KNOWLEDGE – International Journal
Vol.19.1
September,2017

SOME PROBLEMS OF WAREHOUSES AND STORAGE FACILITIES FOR MANUFACTURE AND REPAIR OF AMMUNITION, EXPLOSIVES AND GUNPOWDER

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Abstract: This study's subject is a research which is done based on the accidents that have happened in the ammunition depots in our country and abroad. The problems related to these extremely negative events have been highlighted. The main reasons for the accidents are described and comparative analysis between them in Bulgaria and abroad has been done as well.
Construction and operation of warehouses and storage facilities, manufacturing and repair of ammunition, explosives and propellant in the Army is carried out based on the number of legal documents. The complete safety of warehouses and storage facilities, construction, repair and disarming of ammunition, is achieved through: building them a safe distance from settlements, factories and other manufacturing plants, railway lines and stations, highways and roads I, II and III class, ports and airports, mines and quarries, power lines and other objects, and preventing a further construction, which is dangerously close; arrangement of repositories, platforms, loading and unloading stations and the workshops of the necessary minimum distance explosion-proof; deployment of ammunition, explosive gunpowder in repositories in accordance with the requirements for joint storage; construction of storage facilities, workshops and other buildings, premises, communications and facilities according to master plan, in strict compliance with fire safety construction and technical norms; monitoring the technical condition of ammunition and removal of hazardous for handling and storage; strict compliance with the rules of safety technology in the production, storage, repair and disarming, and conducting activities to improve the qualification of personnel; control when performing hazardous work in the operations of those responsible; strict compliance with fire safety regulations and training of personnel for organized and swift action in case of fire; organization of sustained security and fire protection; systematic control of officials and control bodies of the Ministry of Defense to comply with the requirements of safety in warehouses, bases and troops.
The main reasons for the blasts are emerging: breach of the requirements for storage of explosives and ammunition in warehouses /bases/; accumulating a lot of explosives at one place in contravention of regulations; other improper storage of flammable materials near explosives; ailure to comply with the requirements for fire protection; lack of reliable and objective control by the authorized bodies; recruitment of unqualified workers, engineering and technical staff and directors/managers/ companies; human error; breach of security measures; delay of the procedures for changing the regulatory framework; arson and others.
The aim of this paper is to identify the main requirements for this type of warehouses and bases and to do a study of incidents at ammunition depots in Bulgaria and abroad, to identify problems that have led to these extremely negative events with negative effects and identify the main causes of these incidents by making a comparative analysis between them for the country and abroad.
Key words: warehouses, bases, storage, ammunition, explosives, gun powders, accidents, reasons, requirements.

INTRODUCTION

Over the last fifteen years dozens of explosions at ammunition depots located in the Republic of Bulgaria, have occurred.[1] With these incidents, Bulgaria falls into a not very flattering ranking in the black statistics of explosions. Since 1979 more than 500 explosions have been registered at ammunition depots worldwide, according to a recent study by the Institute for Monitoring of small arms in Geneva. The reasons for these explosions are different. A major problem is the collection of evidence, as after the blast everything is burned and wiped out-on site, there remains almost nothing. Swiss experts have studied the causes of this kind of explosion.[2] According to the them, the basic reason is irresponsibility, but there are many others.

The aim of this paper is to identify the main requirements for this type of warehouses and bases and to do a study of incidents at ammunition depots in Bulgaria and abroad, to identify problems that have led to these

extremely negative events with negative effects and identify the main causes of these incidents by making a comparative analysis between them for the country and abroad.

