

SAFETY DURING REMOVAL OF EXPLOSIVE REMNANTS OF WAR

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Abstract: *A significant increase in investments within the society is accompanied by an increase in construction works and the construction of capital infrastructure facilities. The fact that the territory of the Republic of Serbia was the scene of various war conflicts results in a large number of different examples of explosive remnants of war within the ground. These explosive remnants appear during execution of infrastructure works inside the ground at certain depths. The discovery of the aforementioned explosive remnants of war disables safe work and makes the completion of the planned works impossible. Organizing work on the discovery, excavation, removal and destruction of explosive remnants of war is a procedure that requires compliance with high levels of safety during work. The international standards defined by the United Nations enable the establishment of the necessary legal regulations for the organization of safe work on the removal of explosive remnants of war.*

Key words: *explosive remnants of war, removal*

1. INTRODUCTION

In recent decades, the Republic of Serbia has been characterized by a significant increase in investments. The creation of opportunities for such a degree of investment is accompanied by extensive requirements in significant infrastructure works, construction of industrial facilities, gas pipelines, as well as rehabilitation of important economic facilities. Planning and organization of the aforementioned works, regardless of desires and possibilities, is usually slowed down by requirements for safe working conditions. The set demands come from the fact that during the last 80 years, the territory of the Republic of Serbia has been the site of armed conflicts. Regardless of the reasons for the armed conflicts, the Republic of Serbia was exposed to various consequences. The consequences are most often expressed in human

casualties and damage (expressed in money) caused by the destruction. However, the fact that the area exposed to armed conflicts is marked as an unsafe place for life and therefore for the return of the population (who moved out of the area due to armed conflicts) long after the end of the conflict deserves attention. The stated fact is expressed through the painful truth that the space is contaminated by the use of various explosive and lethal means. (IMAS, 2022)

Within the last few decades, the term in use for space that was affected by armed conflicts - combat operations, is space contaminated by "explosive remnants of war" (hereinafter ERW)¹ (IMAS 2022). The highlighted problem is not typical only for the Republic of Serbia. A large number of countries are facing these problems. (Hall S., 2021, Klever J. Ph., 2022) As a result, the assistance of individual countries in the humanitarian demining of areas contaminated by ERWs was expressed.

In literature, the necessity of humanitarian demining² is constantly emphasized, which aims to remove ERW that are on the surface of the ground. "Minefields"³ made of anti-personnel and anti-tank mines, as well as improvised mines, are included in such communication constructions. The mentioned explosive remnants of war are found on the surface of the ground or up to 10 cm deep in the soil. One of the approaches that can significantly facilitate the process of humanitarian demining is the creation of a unified survey of areas contaminated by explosive remnants of war, which relies on the capabilities of the Geographical Information System. (Schmitz, P., at. al., 2019) This kind of presentation of all areas that were affected by combat operations creates the possibility of easier monitoring of the level of cleaning and planning of funds to create conditions for a carefree life of local communities. However, the problem that has not been given enough attention and about which there is not enough data is expressed in the question "what about the explosive remnants of war that penetrated deep into the ground and remained inside the soil?".

2. PROBLEM DESCRIPTION

The main characteristic of armed conflicts - combat operations is expressed in the fact that they are accompanied by the use of different weapons and combat systems that use different missiles and bombs (mortar, artillery, cannon, artillery-rocket missiles or aerial bombs). The application of the mentioned resources creates an area contaminated with explosive remnants

¹ ERW - UXO and AXO (unexploded ordnance and explosive ordnance that has not been used during an armed conflict, that has been left behind or dumped by a party to an armed conflict, and which is no longer under control of the party that left it behind or dumped it. Abandoned explosive ordnance may or may not have been primed, fuzed, armed or otherwise prepared for use) <https://www.mineactionstandards.org/en/standards/>

²Humanitarian demining is the physical removal or deactivation of abandoned mines, explosive remnants of war (ERW) and improvised explosive devices (IEDs) to protect civilians from their indiscriminate effects, facilitate a return to normal civilian life and, where applicable, ensure the delivery of humanitarian aid. Humanitarian demining differs from military demining because: (a) it aims to completely remove mines to make the area safe for civilians; (b) does not accept demining casualties as an operational reality and must therefore adhere to strict security standards at all times; and (c) must have a distinctly humanitarian, non-military purpose (Humanitarian demining as a form of humanitarian assistance under international humanitarian law, Diakonia International Humanitarian Law Centre).

³ Type of mine-explosive obstacle made of mines. It can be on land and in water. On land (and on the coastal edge up to a depth of 0.5 m of water depth) it is a land surface of a certain size, on which mines are placed according to a preselected schedule, intended to limit and prevent the movement, maneuver, action and landing of enemy forces, and for causing losses to his manpower and technical means. (Military Lexicon, 1982).

of war. However, no one questions what happened to the mentioned missiles and bombs that did not activate when they hit the ground, but continued their movement and remained in the depth of the ground.

