

**MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN
FEDERATION**

**FEDERAL STATE AUTONOMOUS EDUCATIONAL INSTITUTION
OF HIGHER EDUCATION**

NORTH-CAUCASUS FEDERAL UNIVERSITY

METHODOLOGICAL GUIDELINES

FOR PRACTICAL CLASSES

in

LIFE SAFETY

for students majoring in (field of study) / specialty
degree program (profile) / specialization

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INTRODUCTION

The main Aim of the Life Safety discipline is shaping of a professional safety culture (noxiological culture), which is to be interpreted as an individual's readiness and capacity to use within professional activities the acquired set of knowledge, skills, and abilities to ensure safety in the sphere of professional activity, as well as the mindset and value orientations in which safety issues are considered a priority.

The main generalized objectives of the Life Safety discipline include: acquiring an understanding of sustainable development issues and risks associated with human activity; mastering techniques for rationalizing life activities aimed at reducing the anthropogenic impact on the natural environment and ensuring the safety of the individual and society; forming a safety culture, environmental consciousness, and risk-oriented thinking, in which issues of safety and environmental preservation are considered paramount priorities of human life activity; readiness to apply professional knowledge to minimize negative environmental consequences, ensure safety, and improve working conditions in the field of one's professional activity; motivation and ability to independently increase the level of safety culture; ability to assess the contribution of one's subject area to solving environmental and safety problems; formation of a professional safety culture, ability to identify hazards and assess risks in the field of one's professional activity; ability to provide reasoned justifications for one's decisions from the perspective of safety.

Universal Competency UC-8. Capable of creating and maintaining safe living conditions in daily life and in professional activity to preserve the natural environment, ensure the sustainable development of society, including in the presence of threats and during the occurrence of emergency situations and military conflicts.

Competency Achievement Indicators:

AI-1 UC-8. Familiar with the general characteristics of ensuring safety and sustainable development in various spheres of life activity; the classification of military emergency situations, principles and methods of organizing the protection of the population from hazards arising in peacetime and during the conduct of military operations.

AI-2 UC-8. Evaluates the probability of potential danger in wartime, daily life, and professional activity, and takes measures for its prevention.

AI-3 UC-8. Applies basic protection methods in the event of a threat and occurrence of emergency situations and military conflicts in daily life and professional activity.

Life safety is a discipline that examines the fundamentals of safe human interaction with the environment and the fundamentals of protection against negative factors in dangerous and extremely dangerous situations. The study of the discipline forms in a specialist an understanding

of the inseparable unity of effective professional activity and leisure with requirements for technical safety and human protection. The implementation of these requirements guarantees the preservation of human working capacity and health, preparing them for action in extreme conditions.

Practical Class 2.1.1.

Topic: Theoretical Foundations of the National Security (NS) of the RF Institution

Aim of the Class: To introduce students to the national spheres of Russia's state security; to consolidate the basic theoretical knowledge acquired during the lecture and practical class.

National security is protection of the individual, society, and the state from internal and external threats, which allows ensuring constitutional rights, freedoms, a decent quality and standard of living for citizens, sovereignty, territorial integrity, and sustainable development of the RF, as well as the defense and security of the state.

In the RF, there are several levels of state bodies and departments ensuring the safety of humans, society, and the state.

First level – legislative authority bodies that set, at the level of laws, the main directions and mechanisms for ensuring security as a holistic phenomenon.

Second level – executive authority bodies that set the national security strategy and its implementation.

Third level – judicial bodies that ensure strict compliance with laws in the sphere of legal security.

Fourth level – state institutions that ensure security at the level of a system of measures (protection of state borders, customs control, tax authorities, etc.).

Fifth level – the system of internal affairs bodies and special services that directly combat internal threats.

Sixth level – the unified state system for emergency prevention and response. All state bodies ensure the security of the country in strict accordance with the Law of the RF On Security dated March 5, 1992 # 2446-1.

The national spheres of state security of Russia are defined as the aggregate of balanced interests of the individual, society, and the state in the economic, domestic political, social, spiritual, international, information, military, border, and environmental spheres, as well as the protection of the population from terrorism, emergency situations, and the hazards of war.

Fill in the table

National Spheres of State Security of Russia

#	Sphere of activity of society and the state	National spheres of Russia's state security	Threats to national security of Russia
1	Economic	Sustainable development	Weakening of scientific-technical and technological potential, reduction of research aimed at the development of the scientific and technological revolution, outflow of intellectual