1. REQUIREMENTS FOR WAREHOUSES AND STORAGE FACILITIES, PRODUCTION,REPAIR, DISARMING AND DESTRUCTION OF AMMUNITION,EXPLOSIVES AND PROPELLANT IN THE BULGARIAN ARMY

Dynamic changes in the socio-economic environment put the modern organizations in front of the variety of challenges in response of the need for their adaptability by increasing organizational flexibility, improvement and development of management tools.[8]

Our country's membership in NATO, and our EU accession puts our Armed Forces in front of new challenges. In response to the Program for the development of defense capabilities of the Armed Forces of the Republic of Bulgaria 2020, the maintenance and use of military infrastructure [3, p. 306], and, in particular, the warehouses and storage facilities, the production, repair, disarming and destruction of munitions explosives and propellant in the Army, is subject to the requirements for compatibility with NATO's new missions and tasks, collective commitments and the related required operational capabilities (ISO) [3, p. 306], which necessitates this research to take on a new light.

Construction and operation of warehouses and storage facilities, manufacturing and repair of ammunition, explosives and propellant in the Army is carried out based on the number of legal documents, such as Rules of warehouses and storage facilities, production, repair, unarming and destruction of ammunition , explosive substances and propellant in the BA, 1983; Instructions for reporting, accountability, receipt / distribution / storage and preservation of small arms and ammunition in the Army from 1998; Ordinance on the terms and conditions for carrying out activities related to weapons, ammunition, explosives and pyrotechnical products and the control on them, in and by the armed forces of Bulgaria, 2010; Instructions for technical inspection and repair of ammunition, in the army, Sofia, 1979; Law on Control of Explosives, Firearms and munitions, from1998 and its Implementing Regulations, from 1999 and other.

Ammunition, explosives and propellant, depending on the degree of danger of blast, are divided, conditionally, into 5 groups /A, B, C, D, F/ and for their joint storage and transportation there are certain allocated places, established. The allowable maximum ammunition, explosives and gun powders by the different conditional groups put in a storage, is determined according to a table.

Ammunition, explosives and gunpowder are stored in specially designated warehouses /bases/ and production, repair and disarming, are performed in specialized facilities /plants, workshops/ that should meet all requirements for complete explosive and fire safety.

Complete safety is a state of warehouse /base/ enabling:

- When blowing up a store with ammunition and explosives /explosives/ or explosive manufacturing facility, the detonation will not spread to other buildings and premises;
- Blast of the biggest /most threatening/ repository with ammunition or explosives and its blasting air shock wave may not be able to produce more than accidental breakage of glass in buildings closest to settlements or other objects;
- Fire and explosion in the closest objects to it, will not endanger its safety;
- To prevent fire in or near the warehouse, and in cases it happens, it should have the necessary means and conditions for its rapid containment and suppression.

Maximum possible safety, unlike the full, permits if accidental detonation of the biggest /closest to endangered sites/ repository or explosive manufacturing facility, happens, the blast shock wave to cause complete destruction of the glazing of the buildings in the nearest neighborhood or other facilities .The safety margin of the storage /base/ is determined by a corresponding methodology.

The complete safety of warehouses and storage facilities, construction, repair and disarming of ammunition, is achieved through:

- building them a safe distance from settlements, factories and other manufacturing plants, railway lines and stations, highways and roads I, II and III class, ports and airports, mines and quarries, power lines and other objects, and preventing a further construction, which is dangerously close;
- arrangement of repositories, platforms, loading and unloading stations and the workshops of the necessary minimum distance explosion-proof;
- deployment of ammunition, explosive gunpowder in repositories in accordance with the requirements for joint storage;

- construction of storage facilities, workshops and other buildings, premises, communications and facilities according to master plan, in strict compliance with fire safety construction and technical norms;
- monitoring the technical condition of ammunition and removal of hazardous for handling and storage;
- strict compliance with the rules of safety technology in the production, storage, repair and disarming, and conducting activities to improve the qualification of personnel;
- control when performing hazardous work in the operations of those responsible;
- strict compliance with fire safety regulations and training of personnel for organized and swift action in case of fire;
- organization of sustained security and fire protection;
- systematic control of officials and control bodies of the Ministry of Defense to comply with the requirements of safety in warehouses, bases and troops.

Warehousing of army ammunition, EOD /explosive ordnance devices/ and gun powders belonging to organizations and institutions from other departments, is allowed in exceptional cases, and only with the permission of MOD.

