eISSN: 2349-5715 pISSN: 2349-5707

Volume: 11, Issue 12, December-2024 SJIF 2019: 4.702 2020: 4.737 2021: 5.071 2022: 4.919 2023: 6.980 2024: 7,662

Makhmudov Nemadulla Akhmatovich

PhD in Mechanics, Professor of the Department

Academy of the Armed Forces of the Republic of Uzbekistan

A MODEL FOR CALCULATING THE MAGNITUDE OF DAMAGE IN THE EXPLOSION OF CERAMIC AND CERAMIC-SILICATE STRUCTURES AND THEIR MATHEMATICAL AND STATISTICAL INDICATORS

Annotation. The article proposes a model for calculating the number of charges in the explosion of brick structures. Two different methods of the computational model were considered. In particular, the small squares method, i.e. the correlation theory, and the second method was implemented by calculating the obtained research results using simpler methods. It was noticed that similar results were recorded in both calculation methods.

Аннотация.В статье предложена модель расчета количества зарядов при взрыве кирпичных конструкций. Были рассмотрены два разных метода вычислительной модели. В частности, метод малых квадратов, т. е. теория корреляции, а второй метод был реализован путем вычисления полученных результатов исследований более простыми методами. Было замечено, что в обоих методах вычислений были зафиксированы близкие результаты.

Keywords: explosive charge, explosion, strength, coefficient, construction, construction, explosion impact, virtual, feature.

Ключевые слова: заряд взрывчатого вещества, взрыв, прочность, коэффициент, конструкция, Конструкция, удар взрыва, виртуальный, особенность.

To date, scientific research is underway to assess the impact of explosive charges on various structural elements. In this research work, blasting operations on certain structural elements and tests on them are mainly carried out. Tests and experiments in these processes, carried out mainly in real conditions, lead to an increase in a number of factors, such as costs, time, environmental impact, human factor, and resource allocation.

To reduce these factors, one of the most effective methods is to assess the impact on structures and structures of explosives in virtual conditions, taking into account their properties. To date, various studies have been conducted on the implementation of experimental work in virtual environments, methods, computational algorithms and methods used in these studies are not disclosed, but recorded as confidential data.

Even in this regard, it is advisable to conduct a step-by-step study of the structural elements. Therefore, this research paper proposes a model for calculating the number of charges in the explosion of brick structures.

The model was developed in two different ways. Let's consider the first method-the small squares method (correlation theory). We can see the physical properties of bricks by the types shown in 1st Table. This table is obtained as a result of applied research, we apply these properties when assessing the effects of explosive charges.

1st Table

eISSN: 2349-5715 pISSN: 2349-5707
Volume: 11, Issue 12, December-2024 SJIF 2019: 4.702 2020: 4.737 2021: 5.071 2022: 4.919 2023: 6.980 2024: 7,662

№	Features	brick wall (ceramic brick)	brick wall (silicate brick)	a wall made of large-sized ceramic blocks	a wall made of industrial gas blocks
1.	limits of compression resistance, kg/sm^2	125	150	128	15...30
2.	average density, kg/sm^2	1350	1750	830	400
3.	thermal conductivity, W(m*°K)	0,40	0,95	0,21	0,1
4.	water absorption (%)	13	13	12	>20
5.	frost resistance ($cycle$)	35	35	50	25
6.	average wall thickness (m)	0,52*	0,52*	0,38*	0,40

The results of the scientific study are presented in 2nd Table (x_i — parameters of bricks made of ceramic materials (construction), operating conditions, and
y_i — parameters of silicate material).

2nd Table

№	x_i -ceramic brick, y_i - parameters of silicates	x_i	y_i	x_i^2	y_i^2	$x_i y_i$	$y - y_1$
1.	thermal conductivity, W(m*°K)	0,4	0,95	0,16	0,9025	0,38	0
2.	average wall thickness (m)	0,52	0,52	0,27	0,2704	0,2704	0,57
3.	brick weight (kg)	2,5	3,7	13,69	9,25	9,25	-0,23
4.	water absorption (%)	13	13	1369	169	169	3,07
5.	frost resistance ($cycle$)	35	35	1225	1225	1225	7,47
6.	limits of compression resistance, kg/sm^2	125	150	15625	22500	18750	0,47

eISSN: 2349-5715 pISSN: 2349-5707
Volume: 11, Issue 12, December-2024 SJIF 2019: 4.702 2020: 4.737 2021: 5.071 2022: 4.919 2023: 6.980 2024: 7,662

$n = 6$		$\sum x_i = 176{,}42$	$\sum y_i = 203{,}17$	$\sum x_i^2 = 17033{,}1$	$\sum y_i^2 = 23908{,}8$	$\sum x_i y_i = 20153{,}9$	

The stronger the building materials are and the more proportionally they will connect to each other. For example, since the thermal expansion coefficients of iron and cement are very close to each other, they form a solid structure. The strength of structures Primarily depends on the physical, mechanical and chemical properties of the available materials, on what kind of structure it is, which has been confirmed in research and theories [1].