			property, strengthening of external economic dependence
2	Domestic political	Preservation of the stability of the constitutional system, institutions of state power, in ensuring civil peace and national accord, law and order, unity of the legal space	Social differentiation of society, growth of chauvinistic aspirations, nationalism, political and spiritual extremism, erosion of the unified legal space
3	Social	Ensuring a high standard of living	Property stratification of society, growth of unemployment, crisis of education, healthcare, and social protection systems, growth of alcoholism and drug addiction, reduction in birth rate, average life expectancy, weakening of the role of the family
4	Spiritual	Preservation and strengthening of the moral values of society, traditions of patriotism and humanism, cultural and scientific potential of the country	Devaluation of spiritual values, reduction of creative potential, spiritual and moral degradation
5	International	Ensuring sovereignty, strengthening Russia's position as one of the centers of a multipolar world, in developing equal and mutually beneficial relations with all countries	Weakening of influence in the world, expansion of NATO to the east, emergence of new military bases near Russia's borders, escalation of conflicts, weakening of the CIS, territorial claims against the RF, international terrorism
6	Informational	Compliance with the constitutional rights and freedoms of citizens in the field of obtaining and using information, in the development of modern telecommunication technologies, in the protection of state information resources from unauthorized access	Development of the concept of information warfare, dominance of individual countries in the international information space
7	Military	Protection of the independence of the RF, sovereignty, state and territorial integrity, in preventing military aggression against Russia and its allies, in ensuring conditions for peaceful, democratic development of the country	NATO's transition to forceful actions outside its area of responsibility without UN sanctions, creation of next-generation armament and military equipment, change in forms and methods of warfare, intensification of foreign special service activities, low level of tactical and combat training, insufficient manning of the army, imperfection of the regulatory framework in the field of defense
8	Border	Creation of political, legal, organizational conditions to ensure reliable protection of Russia's state	Economic, demographic, cultural-religious expansion, intensification

		borders	of organized crime, terrorism
9	Environmental	Preservation and improvement of the natural environment	Lack of environmental education, depletion of natural resources, use of the territory of the RF for processing and disposal of hazardous waste
10	Protection of the population from terrorism, emergencies, hazards of war	Ensuring the safety of the population from terrorism, emergencies, hazards of war	Activities of terrorist organizations; threat of growth in man-made emergencies; threat of local military conflicts near borders and on the territory of the RF

Hazards and threats always indicate an interaction between two sides: one acts as the source and carrier of hazard – the **subject**, and the other – towards which the hazard or threat is directed – the **object**. In the Law of the RF On Security (Article 1. Concept of Security and Its Objects), it is stated that the main objects of security include: the individual – with their rights and freedoms; society – with its material and spiritual values; the state – with its constitutional system, sovereignty, and territorial integrity. A person acts as both an object and a subject of hazards and threats; they are directly or indirectly included in the system of various relations with society and play an actively creative, passively contemplative, or destructive role in them. Subject-object relations in the field of security are offered in Table 1.

Table 1 Subject-Object Relations in the Field of Life Safety

Subject				
Human being (+)		Human being (-)		
CONNECTIONS, RELATIONS, IMPACTS				
Human being	Nature (Environment)	Technology	State	Society, civilization
Object				

According to objects, three types of security are distinguished.

1. Individual security – the state of protection of conditions ensuring the realization of rights and freedoms of the individual, as well as opportunities for their self-development.
2. Public security – the state of protection of vital interests, allowing the realization of the rights and freedoms of population groups and resisting actions leading to a split in society.
3. State security – the protection of the constitutional system, sovereignty, and geopolitical freedom.

National Security System in the Structure of State Power Bodies of Russia

President							NGOs, media	
President's Administration			Government		Security Council			
Court System							Federal Assembly	
Constitutional Court		Supreme Arbitration Court		Supreme Court	Prosecution Office	Local Court Bodies	Federal Council	National Parliament (Duma)
Federal Executive Authorities								
Ministry of Defense			Ministry of Foreign Affairs		Ministry of Internal Affairs External Intelligence Federal Security		Ministry of Emergencies	
Ground Forces	Navy	Air Force	Central apparatus of the Ministry of Foreign Affairs Embassies, Consulates Representations in international organizations		Internal Troops Police Investigative Bodies State Department for Traffic Safety (GIBDD)		Fire Service	
							Regional centers of EMERCOM	
							Civil Defense Troops	
Airborne Troops							Search and Rescue Service	
Missile Troops								
Space Forces								
Ministry of Justice		Federal Service of Bodyguards (FSO)	Ministry of Finance	Federal Tax Service (FNS)	Ministry of Economic Development and Trade (MERT)	Ministry of Health and Social Development (MZSR)	Federal Agency of Government Communications and Information (FAPSI)	
Ministry of Natural Resources			Federal Service for Financial Markets (FSFN)	Federal Space Agency (FKA)	Federal Service for Environmental, Technological and Nuclear Supervision (Rostekhnadzor)		(Federal Agency of Government Communications and Information [FAPSI] troops)	
State power authorities of the constituent entities of the Federation								