In the cases, when the forces are at camping conditions, or other special occasions, the storage of ammunition and EOD, is organized in temporary / field / stores in open areas. [4]

The following main elements, in the main storage depots for ammunition and explosives are set up:[5]

- Technical area - for storage, for performing technical inspection, maintenance, regulations, handling, transportation and other work with ammunition, explosives and special products.
- Subversion playground - for the destruction of defunct and dangerous to work with and transport ammunition, and for burning of spent gunpowder explosives. It is built outside the area of warehouse / base / at a distance not less than 400 m of storage facilities and other buildings and facilities and not less than one kilometer from settlements and other objects.
- Administrative and business area - For the deployment of the administrative, business and residential premises, checkpoints, fire safety depots, heat and power plants, pumping stations, garages, workshops, warehouses for materials and other buildings and facilities of the supporting services.

2. ANALYSIS OF THE INCIDENTS IN WAREHOUSES AND STORAGE FACILITIES FOR PRODUCTION, REPAIR, DISARMING AND DESTRUCTION OF AMMUNITION, EXPLOSIVES AND DUN POWDERS IN THE COUNTRY

The beginning of a series of negative cases in Bulgaria began on 09.07.2000, between the Haskovo region villages of Alexandrovo , Konstantinovo, Lyubenovo, Rodopi, Polyanovo and Bryagovo, when a raging fire started. Until evening, the fire reaches an ammunition depot in Ivanovo village and leads to explosions.[6]

On 03.07.2008, about 6.30 am. at a military ammunition depot in unit 18250,between Chelopechene and Chepintsi near Sofia, an explosion occurs. The explosions continue throughout the day. The area is rocked by more than 50 explosions. Redundant Armed Forces ammunition subject to utilization, is stored in this unit . In the workshop at this moment, there are 2500 tons of ammunition and about 20 tons of TNT. Residents of nearby villages are evacuated. There are no casualties, but serious material damage is incurred. Six years after the explosion prosecution submitted an indictment. Charges were brought against three senior officers, as prosecutors say they have not exercised sufficient control, and this led to the incident.

On 09.08.2008, at a military warehouse in the factory "Arsenal" in Kazanlak, a fire breaks out, leading to explosions. Grenades are stored in a warehouse for finished products. Luckily, there are no victims in this incident.

On 03.02.2010, late in the evening a fire breaks out, in the plant of "Midzhur" for explosives and materials, in the village of Gorni Lom Municipality Chuprene. The result is: four company employees injured.

On 12.11.2011 around 9.00 am. Former military warehouses located between Sevlievo and Lovnidol, detonate. There are about 3,000 rounds of caliber 152 in the warehouses, at the time. However, there are no chemical and radioactive substances to gas the area. No injured people.

On 10.01.2012, around 10.00 hours, there is an explosion in one of the divisions of VMZ - Sopot, in the Karlovo village of Iganovo. A woman and two men are injured. The cause for the explosion is improper cleaning of the mold for initiating explosive, leading to detonation of the same.

On 05.06.2012, after 14:40 pm. at junction Petolachkata, near Yambol, owned by "Bereta Trading", a series of explosions in warehouses for dismantling of missiles begins. The base is a former factory of "Terem" Tryavna. At the time of the explosion there are13 people present, seven of them are injured. Three people are killed. The firm has

been working on destroying ammunition from the depot explosion in 2008 near Chelopechene. In 2013, prosecutors charge the owner of the base and head of production, with negligently performing their obligations as officials, and not taking the necessary security measures for handling explosives. Prosecutors say that, the failure of safety measures and security is, precisely, what caused the blast.

On 12.09.2012, two blasts shook in less than a day, the military plant of "Arsenal" in Kazanlak. No injuries.

On 28.2.2014, at workshop 130 of Factory 4 "Arsenal" Arms complex near Muglizh, a blast erupts. A worker in the factory dies, after suffering polytraumatic condition, following 98 percent burns.