Such problems have not received sufficient attention from various international humanitarian organizations, which would allocate significant funds in the form of aid to solve them. The mentioned problems are left to the jurisdiction of the countries, which they must solve independently. The issue of missiles and bombs that penetrated deep into the ground is not raised until the moment they affect normal life and work of the population or when it is necessary, to arrange or develop the area through the construction or renovation of various construction facilities or the implementation of capital infrastructure projects. Previous practice has shown that the largest number of explosive remnants of war are found at depths of up to 50 cm. It is mostly ammunition of smaller calibers and therefore larger quantities. However, there is not a small number of explosive remnants of war with large amounts of explosives inside at greater depths (up to several tens of meters). Based on certain data available to the Mine Action Centre of the Republic of Serbia, it is assumed that since the bombing in 1999, various unexploded aerial bombs or rockets are located on the territory of the Republic of Serbia at around 150 locations in the country at a depth of up to 20 meters. (Report on the mine situation from August 2022 in the Republic of Serbia) On the territory of the Republic of Serbia, throughout the practice of the last 20 years or so, we have witnessed the existence of: bombs (of various types and weights), missiles, mines, ammunition (of various calibers), sunken ships that were mined with improvised explosive devices, etc. The mentioned ERW date from the First and Second World Wars, the conflict in the immediate vicinity of the border of the Republic of Serbia (1991-1995), the NATO aggression in 1999, as well as the arbitrary involvement of Siptar terrorist groups during 1999-2003. Considering the extremely long period of time (from installation to the present day), a large part of space has changed its appearance. A significant part of the surface is overgrown with different vegetation, and part of the ground is used as arable land.

3. SAFETY REQUIREMENTS WHEN WORKING ON REMOVAL OF EXPLOSIVE REMNANTS OF WAR

The initial guidelines for work on humanitarian demining tasks are based on defined legal regulations. Initial guidelines in this area have been established by various international standards and norms. A large number of conflicts around the globe have caused a significant number of countries to face ERW problems. In the desire to remove ERW and create safe working conditions, various positive and negative experiences have been gained. In order to harmonize certain norms, the United Nations standards for the removal of unexploded ordnance (IMAS - International Mine Action Standards) were created. (IMAS, 2022) It is important to point out the fact that the stated standards are supplemented every year by positive practice that has been confirmed in humanitarian demining tasks in different countries around the world. For the purposes of the work, we will mention certain standards (which are important for the topic of this paper):

- IMAS 07.40 Monitoring of demining organizations.
- IMAS 08.22 Technical survey.
- IMAS 08.30 Post-clearance documentation.
- IMAS 08.40 Marking mine and UXO hazards.
- IMAS 09.10 Clearance requirements.
- IMAS 09.11 Battle Area Clearance.

The previously mentioned standards are the guidelines that each of the signatory states applies during the drafting of its legislation in this area and prescribes the standards. Based on that, the following are defined:

- Law on Disaster Risk Reduction and Emergency Management ("Sluzbeni glasnik RS" No. 87/2018).
- Regulation on protection against unexploded ordnance ("Sluzbeni glasnik RS" No. 7/2013).
- Labor Law ("Sluzbeni glasnik RS", No. 24/2005, 61/2005, 54/2009, 32/2013, 75/2014, 13/2017 - decision of the US, 113/2017 and 95/2018).
- Law on Safety and Health at Work ("Sluzbeni glasnik RS", No. 101/2005, 91/2015 and 113/2017).
- Law on Environmental Protection ("Sluzbeni glasnik RS", No. 135/2004, 36/2009, 72/2009, 43/2011 - decision of the US, 14/2016, 76/2018, 95/2018 and 95/2018).
- Law on Nature Protection ("Sluzbeni glasnik RS", No. 36/2009, 88/2010, 91/2010-amended, 14/2016, 95/2018, 71/2021).
- Law on Fire Protection ("Sluzbeni glasnik RS" No. 111/2009, 20/2015, 87/2018, 87/2018).
- Rulebook on personal protective equipment ("Sluzbeni glasnik RS" No. 23/2020).
- STANDARD ISO 9001:2008 – Quality management system.
- STANDARD ISO 14001:2004 - Environmental protection management system.
- STANDARD OHSAS 18001:2007 - Occupational health and safety management system.
- STANDARD ISO 45001 - Occupational health and safety management system.

