IJCRSSL
International Journal of Current Researches in Sciences, Social Sciences and Languages

Volume: 01 | Issue: 04 | 2021 | Open Access | Impact Factor: 4.625

# Improvement of Rescue Operations Related with the Destruction of Buildings and Structures

**B.S. Mirzakabilov[1], B.T.Ibragimov[2]**

Department of Emergency Situations of Jizzakh region, Ministry of Emergency Situations of the Republic of Uzbekistan[1]

Doctor of Technical Sciences Academy of the Ministry of Emergency Situations of the Republic of Uzbekistan[2]

**Abstract:** The research paper describes the methods of carrying out rescue operations using modern equipment. How the processes of automation and mechanization will increasingly invade our lives. Experience in emergency response shows that assess the scale of their consequences required the involvement of dozens of people. To carry out rescue operations in destroyed buildings and structures, it is proposed to improve the technology of making openings in the walls. With the use of modern tools, a reduction in the time of emergency rescue operations is achieved.

**Keywords:** Rescue operations, rescuer, rescue tools and equipment, rescue technologies.

## INTRODUCTION

The development of rescue equipment, as of the whole society as a whole, is based on the introduction and improvement of modern technologies. Analysis of emergencies that have occurred in recent years shows that the number and scale of natural disasters, accidents and disasters are at a high level. Only in recent years in the republic, buildings and structures were destroyed for various reasons 23 times, as a result of which 18 people died and 74 people were injured [1].

When buildings are destroyed, rubble is formed, which is a chaotic heap of large and small fragments of building structures, plumbing, furniture, technological equipment and other things.

The experience of carrying out rescue operations in the republic shows that skillful actions of rescuers equipped with modern emergency rescue tools and equipment reduce the total losses and reduce the time to unblock the victims.

## METHODS OF RESEARCH

The effectiveness of the rescuers' actions is significantly influenced by the availability of the necessary technical means and their condition, expressed by the tactical and technical characteristics, as well as by such characteristics as reliability, mobility and versatility. Therefore, it is very important to have a rescue tool and equipment allowing for a short period of time to carry out high-intensity rescue operations under adverse emergency conditions.

The procedure for conducting rescue operations with destroyed buildings and structures consists of four stages [5]:

[1] search for victims;
[2] unblocking of victims;
[3] first aid;
[4] evacuation of victims.

When carrying out rescue operations in destroyed buildings and structures, rescuers carry out various works, including making openings in the walls, ceilings of buildings and structures to unblock victims who are under the rubble and are not able to get out on their own.

Unblocking of victims is carried out when they are found in the rubble of building structures; in confined spaces; on the upper floors of buildings and structures.
Release work is carried out in the following ways:

[1] sequential disassembly of the blockage;
[2] manhole device;
[3] installation of a gallery in the ground under the rubble;
[4] punching openings in reinforced concrete (concrete) and brick walls and ceilings (coatings) [5].

Punching openings may be preceded by disassembly of the blockage at the outer wall of the building and excavation of a pit. In some cases, cutting an opening in the front door of a blocked room is used. Passages to blocked rooms can be arranged in the form of openings in ceilings (coverings), walls (partitions), entrance doors both outside the building and from neighboring (adjacent rooms), access to which is free or previously prepared.
The location and dimensions of the opening should ensure the possibility of unhindered and relatively convenient penetration through it into the locked room by rescuers and evacuation of the injured, mainly those who have lost the ability to move independently.
Punching an opening is a difficult type of work and requires special training, training of rescuers. Concrete floors and slabs that rescuers encounter during rescue operations consist of concrete (grade M-300), inside which there is reinforcement (with a diameter of 14-18 mm) and a reinforced mesh to give greater strength.
Usually, openings are arranged in the form of a square (rectangle) with an area of 0.5 - 1.0 m2 with sides 0.8 (1.0) x 0.8 (1.0) m. the lower edge should be at a height of 0.8 - 1.2 m above the level of the floor or the surface of the earth, and in practice, they make triangular openings (the opening area is smaller), therefore, the time for its organization is reduced.
The device of an opening in the enclosing structures of blocked rooms presupposes the preparation of a workplace for the placement of mechanization means and the surface of the structure in the place of punching the opening, preliminary disassembly of the blockage or excavation of a pit, the choice of the location and designation of the outline of the opening and directly threading the opening into reinforced concrete (concrete) structure or brick wall.
Nowadays, the device of the opening in the wall is performed by a calculation of 3-5 people who use the following rescue tools and equipment [6]:
Punching openings may be preceded by disassembly of the blockage at the outer wall of the building and excavation of a pit. In some cases, cutting an opening in the front door of a blocked room is used. Passages to blocked rooms can be arranged in the form of openings in ceilings (coverings), walls (partitions), entrance doors both outside the building and from neighboring (adjacent rooms), access to which is free or previously prepared.

