi.org/10.37547/tajet/Volume03Issue12-08

IMPACT FACTOR
2021: 5. 705
OCLC - 1121105677

Journal Website: https://theamericanjournals.com/index.php/tajet

Strengthening Of Deficient Concrete Structures Under Loads And High Temperatures

Mirzaakhmedova Ugiloy Abdukhalimjohnovna
Senior Lecturer, Department Of Construction Of Buildings And Structures, Fergana Polytechnic Institute, Fergana, Uzbekistan

Akhmedov Tolqin
Senior Lecturer, Department Of Construction Of Buildings And Structures, Fergana Polytechnic Institute, Fergana, Uzbekistan

Xaydarov Abduxalil Mutalib Ogli
Assistant, The Department Of Construction Of Buildings And Structures, Ferghana Polytechnic Institute, Ferghana, Uzbekistan

Gulomiddinov Sarvarjon Gayradjonovich
Assistant, The Department Of Construction Of Buildings And Structures, Ferghana Polytechnic Institute, Ferghana, Uzbekistan

ABSTRACT

The article shows the work of flexible reinforced concrete structures in the state of complex stress under technological temperature and external loads, the formation of additional stresses and deformations relative to normal temperatures, the calculation of the temperature formed in the section of the element.

KEYWORDS

Concrete, Reinforced Concrete, Bending Elements, Stress State, Crack Formation, Temperature Distribution, Tensile Stress, Expansion Of Reinforcement.

INTRODUCTION

Bending reinforced concrete structures are in a state of complex stress under the technological temperature and external loads, which creates additional stresses and deformations from heating in addition to normal temperatures.

Therefore, the calculations first need to determine the temperatures that are formed in the section of the element.

MATERIALS, DESIGNS AND PROTOTYPING

Temperature distribution in the section of reinforced concrete structures is performed for the stabilized heat flow by the methods of technological temperature calculation in barrier structures. In this case, the temperature in the reinforcement is taken as equal to the temperature in the concrete in which it is located [1].

In uneven heating, the temperature at the cross section of the bending element is distributed according to a curvilinear-parabolic law. As a result, cracks are formed, compressive stresses are formed on the sides of the element section, and tensile stresses are formed in the middle (Fig. 1).

Deformations and curvatures in concrete and reinforcement of reinforced concrete elements are calculated depending on the formation of cracks under the influence of temperature, their location in the area, the straight or curved distribution of temperature [2,3,4].

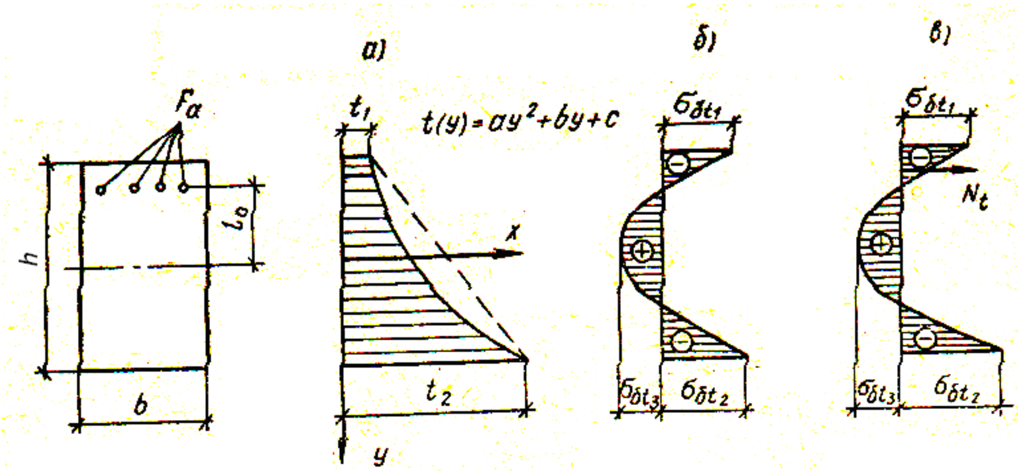

Figure 1. Until cracks form in the bending element section: a - temperature; b is the equilibrium formed by the curvilinear distribution of the temperature in the section tension diagram; v is the same as the diagram of the stress diagram of the difference between the coefficients of temperature deformation of concrete and reinforcement.