Fill in the table Federal Laws of the RF and Their Purpose

#	Name and Year of Adoption	Purpose	Duties of Citizens
1	Federal Law On Security dated March 5, 1992 # 2646-1	Introduces the security system of the RF	Does not impose
2	Federal Law On Fire Safety dated December 21, 1994 # 69-FZ	Introduces the fire safety system of the RF, establishes the powers of its constituent bodies	Does not impose
3	Federal Law On Civil Defense dated February 12, 1998 # 328-FZ	Introduces the civil defense system, establishes the powers of its constituent bodies	Imposes
4	Federal Law On the State of Emergency dated May 30, 2001 # 3-FKZ	Introduces the state of emergency system, establishes the powers of its constituent bodies	Does not impose
5	Federal Law On Countering Terrorism dated March 6, 2006 # 35-FZ	Introduces the counter-terrorism system, establishes the powers of its constituent bodies	Does not impose
6	Federal Law On Information, Information Technologies, and Information Protection dated July 27, 2006 # 149-FZ	Introduces the information protection system, establishes the powers of its constituent bodies	Imposes
7	Resolution of the Government of the RF On the Classification of Natural and Man-Made Emergency Situations dated May 21, 2007 # 304	Introduces the classification of natural and man-made emergency situations, establishes the powers of its constituent bodies	Does not impose

Practical Class 2.2.1.

Topic: Geopolitical Position of the Russian Federation

1. Theoretical Material. Specified in the slide material for Lecture 5.
2. Tasks for Classwork

2.1.Fill in the table Trends in the Development of International Relations

2.1. What does the globalization of modern international relations mean in your understanding?

It consists in the internationalization of the economy, the development of a unified world communications system, changes in and the weakening of the functions of national states, and the intensified activity of transnational non-state entities. On this basis, an increasingly interdependent and integrated world is being formed; interactions within it have acquired a systemic character, where even minor shifts in one part of the world inevitably resonate in other parts, regardless of the will or intentions of the participants in such processes.

2.2. Into which two poles has the world been divided? Name the countries belonging to these poles.

The poles of peace, prosperity, and democracy, and the poles of war, turmoil, and tyranny. The majority of humanity lives at the pole of turmoil, where poverty, anarchy, and tyranny prevail.

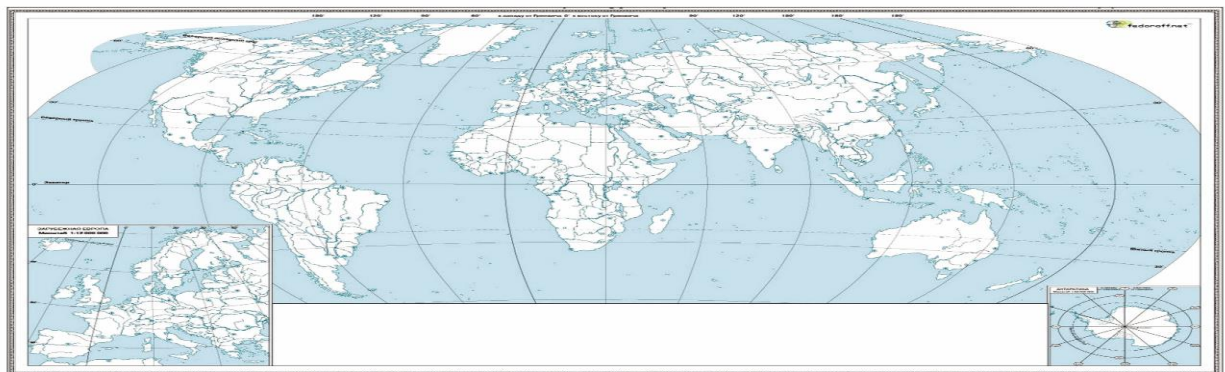
At the pole of peace, prosperity, and democracy there are 25 countries: the states of Western Europe, the USA, Canada, Japan, Australia, and New Zealand. They are inhabited by 15% of the global population, the so-called golden billion. In these countries, the standard of living of the average citizen is very high by historical standards (from \$10,000 to \$30,000 in annual income), with a life expectancy of at least 74 years. A country can achieve such prosperity only through the presence of a highly developed, knowledge-intensive economy.

At the other pole are the states of Africa, Asia, Latin America, and Eastern countries. They account for over 80 million people.

2.3. List the countries and indicate them on the map:

- **in red color** – BRICS countries;
- **in blue color** – NATO block countries.

2.4. List the nuclear-weapon states and indicate them on the map.



2.5. What is the main meaning and point of the foreign policy of the Russian Federation on the international stage?

Maintaining peace and security to ensure the well-being of its citizens and the sustainable development of the country. The Russian Federation advocates an equal dialogue and consensus in relations among all nations. Like other states, Russia recognizes the existence of national interests in the field of international contacts, which it seeks to defend within the framework of international law.

2.6. Read the text and provide examples of actions by the Russian Federation that confirm these ideas.

In view of growing geopolitical tensions, the foreign policy of the Russian Federation should contribute to:

- Increasing the stability of the system of international relations based on international law, as well as the principles of universal, equal, and indivisible security;
- Deepening multilateral cooperation without dividing lines or bloc-based approaches to jointly address global and regional problems, with the central coordinating role played by the United Nations (UN) and its Security Council;
- Pursuing an independent foreign policy course for Russia that ensures its sovereignty and territorial integrity.