The location and dimensions of the opening should ensure the possibility of unhindered and relatively convenient penetration through it into the locked room by rescuers and evacuation of the injured, mainly those who have lost the ability to move independently.
Punching an opening is a difficult type of work and requires special training, training of rescuers. Concrete floors and slabs that rescuers encounter during rescue operations consist of concrete (grade M-300), inside which there is reinforcement (with a diameter of 14-18 mm) and a reinforced mesh to give greater strength.
Usually, openings are arranged in the form of a square (rectangle) with an area of 0.5 - 1.0 m2 with sides 0.8 (1.0) x 0.8 (1.0) m. the lower edge should be at a height of 0.8 - 1.2 m above the level of the floor or the surface of the earth, and in practice, they make triangular openings (the opening area is smaller), therefore, the time for its organization is reduced.
The device of an opening in the enclosing structures of blocked rooms presupposes the preparation of a workplace for the placement of mechanization means and the surface of the structure in the place of punching the opening, preliminary disassembly of the blockage or excavation of a pit, the choice of the

location and designation of the outline of the opening and directly threading the opening into reinforced concrete (concrete) structure or brick wall.
Nowadays, the device of the opening in the wall is performed by a calculation of 3-5 people who use the following rescue tools and equipment [6]:

[1] impact power tool (concrete breaker, perforator);
[2] hand tools of percussion action (kuvalda, crowbar);
[3] dynamic action hydraulic tool;
[4] disk cutting machines (gas cutter, angle grinder (hereinafter - LBM)).
[5] Making an opening in a reinforced concrete (concrete) structure includes the following operations:
[6] making a through hole with a perforator / concrete breaker;
[7] cutting the contour of the manhole with a gas cutter by 1/2 - 2/3 of the plate thickness;
[8] breaking out fragments with a concrete breaker;
[9] destruction of the remains of the slab with a concrete breaker (sledgehammer, crowbar);
[10] removal of reinforcement using angle grinders.

For rescuers, according to the collection of standards, 110 minutes are allotted for punching an opening in a reinforced concrete wall with a size of 0.8 by 0.8 m and a thickness of 400 mm [7]. In this case, a compressor station is used and jackhammers powered by compressed air. The equipment specified in the collection of standards is practically not used due to its large dimensions and limited use in the winter period of time, as well as work with a breaker hammer causes an additional vibration effect, which can lead to displacement or collapse of the blockage.

For a more objective assessment of the operation time, an experiment was carried out, which included 10 experiments on making an opening in the wall using a standard set of tools (gas cutter, perforator, angle grinder, extension cord and sledgehammer) (table 1) and using a ring cutter instead of a gas cutter (table 2). In accordance with the conditions for fulfilling the standard for making an opening, the thickness of the wall (slab) was 400 mm. The experiment was carried out on a specialized site that allows you to practice the initial skills of working with an emergency rescue tool and equipment [8].

The stages of the experiment on making an opening in the wall include:
[1] determination of the purpose of the experiment;
[2] determination of the conditions of the experiment;
[3] formation of a set;
[4] analysis of experimental results.

Table 1: the results of the experiment on making an opening using a gas cutter

| No experiment | Time t, min |
|---|---|
| **1** | 94 |
| **2** | 101 |
| **3** | 93 |
| **4** | 95 |
| **5** | 97 |
| **6** | 96 |
| **7** | 98 |
| **8** | 109 |
| **9** | 93 |
| **10** | 94 |

IJCRSSL International Journal of Current Researches in Sciences, Social Sciences and Languages

Volume: 01 | Issue: 04 | 2021 | Open Access | Impact Factor: 4.625

Table 2: the results of the experiment on making an opening using a ring cutter

| No experiment | Time t, min |
|---|---|
| **1** | 72 |
| **2** | 74 |
| **3** | 67 |
| **4** | 69 |
| **5** | 75 |
| **6** | 81 |
| **7** | 78 |
| **8** | 84 |
| **9** | 78 |
| **10** | 82 |