The American Journal of Engineering and Technology
(ISSN – 2689-0984)
Published: December 22, 2021 | **Pages:** 52-60
Doi: https://doi.org/10.37547/tajet/Volume03Issue12-08

IMPACT FACTOR
2021: 5. 705
OCLC - 1121105677

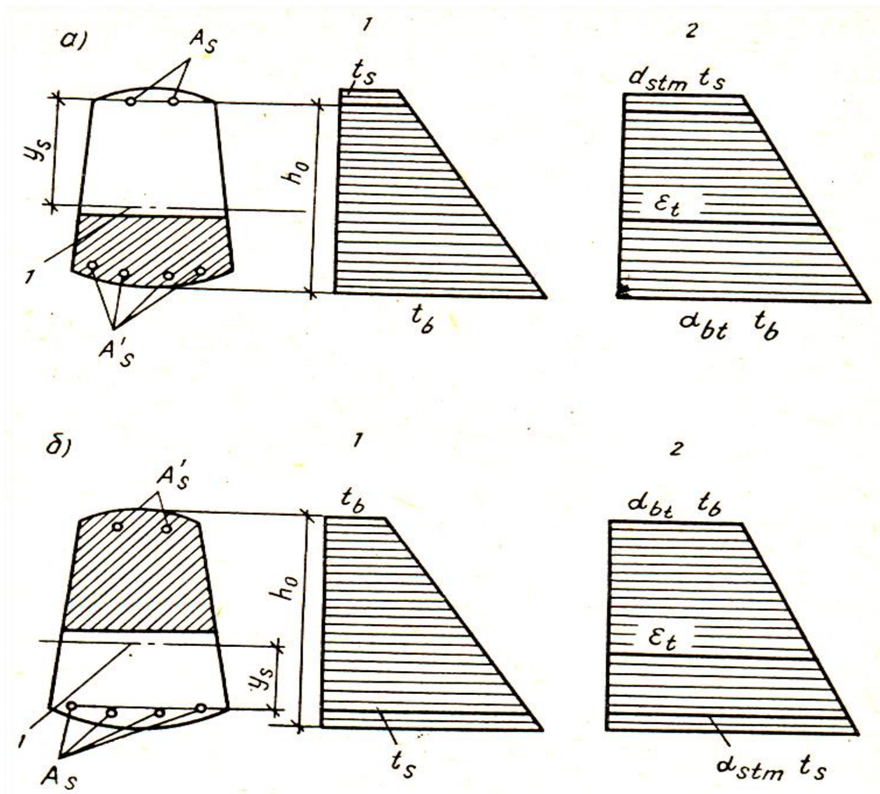

Figure 2. In uneven heating, the temperature is linear with respect to the height of the bending element section diagram of the distribution of temperature (1) deformations (2) in scattered cases:

a - in reinforced concrete elements with cracks in the elongated area located in the less heated oil; b - similarly, in more heated oil.

EXPERIMENTAL RESEARCH TECHNIQUE

Voltages in the section of the bending element with a temperature curve are determined by the following formula;

$$\sigma_{bx} = -\alpha_{bt} E_{bt}(y) + \frac{1}{2h} \int_{-h}^{+h} \alpha_{bt} E_{bt}(y) dy + \frac{3y}{2h^3} \int_{-h}^{+h} \alpha_{bt} E_{bt}(y) dy. \quad (1)$$

(1) After the integration according to the formula and some mathematical changes, we get the formula for the stresses that occur in concrete:

$$\sigma_{bt} = \frac{\alpha_{bt} E_{bt} (t_2 - t_1)}{4} \left(\frac{1}{3} - \frac{y^2}{h^2}\right). \tag{2}$$

The state of stress also occurs in the reinforced concrete element due to the thermal expansion of the concrete and reinforcement. If the bending element is a single armature, the force on the armature will be decentralized. If the thermal expansion of the reinforcement is greater than that of concrete, the elongation, if small, the compressive force is formed:

$$N_t = (\alpha_{st} - \alpha_{bt}) t_s E_{st} A_s . \tag{3}$$

The moment generated by this force:

$$M_t = N_t e_0 . \tag{4}$$

Compressive stresses in concrete at the cross section of the bending element are found by the following formulas:

unheated edge:

$$\sigma_{b,tem} = -\frac{\alpha_{bt} E_{bt} (t_2 - t_1)}{6} + \frac{N_t}{A} + \frac{M_t}{W_{pl}}, \tag{5}$$

On the heated edge:

$$\sigma_{b,tem} = -\frac{\alpha_{bt} E_{bt} (t_2 - t_1)}{6} + \frac{N_t}{A} - \frac{M_t}{W_{pl}}, \tag{6}$$

Elongation stresses on the cutting axis:

$$\sigma_{btt} = +\frac{\alpha_{bt} E_{bt} (t_2 - t_1)}{12} + \frac{N_t}{A}. \tag{7}$$

In high-temperature flexible reinforced concrete structures, as the temperature difference in the height of the cut increases, the compressive and longitudinal deformations in the concrete in the middle of the cut increase, and the stresses reach the value of elongation resistance of concrete. In this case, vertical cracks are formed in the concrete in the middle of the cut, and the deformations of the reinforcement are reduced.