2.7. What goal do Western countries pursue by imposing sanctions against the Russian Federation?

The target of the sanctions is quite clear: to undermine the stability of development in the country and to prevent its revival as one of the world's centers – as a great power.

2.9. Offer examples of Western double standards regarding Russia.

2.10. On February 24, 2022, the President of Russia – Commander-in-Chief of the Armed Forces Vladimir Putin – announced the start of a special military operation of the Russian Army in Ukraine.

List (in your view) the main reasons that influenced the start of the Special Military Operation in Ukraine.

2.11. Based on which legal acts is the special operation being carried out (legal framework)?

1. Subject to Article 51 of Chapter VII of the UN Charter;
2. Authorized by the Federation Council of the Russian Federation;
3. Pursuant to the treaties of friendship, cooperation, and mutual assistance with the Donetsk People's Republic and the Luhansk People's Republic, ratified by the Federal Assembly on February 22, 2022.

2.12. What does Article 51 of Chapter VII of the UN Charter state?

Nothing in the present Charter shall impair the inherent right of individual or collective self-defense if an armed attack occurs against a Member of the United Nations, until the Security Council has taken measures necessary to maintain international peace and security. Measures taken by Members in the exercise of this right of self-defense shall be immediately reported to the Security Council and shall not in any way affect the authority and responsibility of the Security Council under the present Charter to take at any time such action as it deems necessary in order to maintain or restore international peace and security.

2.13. What are the objectives of the special operation to fulfill its mission?

To strive for the demilitarization and denazification of Ukraine, as well as to bring to justice those who committed numerous bloody crimes against civilians, including citizens of the Russian Federation.

2.14. What is not included in the plans for conducting the special operation?

The plans for the special operation do not include the occupation of Ukrainian territories. Russia is not going to impose anything on anyone by force. The main task is to give the citizens living in Ukraine the right to make a choice regarding the territorial affiliation of their regions.

3. Tasks and Questions for Competency Development and Assessment

1. Contemporary trends in the development of international relations.
2. Foreign policy of the Russian Federation at the present stage.
3. Reasons and goals of the Special Military Operation in Ukraine.

4. Recommended Literature

1. *Military Doctrine of the Russian Federation*. Executive Order of the President of the Russian Federation # Pr-2976 dated December 25, 2014.
2. *Executive Order of the President of the Russian Federation of December 31, 2015 # 683 On the National Security Strategy of the Russian Federation*.
3. *Main Provisions and Features of the New National Security Strategy of the Russian Federation*. Study Guide, HSE University, 2016.

Practical Class 3.1.1

Topic: Organization of Civil Defense

Aim: To introduce students into the civil defense arrangements, to consolidate basic theoretical knowledge acquired during lectures and practical sessions.

1. **Complete the Sentences** A system of measures to prepare for the protection of, and to protect, the population, material, and cultural assets on the territory of Russia from hazards arising during or as a result of military actions, as well as from natural and man-made emergency situations is called ...

2. _____ is a set of measures for the organized removal (withdrawal) from categorized cities and relocation to a suburban area for residence and rest of economic entity personnel whose production activity will continue during wartime.

3. The maximum weight per person during transport evacuation is ...

Fill in the Table

Evacuee's Luggage Components		
#	Component	List of Necessary Items
1.	Documents	Passport, birth certificates, military ID, educational/property diplomas, money, bank cards, medical policies (packed in a waterproof pouch).
2.	Protective Equipment	Gas mask, dust mask (PPM-1 / PTM-1), industrial respirator, cotton-gauze dress, protective gloves, raincoat/cape.
3.	Personal Belongings	Seasonal outerwear, robust footwear, changes of underwear, personal hygiene items (soap, towel, toilet paper), flashlight, matches/lighter.
4.	Food Supply	Non-perishable food for 2–3 days (canned goods, dry biscuits/biscuits, sugar, concentrated rations), drinking water (1.5–2 liters per person).
5.	Medications	Individual first-aid kit (AI-2 / AI-4), prescription drugs taken regularly, painkillers, broad-spectrum antibiotics, antiseptics, bandages, tourniquet.

Solve the Situational Task

Task: Calculate the distance of the emergency exit from an embedded shelter if it is located in the basement of a standalone 16-story single-entrance residential building with a height of 68 m.

Fill in the Table: Types of Civil Defense Property Supplied to Schools in Emergency Situations

#	Personal Protective Equipment (PPE)	Radiation and Chemical Reconnaissance Instruments	Medical Protection Means

1.			
2.			
3.			
4.			
5.			