On 08.08.2014, at Kostenec factory "Terem - Tsar Samuil" Ltd., during the utilization of ammunition, a spark causes an explosion. The victims are10 people - five men and five women.

On 01.10.2014, after 17.00,an explosion breaks out in a workshop in "Midzhur" military factory in the area of Gorni Lom Municipality Chuprene.15 people are burned out in the blast.

On 19.12.2014, Muglizh village, a blast erupts at 11:27 pm., in a private ammunition factory . As a result, a man of 51, is killed, and two women and another man, are injured. The explosion happens in a company specializing in the production of cartridges and hunting ammunition.

On 21.03.2015 an ammunition depot near the village Iganovo, explodes. Nearly 2,000 unguided missiles - Nurs, blow up in the ammunition depot of VMZ-Sopot. The blast in the village Iganovo is another incident happening in a workshop with ammunition. The warehouse is located two kilometers from the village. There is no danger for the settlement and no injured in the incident.

The main reasons for the blasts are emerging:

- breach of the requirements for storage of explosives and ammunition in warehouses /bases/;
- accumulating a lot of explosives at one place in contravention of regulations;
- other improper storage of flammable materials near explosives;
- failure to comply with the requirements for fire protection;
- lack of reliable and objective control by the authorized bodies;
- recruitment of unqualified workers, engineering and technical staff and directors/managers/ companies;
- human error;
- breach of security measures;
- delay of the procedures for changing the regulatory framework;
- arson and others.

3. ANALYSIS OF ACCIDENTS IN WAREHOUSES AND STORAGE FACILITIES, PRODUCTION, REPAIR, UNARMING AND DESTRUCTION OF AMMUNITION, EXPLOSIVES AND DUN POWDERS ABROAD

The list of countries with incidents is topped by Nigeria and North Korea. In these two countries there have been registered the heaviest explosions at ammunition depots, which have killed around 1000 - 1500 people. The wounded in the two explosions are thousands. The two serious accidents affect people from entire cities and regions.

In 2012 in Brazzaville (Congo) a blast at an ammunition depot kills hundreds of people and more than 100,000 people remain without a roof over their head. A special committee of the EU, investigates this accident and concludes that it is it is a case of gross negligence.

Closer to continental Europe in 2011 a large explosion also occurs. The blast in Cyprus takes 13 victims and nearly destroys a power plant. For months, the island lacks electricity and material damage exceeds 2 billion euros. 98 containers of weapons, ammunition and explosives - delivery from Iran to Syria, which was intercepted by the Cypriot authorities, blow up in this explosion. Despite the warnings, the confiscated goods are stored without any precautions - a classic example of negligence on the part of the government.

We must consider other similar incidents in the world. [7]

In an explosion at a chemical plant "Nitrohimi" in the city Bee Berk, France, in March 2003 three people are killed. The blast is caused by a fire in the workshop for formation of dynamite.

In May 2006 in Ukraine, an armory depot with ordnance explodes. The explosion leads to a fire that injures two people.

In early 2008 a blast at an illegal fireworks workshop in Istanbul kills 19 people and injures 117. The incident is caused by a small fire in the building where the shop is located.

Twenty-seven people are killed and over 300, including children, are injured in explosions at an arms depot in the village of Gerdec, Albania, 12 km from the capital Tirana, in March 2008. The explosions last about two

hours. As a result, part of the international airport in Tirana is destroyed. The reason is careless operation with ammunition.

Three years later, an explosion in a warehouse for utilization of ammunition in Pigas, southern Albania, kills one person and wounds three more.

An explosion and subsequent fire in a warehouse of a fireworks factory in southern India in October 2009 kills 33 people and 10 are injured. The cause of the blast is a bomb, which ignites in a crowded store with people.

Thirteen people die and about 150 people are injured in an explosion in a warehouse for fireworks near Yichun city in northeast China.

In September 2014 an explosion at a fireworks factory in Italy kills five people. The incident happens in the town of Arpino, 120 km from Rome.

A month later, an explosion in a fireworks warehouse in Denmark takes the life of two people.