At the expense of the constructions, the modulus of elasticity of the concrete is taken at the temperature between the sections and the deformations in the reinforcement are determined.

In the calculation of the strength, strength and ductility of flexible reinforced concrete elements, the stresses generated by the forces are combined with the stresses generated by the temperature, and the calculation of the final stresses is performed by the boundary condition method.

In pre-stressed flexible reinforced concrete structures, additional losses of pre-applied stresses occur under the influence of temperature. In this case, the main additional losses are formed due to the penetration of concrete from the temperature and the increase in creep, as well as as a result of adverse changes in the reinforcement. The current Building Standards and Regulations contain methods and criteria for calculating the losses of pre-applied stresses in reinforced concrete structures operating under high temperatures, which are determined taking into account the type of concrete and reinforcement, operating temperatures.

When calculating flexible reinforced concrete structures operating under high temperatures for the second group of boundary conditions, the large effect of temperature on the stress-strain state of the element must be taken into account [5,6].

The main indicator is the decrease in the deformation properties of concrete and reinforcement under temperature. This, in turn, leads to excessive deformation of the structure under normal conditions under high temperatures, and the formation of cracks in it before the external load is applied. It can be seen that under the conditions of technological temperatures, flexible reinforced concrete elements are in a more complex state of stress-strain.

This, in turn, further complicates the calculation formulas, leading to the emergence of redundant limits. However, in reinforced concrete elements operating at high technological temperatures, the state of stress is observed as in normal conditions, and the image of the boundary condition is the same. Based on this, the calculation of reinforced concrete structures operating under high temperatures is carried out by the method of boundary conditions, as in ordinary elements.

As an example, Figure 3 shows the experimental and theoretical values of the ψ_s coefficient of temperature at the expense of flexible reinforced concrete structures operating under technological temperatures, through which the deformation parameters of the structure are determined [7,8].

In the same way, calculations are made for the formation of cracks in the structures and finding the width of their openings, making appropriate changes.

In the calculation of the stiffness of flexible reinforced concrete structures operating in conditions of high technological temperatures, calculations are made taking into account the changes in the properties of concrete and reinforcement, their deformation parameters and temperature dependence of their properties.

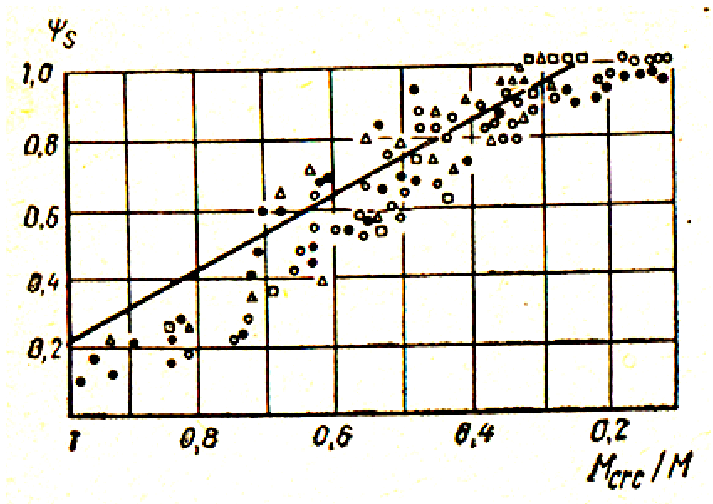

Figure 3 Flat heating for beams with reinforcement coefficients 0.4 - 1.4 % Comparison of experimental and theoretical values of the ψ_s coefficient in the case of: _________ - theoretical values; experimental values: ● - at 200S;

○ - 60 - 900S da; Δ - 1500S da; □ - at 2000S.

CONCLUSION

In general, the calculation of reinforced concrete structures operating under normal temperature conditions and elements operating under high technological temperatures is in principle the same and they are based on a physical model of stress-strain. The main difference here is in the working conditions, in order to properly take into account all its effects, additional working conditions coefficients are introduced, and their values for each specific case are given in the KMK.

However, determining the values of these coefficients on the basis of experimental studies, determining their values according to their physical nature, allows to increase the accuracy of calculations, increase the operational reliability of structures.

REFERENCES

1. M. Martemyanov. Design and construction in seismic areas. M .: Stroyizdat, 1985.220 p.
2. Djurayevna, T. N. (2020). Influence Of Surface Additives On Strength Indicators Of Cement Systems. The American Journal of Applied sciences, 2(12), 81-85.
3. Djurayevna, T. N. (2020). Building Materials Determined In The Architectural Monuments Of Central Asia. The American Journal of Applied sciences, 2(12), 77-80.
4. 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.