Radiation Shelter (PRU) Technology and Specs

Construction Technology

1. Excavate a trench/pit for the shelter so that the ceiling beams lie at ground level, with a depth allowing full standing height (2 m); reserve space along walls for benches with a 50 cm central aisle, plus storage areas for food, water, and medical supplies.
2. Allocate space for a vestibule (airlock) between the bottom step of the staircase and the interior entrance door.
3. Reinforce walls using brick, timber logs, or wooden posts sheathed with boards (filling the gap between soil and boards with concrete mortar).
4. Install intake and exhaust ventilation ducts.
5. Cover the ceiling structure with concrete slabs.
6. Apply a 1-meter thick soil/earth layer over the ceiling slabs.
7. Cover the earth embankment with turf.
8. Lay waterproofing on the shelter floor (concrete, expanded clay, timber).
9. Install three doors: one entrance door and two vestibule doors (10–15 cm above floor level).
10. Install emergency lighting (kerosene lamps, candles).
11. Stock supplies of PPE, drinking water, and pharmaceuticals.

Radiation Attenuation Factor (Katt): approximately **300–400** units.

Put down the chart

#	Signal	When Issued	Method of Delivery
1.	Attention Everyone!	To attract public attention prior to broadcasting warning signals or verbal notifications.	Sounding electric/electronic sirens, industrial horns/whistles, and other acoustic signaling equipment.
2.	Air Raid Warning!	Upon the immediate threat of an enemy strike, indicating an attack could follow shortly.	Verbal announcements via radio/TV networks, facility and mobile alert systems, and all available communications channels.
3.	All Clear (Air Raid)!	If the strike did not take place or its aftermath poses no further danger to the population.	Verbal announcements via radio/TV networks, facility and mobile alert systems, and all available communications channels.
4.	Radiation Danger!	Upon immediate threat or actual detection of radioactive contamination.	Verbal announcements via radio/TV networks, facility and mobile alert systems, and all available communications channels.

5.	Chemical (Biological) Alarm!	Upon immediate threat or actual detection of chemical or biological contamination.	Verbal announcements via radio/TV networks, facility and mobile alert systems, and all available communications channels.
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Fill in the Table: Types of Protective Structures and Their Purpose

#	Type of Protective Structure	Purpose of the Protective Structure
1.	Shelters	
2.	Radiation Shelters	
3.	Simple Protective Structures	

Fill in the table.

Indicating Yes / No for factors without individual respiratory/skin protection, and attenuation factor for Penetrating Radiation

Protection Against WMD Damaging Factors

#	Type of Protective Structure	Protection Against WMD Damaging Factors (without respiratory and skin protection)				
		Shockwave	Light Radiation	Penetrating Radiation	Biological Hazards	Poisonous / Toxic Substances
1.	Shelters					
2.	Radiation Shelters					
3.	Simple Protective Structures					

Medical Personal Protective Equipment (MPPE) Overview

Designed for preventing the effects of WMD damaging factors and conventional weapons, as well as providing first aid to victims.

Primary MPPE Items

1. Individual First-Aid Dressing Package (PPI);
2. Individual First-Aid Kit (AI-2);
3. Individual Anti-Chemical Package (IPP-8, IPP-9, IPP-10).

Specialized Medical Preparations

- **Radioprotectors:** Chemical substances that reduce the effect of ionizing radiation on the body and increase systemic resistance (e.g., Cysteine, Cystamine, Cystaphos – taking them prior to exposure reduces radiation severity by 1.5–2 times).

- **Complexons:** Aminopolycarboxylic acids and their derivatives used for binding and eliminating radionuclides.
- **Adsorbents:** Synthetic and natural porous bodies (silica gels, alumina gels, activated charcoal, zeolites) that absorb hazardous gases and dissolved toxins.
- **Individual anti-chemical packages** (IPP-8, IPP-9, IPP-10).

Fill in the Table: Individual Anti-Chemical Packages (IPP)

#	Name	Brief description	How to use
1.	IPP-8	A flat glass vial (125–135 mL) with a neutralizing solution and 4 cotton-gauze pads inside a cellophane pouch.	Unscrew cap, moisten pad with solution, wipe exposed skin areas (except around eyes). Rinse skin around eyes with water or 2% sodium bicarbonate solution.
2.	IPP-9	Cylindrical metal vessel with a screw-on cap and an integrated sponge (replacing pads).	Depress the punch pin fully, open vessel, invert and shake. Wipe affected skin with sponge. Pull pin back out and screw cap closed.
3.	IPP-10	Cylindrical metal container with a lock-nozzle cap mounted on a strap containing an internal puncher.	Twist cap off lock stops and strike it to puncture vessel. Remove cap, pour 10–15 mL onto hands, treat face and front of neck, then hands and back of neck.