The previously presented documents have an obligation for legal entities, which deal with humanitarian demining, and have received authorization from the Ministry of Internal Affairs of the Republic of Serbia to carry out protection against unexploded ordnance on the territory of the Republic of Serbia, to carry out the development of Standard Operating Procedures (hereinafter SOP) through which the regulations are implemented. The prepared SOP is subject to verification and approval by the Mine Action Centre of the Republic of Serbia.

The standard operating procedure, in addition to general guidelines and work procedures, should also define:

- Standard Operating Procedure - SOP for finding unexploded ordnance in water areas.
- Standard Operating Procedure - SOP for marking suspicious and contaminated surfaces - Emergency marking, permanent marking, semi-permanent marking.
- Standard Operating Procedure - SOP for tasks marking suspicious and contaminated surfaces - demining tasks, clearing battlefields, removing large-mass projectiles at greater depths.
- Standard Operating Procedure - SOP for Technical Reconnaissance, Pyrotechnic Surveillance and Inspection of Surfaces Suspected to be Contaminated by Unexploded Ordnance, Anti-Personnel and Anti-Tank Mines.

Approved documentation enables a legal entity to be approved for humanitarian demining tasks. After obtaining approval for the execution of work at a certain location, the obligation of the Mine Action Centre of the Republic of Serbia is to introduce the legal entity to work and check the technical means that will be used. Work on the removal of ERW is based on non-technical and technical reconnaissance, then on the removal of explosive remnants of war.

Non-technical reconnaissance activities will not be considered in this paper. Technical reconnaissance requires the establishment of a certain system, i.e. standard operating procedures during reconnaissance work and establishment of facts important for further work. In practice, they call it the definition of certain phases of work execution. The defined phases of the work performance require a sequence due to the influence of the ground on the performance of the work. Technical reconnaissance is not always possible to fully realize with one means or in one way. The aforementioned characteristics of the ground require a certain sequence. The gradualness is reflected in the application of appropriate mechanization depending on the characteristics of the ground itself. Reduction of time and efficiency in work can be significantly improved by the application of mechanization. As an example, the requirements for the removal of tall vegetation can be cited. High vegetation, due to a long period of non-exploitation of the ground can be a significant obstacle because a tree with a diameter of 10 to 40 cm makes safe work impossible. This alone makes the execution of works complicated. Special attention should be paid to the fact that these surface works must be approached with a simultaneous check of the surface of the ground and the immediate depth of the ground of 10 cm. Successfully performed surface works to remove vegetation enable a safe in-depth search of the ground up to a depth of 50 cm. Discovery, excavation and removal (destruction on the spot or transport to the place of destruction) create opportunities to move to the next phase of humanitarian demining.

It is possible to inspect the ground up to a depth of 3.0 m. For the needs of such inspections, it is most expedient to use the means of technical reconnaissance, which enable the inspection of the ground and providing the location of the object using GPS coordinates. With this approach, the process of mapping objects is significantly shortened, the safety of the work of the personnel is increased, and at the same time, a precise database is formed for later analysis.

Mineralized soil is a problem that arises during work at these and greater depths. The composition of the soil can significantly affect the creation of errors in data reading. In order to avoid such problems, constant conditioning and training of the personnel (operators) working on these devices is very important.

In order to carry out the work faster and safely, it is advisable to hire machinery intended for the execution of work in the ground or stone (different excavators or diggers, with different working tools). Regardless of the increase in the speed of work, the issue of safety during work must never be overlooked. In this sense, it is an obligation to constantly check the pace of work (safety first, and performance second. Do not change the sequence in any way) as well as check with technical devices whether new discoveries have been made (within the field) regarding ERW. This procedure is necessary due to the experience gained during the ERW removal tasks (a certain reinforced concrete slab at a depth of 2.4 meters made a "mask" that concealed the aerial bomb. Previously performed checks indicated the existence of metal even after the removal of the reinforced concrete slab it was thought to be a false alarm. The amount of armature in the plate was sufficient to make it impossible for the device to detect an aerial bomb.

4. CONCLUSION

Insisting on the issue of removing the ERW is not just an expressed desire to solve the current problem. It is a request that must be approached with a lot of seriousness and anticipation of further steps in the work. A large number of situations should be foreseen and, accordingly, a standard operating procedure for dealing with such situations should be prepared. However, regardless of the desire to pretend, it is necessary to first define the legal frameworks that enable action and provide support when working on the tasks of removing explosive remnants of war.

The starting step towards solving the mentioned problem is a realistic assessment of the mentioned problem. As a reminder, the Regulation on protection against unexploded ordnance ("Sluzbeni glasnik RS" No. 7/2013) is in force. Regardless of its modernity, at the time of its adoption, for many years it influenced that this issue must be approached in accordance with positive examples based on practice from around the world. In particular, it is necessary to implement positive examples that have been verified by practice.

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