5. Ogli, X. A. M. (2021). Construction Of Flexible Concrete Elements In Buildings. The American Journal of Engineering and Technology, 3(06), 101-105.
6. 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.
7. 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).
8. Usmonov, Q. T., & Xaydarov, A. M. (2021). Yirik shaharlarda turar-joy maskanlari uchun xududlarni muhandislik tayyorgarlik va obodonlashtirish ishlarini amalga oshirish yo ‘llari. Scientific progress, 2(6), 1297-1304.
9. 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.
10. Ogli, X. AM, Ogli, AUA, & Mirzajonovich, QG (2020). Ways Of Implementation Of Environmental Emergency Situations In Engineering Preparation Works In Cities. The American Journal of Engineering and Technology, 2(11), 108-112.
11. Ogli, X. AM, Ogli, AUA, & Mirzajonovich, QG (2020). Hazrati Imam Architecture The Complex Is A Holiday Of Our People. The American Journal of Engineering and Technology, 2(11), 46-49.
12. 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).
13. Usmonov, Q., & Xaydarov, A. (2021). The Methods for Implementing Engineering and Preparatory Works and Improvement in Cities. CENTRAL ASIAN JOURNAL OF THEORETICAL & APPLIED SCIENCES, 2(11), 218-225.
14. 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.
15. Tolqin, A. (2021). Ancient greek and ancient rome architecture and urban

planning. The American Journal of Engineering and Technology, 3(06), 82-87.

16. T. Axmedov GOTIKA USLUBINING ARXITEKTURADAGI AHAMIYATI // Ilmiy taraqqiyot. 2021 yil. 6-son. URL: https://cyberleninka.ru/article/n/gotika-uslubining-arxitekturadagi-ahamiyati (kirish sanasi: 10.12.2021).
17. Ibrohim Numanovich Abdullayev, Azizxon Abbosxonovich Marupov, Tulqin Ahmedov. (2020). Analysis of land in protected areas of gas pipelines of different pressure on the example of the ferghana region. EPRA International Journal of Multidisciplinary Research+ (IJMR+) - Peer Reviewed Journal, 6(5), 311-314.
18. Usmonjon Turgunaliyevich Yusupov, 2 Akhmedov Tulkin Obidovich. (2019). Development of polyfunctional additives based on secondary resources and technologies of portland cement production. INTERNATIONAL JOURNAL OF RESEARCH CULTURE SOCIETY, 3(12), 200-208.
19. Nabiev, M., GM, G., & Sadirov, B. T. (2021). Reception of improving the microclimate in the houses of the fergana valley. The American Journal.
20. Abdukhalimjohnovna, M. U. (2021). Technology Of Elimination Damage And Deformation In Construction Structures. The American Journal of Applied sciences, 3(5), 224-228.
21. 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.
22. 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.
23. Mirzaakhmedova, U. A. (2021). Inspection of concrete in reinforced concrete elements. Asian Journal of Multidimensional Research, 10(9), 621-628.
24. Abdukhalimjohnovna, M. U. (2020). Failure Mechanism Of Bending Reinforced Concrete Elements Under The Action Of Transverse Forces. The American Journal of Applied sciences, 2(12), 36-43.
25. Mirzaahmedov, A. T. (2020). Accounting For Non-Linear Work Of Reinforced Concrete In The Algorithms Of Calculation And Design Of Structures. The American Journal of Engineering and Technology, 2(11), 54-66.

26. Мирзаахмедов Абдухалим Тахирович, & Мирзаахмедова Угилой Абдухалимжановна (2019). Алгоритм расчета железобетонных балок прямоугольного сечения с односторонней сжатой полкой. Проблемы современной науки и образования, (12-2 (145)), 50-56.
27. Mirzaeva, Z. A. (2021). Improvement of technology technology manufacturing wood, wood with sulfur solution. Asian Journal of Multidimensional Research, 10(9), 549-555.
28. Мирзаева Зарнигор Алишер Кизи, & Рахмонов Улмасбек Жуманазарович (2018). Пути развития инженерного образования в Узбекистане. Достижения науки и образования, 2 (8 (30)), 18-19.
29. Goncharova, N. I., Abobakirova, Z. A., & Kimsanov, Z. (2019). Technological Features of Magnetic Activation of Cement Paste" Advanced Research in Science. Engineering and Technology, 6(5).
30. Кимсанов, З. О. О., Гончарова, Н. И., & Абобакирова, З. А. (2019). Изучение технологических факторов магнитной активации цементного теста. Молодой ученый, (23), 105-106.