Practical Class 3.1.2

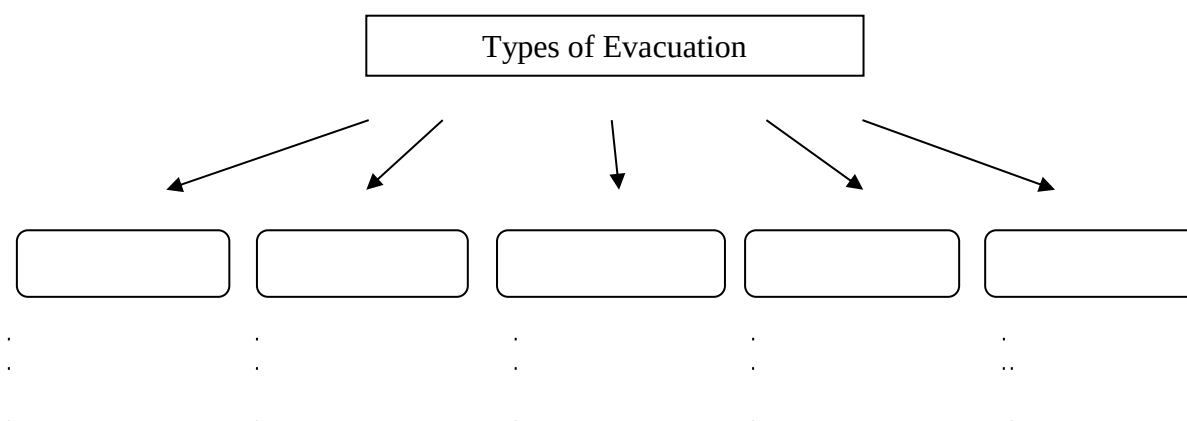
Topic: Preparation of Data for Determining the Procedure for Using Civil Defense Protective Structures to Shelter Facility Workers and Their Family Members in case of Emergency Situations

Aim

1. To introduce students to the procedure for performing calculations to determine the required number of civil defense protective structures for sheltering facility employees and their family members, the plan for bringing shelters into readiness, and the calculation methodology for bringing civil defense protective structures into readiness.
2. To develop students' skills in performing the necessary calculations to ensure the sheltering of facility employees and their family members in civil defense protective structures.

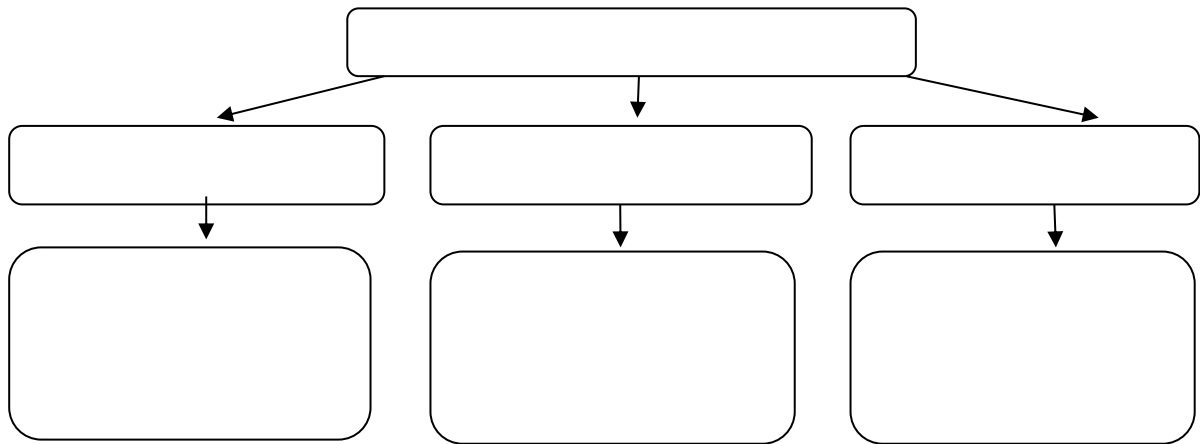
Scheme 1: Types of Evacuation

1. Based on the analysis of regulatory legal frameworks governing the organization of evacuation, complete the scheme TYPES OF EVACUATION:



Scheme 1. TYPES OF EVACUATION

Use the following list of actions to fill in the scheme: before evacuation begins turn on the tv or radio and listen to the announcement. find out the location and time of the assembly point, gather essential documents, collect valuables and clothing, stock up on a 2–3 day supply of food, take necessary medications, prepare a flashlight, spare batteries, and candles, prepare an information note for children, make sure you have means of communication, turn off lights, gas, and water, release domestic pets/animals; during evacuation, observe safety measures, pay attention to people who need assistance, when driving a vehicle, move only along main roads and highways; after evacuation register with the representative of the evacuation commission, receive temporary housing and employment.



Scheme 2: Actions During Evacuation

Example Calculation of the Required Number of Civil Defense Protective Structures for Facility Personnel

The calculation is carried out to determine the necessary number of civil defense protective structures to shelter the personnel of an economy entity.

Initial Calculation Data: Largest Working Shift (LWS) headcount: $K_{lws}=185$ people.

Existing facility assets:

Shelter # 1 capacity (C1): 25 places

Shelter # 2 capacity (C2): 30 places

Radiation Shelter capacity (C3): 30 places

Three basements (recessed premises) suitable for retrofitting as civil defense protective structures:

Basement # 1 capacity (C4): 20 places

Basement # 2 capacity (C5): 20 places

Basement # 3 capacity (C6): 20 places

Solution. The total capacity of existing (C) and planned (C_{plan}) civil defense protective structures must allow for the sheltering of the entire largest working shift (K_{lws}), i.e., the following inequality must hold: $K_{lws} \leq C + C_{plan}$.