If structures and structures were built from more advanced structural, durable and reliable materials, the destruction of such structures and structures by explosion would require a large explosive expenditure of energy, skills and resources [2,3].

We can also express the energy normally expended on the destruction of structures and structures (the destructive impact of an explosive) in a degree of strength equivalent to it. For example: since the degree of destruction of an atomic bomb can be determined by theoretical or virtual methods, our research work also includes the development of empirical formulas based on the energy required to destroy structures and structures, the strength coefficients of building materials and structures and the assessment of their strength coefficients based on certain reliability. We present the results of 2nd Table to the small squares method, the linear regression equation $y = ax - b$, in order to form a standard system of equations:

$$\begin{cases} a\sum_{i=1}^{n} x_i^2 + b\sum_{i=1}^{n} x_i = \sum_{i=1}^{n} x_i y_i \\ a\sum_{i=1}^{n} x_i + bn = \sum_{i=1}^{n} y_i \end{cases} \qquad (1.1)$$

(1.1) let's substitute the results of scientific research from 2nd Table into the system of equations and calculate

$$\begin{cases} 17033{,}12a + 176{,}42b = 20153{,}90 \\ 176{,}42a + 6b = 203{,}17 \end{cases} =>$$

$$b = \frac{203{,}17 - 176{,}42a}{6} \cdot 17033{,}12a + 176{,}42 \cdot \frac{203{,}17 - 176{,}42a}{b} = 20153{,}90$$

it follows that $a = 1{,}197 \approx 2$, $b = -1{,}4$ then the direct regression formula will be equal to $y = 1{,}2x - 1{,}4$.

Consider 2nd Method. If the results of a scientific study are presented in the form of 2nd Table, it is considered sufficient to draw up equations of a straight line passing through these points or the

eISSN: 2349-5715 pISSN: 2349-5707

Volume: 11, Issue 12, December-2024 SJIF 2019: 4.702 2020: 4.737 2021: 5.071 2022: 4.919 2023: 6.980 2024: 7,662

distances closest to them. The graph passing through these points is considered an empirical formula and represents the result of scientific research.

For example: (2nd Table) A(0.4: 0.95) starting point A(x_i: y_i), the end point B (125: 150) let's make up the equation of the line passing through these points ; we look for it in the form $y = a_0 + a_1 x$:

$$\begin{cases} a_0 + 0{,}4a_1 = 0{,}95 \\ a_0 + 125a_1 = 150 \end{cases} \Rightarrow$$ let's solve this system of equations together

$124{,}6a_1 = 149{,}05$ $\quad a = 1{,}197 \approx 2$

$a_0 = 0{,}95 - 0{,}48 = 0{,}47$ $\quad$ so that: $y = 1{,}2x + 0{,}47$

Let's see how much this empirical formula deviates in points. This deviation is a deviation error (deviation from the target), which is crucial for experiments:

$b_1 = 1{,}2 \cdot 0{,}4 + 0{,}47 - 0{,}95 = 0$, $b_2 = 1{,}2 \cdot 5{,}2 + 0{,}47 - 0{,}52 = 0{,}57$, $b_3 = 1{,}2 \cdot 2{,}5 + 0{,}47 - 3{,}7 = -0{,}23$, $b_4 = 1{,}2 \cdot 13 + 0{,}47 - 13 = 3{,}07$, $b_5 = 1{,}2 \cdot 35 + 0{,}47 - 35 = 7{,}47$, $b_6 = 1{,}2 \cdot 125 + 0{,}47 - 150 = 0{,}47$

In 2nd Table $y - y_1$, the very close arrangement of the results indicates that the scientific study consists of practical and theoretical confirmation of each other.

Instead of a conclusion, we can say that it was noticed that the results of both proposed methods are very close to each other in quantitative terms.

USED LITERATURE:

1. Турсунов К.М., Кодиров А.А., Махмудов Н.А., Курбанбаев М.Ш., Маматкулов А.А. МАТЕМАТИЧЕСКОЕ МОДЕЛИРОВАНИЕ УРОВНЯ ПРОЧНОСТИ И АНАЛИЗ ВЕРОЯТНОСТИ ПОВРЕЖДЕНИЯ ЭЛЕМЕНТОВ КОНСТРУКЦИЙ ЗДАНИЙ ПОД ВОЗДЕЙСТВИЕМ СЛУЧАЙНОГО ВЗРЫВА. Жур. Mexanika Muammolari. Тошкент-2024: 114-119б.
2. Белов Н.Н. и др. Расчет железобетонных конструкция на взрывные и ударные нагрузке. Нортнэмптон -Томск, 2004 – 465
3. Белов Н.Н., Югов Н.Т. и др. Расчет прочности сталебетонных колоны на взрывные и ударные нагрузки. Вестник ТАСУ “2, 2007. С-132-138