The time for making an opening in the wall is a discrete random variable distributed according to a uniform law. The time values in each experiment are equally probable. Since there are 10 experiments, the probability with which a random variable takes any value is 0.1. Let us determine the mathematical expectation of a discrete random variable "the time of making an opening in the wall" is determined by the formula 1:

$$M(T) = \sum_{i=1}^{10} t_i \cdot x_i$$

where M(T) - mathematical expectation of a discrete random variable "time of making a hole in the wall",
t_i - the value of a random variable in the r-th experiment,
x_i - the probability with which a random variable takes on a particular value in the i-th experiment.
Applying formula (1), we determine the mathematical expectation of the time for making an opening in the wall using a gas cutter
(Table 1):
M(T) = 94 · 0,1 + 101 · 0,1 + 93 · 0,1+95 · 0,1 + 96 · 0,1+ 98 · 0,1 + 109 · 0,1+ +93 · 0,1 + 94 · 0,1 = 97 minutes
During the experiment, it was found that the mathematical expectation of the time for making an opening in a reinforced concrete slab 400 mm thick using a gas cutter is 97 minutes.
Applying formula (1), we determine the mathematical expectation of the time for making an opening in the wall using a ring cutter (table 2):
M(T) = 72 · 0,1 + 74 · 0,1 + 67 · 0,1+69 · 0,1 + 75 · 0,1 +81 · 0,1+ 78 · 0,1 +84 · 0,1 + 78 · 0,1 + 82 · 0,1 = 76 minutes
The mathematical expectation of the opening time in a reinforced concrete slab using a ring cutter for 76 minutes.
The time spent on making a standard opening of 0.8 by 0.8 meters in a reinforced concrete wall (slab) with a thickness of 400 mm using a gas cutter is 97 minutes. This indicator is better than the allotted time in the collection of standards for rescue military units, but it can be improved even further by replacing the gas cutter with a ring cutter.
The cutting depth of the gas cutter is 125 mm, and the cutting depth of the ring cutter is 270 mm. At the same time, the thickness of the floor slabs is 160-220 mm. The thickness of the bearing walls of buildings and structures is 400-600 mm.There is no rotation axis in the design of the ring cutter, which increases its productivity. The use of a ring cutter will allow you to make an opening in slabs up to 270 mm thick

(floor slabs) in one operation (making the contour of the opening with the subsequent removal of the fragment). This will take 30-35 minutes. These indicators were obtained during practical training with the rescuers of the rescue squad of the Emergency Situations Department of the Jizzakh region.Making an opening in the wall using a gas cutter forces you to perform the same operation several times, while using a perforator and a concrete breaker to break the concrete and excavate small fragments (about 100 by 100 mm in size) of the wall. The opening time is 45-50 minutes.The use of a ring cutter for making an opening can reduce the number of rescuers to 3 people. The time spent on making an opening is reduced by 1.27 times and is 76 minutes. Due to the increased depth of cut, the number of repetitions is reduced to two times (breaking off fragments of the slab (wall) with subsequent removal and deepening), while it is necessary to use an additional tool (puncher, angle grinder, extension cord).

## CONCLUSION

Thus, in order to more efficiently carry out emergency rescue operations associated with making an opening in a concrete wall (slab) when dismantling debris, it is necessary to use a ring cutter. This allows you to reduce the number of rescuers involved, reduce the operation time by 1.27 times (from 97 to 76 minutes), with a reinforced concrete wall (slab) thickness of 400 mm, and with a wall (slab) thickness of up to 270 mm (between ¬Du-floor slabs) will take 30-35 minutes. This will free up an auxiliary tool for performing other operations during rescue operations and ultimately increase the chances of survival for those under the rubble.

## REFERENCES

[1] Order of the Prime Minister of the Republic of Uzbekistan No. 1 dated January 21, 2021.
[2] State report "On the state of protection of the population and territories of the Russian Federation from natural and man-made emergencies in 2015 "/ - M .: EMERCOM of Russia. FGBU VNII GOChS (FC), 2016 .12 – 21 p.
[3] State report "On the state of protection of the population and territories of the Russian Federation from natural and man-made emergencies in 2014 "/ - M .: EMERCOM of Russia. FGBU VNII GOChS (FC), 2015. 11-19 pp.
[4] State report "On the state of protection of the population and territories of the Russian Federation from natural and man-made emergencies in 2013 "/ - M .: EMERCOM of Russia. FGBU VNII GOChS (FC), 2014 . 13 - 17 pp.
[5] Handbook of the rescuer: Book 2: Rescue operations in the aftermath of earthquakes, explosions, storms, tornadoes and typhoons / - M .: VNII GOChS. 2006 . 180 pp.
[6] D.F. Lavrinenko, D.V. Myasnikov, A.V. Barinov, P.P. Petrenko. Emergency rescue tools and equipment. Textbook. / - Khimki: AGZ EMERCOM of Russia 2016 . 156 pp.
[7] A.V. Agafonov, S.V. Burenko, V.S. Pavlenko. Collection of standards for the training of rescue military units EMERCOM of Russia. / - M .: 2016. 218 pp.
[8] M.F. Barinov, D.V. Myasnikov, D.F. Lavrinenko. Educational and training complex for obtaining initial skills in working with emergency rescue tools and equipment // Scientific and educational problems of civil protection. 2014 No. 1. 66 – 71 pp.