1. Find the number of people sheltered in all currently available structures at the facility (C_{total}):

$$C_{total} = C1 + C2 + C3 + C4 + C5 + C6 = 25 + 30 + 30 + 20 + 20 + 20 = 145 \text{ people.}$$

2. Find the number of personnel not provided with shelter:

3. Based on **Table 1**, select a prefabricated timber shelter with a capacity (Cplan) of 50 places, which can be constructed rapidly.
4. Verification: $185 < 145 + 50 = 195$ places (Requirements met)

Main Indicators of Prefabricated Shelters of Various Capacities and Designs

Structural Type of Shelter	Capacity (people)	Labor Intensity (man-days)
Type 1: Shelters made of precast concrete blocks and reinforced concrete products	50	152
	100	185
	150	299
Type 2: Shelters made of individual precast reinforced concrete items	50	205
	100	564
	150	632
Type 3: Shelters made of reinforced concrete three-part slabs	50	38,7
	100	69,5
Type 4: Shelters made of individual circular reinforced concrete blocks	50	122
Type 5: Shelters made of individual rectangular reinforced concrete blocks	50	116
	100	213
	150	247
Type 6: Shelters made of timber materials	50	36
	100	50
	160	69

Table 2

[illegible]

8.	Checking the air supply system													
9.	De-preserving and test-running diesel generator sets													
10.	Engaging the heating system													
11.	Inspecting the power supply system													
12.	Connecting communication and warning systems													
13.	Fully equipping with inventory and other assets													
14.	Leakage and hermeticity testing													

Calculation of Readiness Implementation within 24 Hours

Initial data for civil defense shelters

Calculation objective: to identify the start and end time of measures for readiness preparation of civil defense shelters at the facility by types of work for each calculation procedure:

- the number of shelters and radiation shelters (RS) available at the facility, their capacity, and readiness preparation time
- the number of basements, timeframes, and volumes of work for their retrofitting
- the construction plan for shelters and RS for the current year
- the planned number of rapid-assembly shelters, construction standards for each type of rapid-assembly shelter and RS (Table 1)
- the planned number of makeshift shelters and their construction standards.

Example of performing the calculation for the readiness preparation of civil defense shelters

It is necessary to identify the readiness preparation time for civil defense shelters and enter the obtained results into Table 3.

Let us take the initial data from the example calculation of the required number of civil defense shelters for sheltering the facility's personnel, given above.

Solution

1. Work on the readiness preparation of existing shelters and RS is performed by the civil defense shelter maintenance group (team). During the first 24 hours, the following civil defense shelters (3 units) with a total capacity of $C = C_1 + C_2 + C_3 = 25 + 30 + 30 = 85$ people are prepared for readiness.
2. From the experience of conducting exercises at the facility, it has been established that the labor input for adapting one stone-house basement into a shelter with a capacity of 20 people (T_p) is 90 man-hours. One crew consisting of 9 people (K_r) will spend the following time on retrofitting one basement: $T_p / K_r = 90 / 9 = 10$ h. The facility has three such basements with a total capacity of $C_4 + C_5 + C_6 = 20 + 20 + 20 = 60$ people. We plan the work of three crews of 9 people each. In this case, all three basements will be adapted during the first 24 hours.

3. Completion of construction of shelters and RS according to the plans of the current year. The construction completion time for civil defense shelters is taken from the construction project documentation. (In this example, construction completion is not provided for.)
4. Construction of rapid-assembly shelters. The facility plans to construct one rapid-assembly shelter made of timber with a capacity of 50 people. The construction labor input (TBVU), according to Table 1, for this type of shelter will be: $TBVU = 36$ man-days. We plan a construction crew numbering (Kbvur) 18 people. The construction time will be: $Tbv_u = 36 / Kbvur = 36 / 18 = 2$ days.
5. The construction of makeshift shelters at the facility is not planned.

Table 3.

Calculation for Bringing Civil Defense Protective Structures into Readiness

#	Work	Daya								Notes
		1	2	3	4	5	6	7	8	
1.	Bringing existing shelters into readiness (quantity / capacity)	3/85								
2.	Retrofitting existing basements (quantity / capacity)	3/60								
3.	Completion of shelter construction under current year plans (quantity / capacity)									
4.	Construction of prefabricated shelters (quantity / capacity)		1/50							
5.	Construction of simple shelters (quantity / capacity)									
	TOTAL	6/145	1/50							

Practical Class 4.1.1

Topic: Public Danger of Terrorism and Extremism

Aim

To familiarize students with the rules of safe behavior in criminogenic hazards; to consolidate the main theoretical knowledge gained during lectures and practical session.

Following World War II, crime turned into a global issue.

Trends Characterizing World Crime

- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____
- 6) _____
- 7) _____
- 8) _____
- 9) _____

Organized Crime. In the 1990s, Russia was officially recognized to have organized crime.