The explosions at ammunition depots occur mainly in countries where public order is not up to par. Most such incidents in the last 30 years have been registered in Russia and in several republics of the former Soviet Union. Large quantities of arms and ammunition are stored on their territories. After the collapse of the USSR, these huge inventories are neglected, emphasize Geneva professionals.[2]

An example is Albania, where in 1997 the entire state order collapses, and just in the same year there is a recorded list of 18 incidents, involving 140 victims of blasts.

Most at risk, of course, are the countries where there are wars, incl. civil. Over the past two years numerous explosions of ammunition are reported in Yemen, Syria, Lebanon, Libya and Pakistan. For previous periods there have been registered such incidents in Sri Lanka, Iraq and Afghanistan. It's a fact that in countries where in power is an authoritarian regime, the control their arsenals is not conducted as well as it should.

But explosions at ammunition depots, happen also in advanced solid countries like France and the US. The main reason for them most often, is the improper handling of explosives. The destruction of ammunition must follow strict rules. Very often in the affected stores, there is a lack of trained staff, there are no procedures and supervision, there is negligible conduct. Some stores are not developed well as architectural design or poorly constructed.

The study of the Geneva Institute lists absurd examples such as the military base in the center of town Bakavu in Congo-Kinshasa, where 12 tons of ammunition were stored next to tanks with gasoline.[2]

In most cases, warehouses are secured from outsiders, but often however, corrupt guards sell to their own benefit, weapons and ammunition to insurgents or criminals. This, in turn, creates additional risks.

Based on the research we can draw the following **conclusions:**

- In the last 12-15years, there have been a number of disturbing incidents in warehouses, databases and storage companies, for manufacturing, repair, unarming and destruction of ammunition, explosives and gunpowders in our country and abroad, which have extremely negative consequences. Analyzes show that the weak economically countries are more prone to accidents such as explosions at munitions depots and they occur mainly in countries where public order is not up to par.
- Warehouses and storage facilities for production, repair, unarming and destruction of ammunition, explosives and gunpowders in the Armed Forces, are an important part of the warehousing in the BA and extremely necessary for the Army, in terms of its functions and tasks. The tendencies observed about incidents of this kind in warehouses and bases, are a strong signal that we need to take serious measures to prevent risks of this sort.
- The requirements for the construction and operation of warehouses and storage facilities, production, repair, unarming and destruction of ammunition, explosives and propellant in the Army are based on effective for its time, but unfortunately outdated for modern conditions, regulations. It is appropriate that it be updated on the foundations of technological developments in storage and preservation, and in accordance with NATO standards.
- It is appropriate, to have maintenance and renovation of existing facilities and increased control over work in these warehouses and facilities, in order to prevent the risk of accidents, which in most cases have extremely negative consequences. Higher level of the warehousing can be achieved through continuous monitoring and control of state storage operations and looking for ways to improve. The approach, which should be applied is, to invest in those areas in the warehouse, which mark the biggest backlog of global practices and which jeopardize the basic functions of these warehouses: investments in maintenance of buildings, investment in modern information and communication systems and investments in improving safety and improving working conditions in warehouses and others.

Finally, we consider it appropriate, ammunition, explosives and propellant to be kept in smaller stores. Many governments believe that the larger arsenal they have, the stronger they are - and they fail to notice that the

risk is huge. Also, too much wasted ammunition is kept, rather than being destroyed. Responsible persons and institutions do not realize the danger and therefore do not support good management and skilled personnel.

In our view, the conclusions are extremely useful for all in the industry, including Bulgaria, as ammunition subject to utilization, disposal or sale in the country currently is over 14,000 tons.[156]

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[156] This article is related to project No BG05M2OP001-2.009-0001 " Support for the development of human resources and capacity for science and research of National Military University for its transformation into a contemporary knowledge centre". The project is implemented with the financial support of the Operational Programme „Science and education for intelligent growth" 2014 - 2020, co-financed by the European Union through the European Structural and Investment Funds.