Banditry

Robbery

Blackmail: A crime involving the threat of disclosing compromising information (whether true or false) in order to obtain certain benefits.

One of the ways of blackmailing is anonymous phone calls. They can be extremely unpleasant, not only because of the nature of the call itself, yet also because the victim usually does not know who is calling or where the call is coming from. Anonymous calls can be obscene, threatening, insulting, or just annoying. They can also constitute criminal acts.

Actions During Anonymous Telephone Calls:

- 1) _____

- 2) _____
- 3) _____
- 4) _____
- 5) _____
- 6) _____
- 7) _____
- 8) _____
- 9) _____

Fraud, Extortion, Theft, and Robbery –

Extortion, theft, and robbery are more likely to occur on the street, although the danger exists both at home and elsewhere. It is important to know that a typical robber tends to target easier victims (children, teenagers, women, the disabled, etc.).

As a rule, by giving up what is yours without argument, you reduce the risk of bodily harm, and a concession may save you from further violence. However, submission to extortion does not guarantee a reduction in this risk.

List self-defense rules in critical situations, which may be the only chance to get out of a critical situation:

- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____
- 6) _____
- 7) _____
- 8) _____
- 9) _____

Assault in a car. A personal car may be a relatively safe type of transport – no need to walk home late at night or remember not to miss the last bus or train. However, driving a car implies certain risks and requires basic caution measures:

- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____
- 6) _____
- 7) _____
- 8) _____
- 9) _____

Principles of Safe Car Travel.

- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____
- 6) _____
- 7) _____
- 8) _____
- 9) _____

Assaults on Public Transport.

- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____

Racketeering is considered to be a form of organized crime. Today, crime poses a real threat to national security.

Terrorism is a method by which an organized group or party seeks to achieve its declared goals through the systematic use of violence. Terrorist acts such as bombings and arson of shops, train stations, hostage-taking, hijacking of airplanes, etc. are used to create fear.

To prevent a possible act of terror:

- 1) _____
- 2) _____
- 3) _____
- 4) _____

Behavior rules when a group of people is taken hostages by terrorists:

- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____
- 6) _____
- 7) _____
- 8) _____
- 9) _____

Actions During a Firefight / Crossfire

Actions During Aircraft (or Bus) Hijacking

Avoiding Conflict

Confidence is a specific type of behavior that helps a person express their feelings, needs, and desires in a clear and understandable way. Confidence is the opposite of passive behavior, where communication is often lost in vague or indecisive actions.

Confident behavior does not leave room for misunderstandings.

Protection Against Armed Attack. In the event of the use of weapons, such as firearms, surrender should be preferred to resistance, unless it puts the victim in an even more dangerous situation. Surrender should never be considered a sign of cowardice. Remember: property can be bought, but life cannot.

A guideline for handling such situations:

3. Move cautiously by crawling behind cover
4. Provide first aid to the wounded after the shooting subsides
5. Call an ambulance and the police (providing the incident address and your full name)
6. Remain at the site of the firefight until the police arrive

Fill in the table below

#	Criminogenic Situation	Safe Conduct Rules
1.	Unfamiliar persons ask you to watch their bags.	
2.	Someone rings your doorbell, introducing themselves as a plumber or electrician, and asks to be let in.	
3.	You are waiting for public transport late at night at a deserted stop.	
4.	Returning home late at night, you notice an unfamiliar vehicle following you.	
5.	While you are waiting for public transport with a (girl)friend, strangers begin to harass you.	

Practical Class 5.1.1

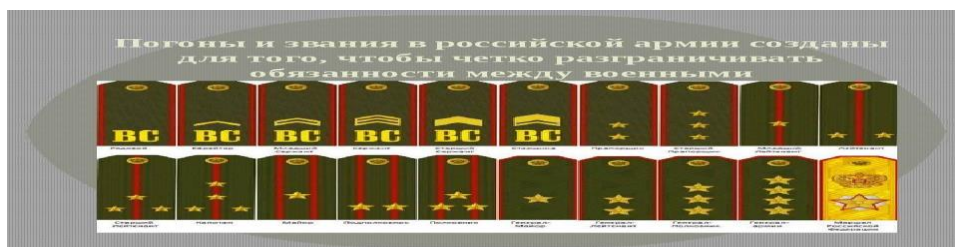
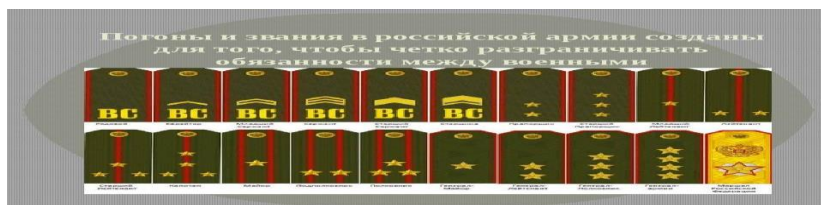
Topic: Fundamentals of Military-Political Work in the Armed Forces of the Russian Federation: Goals, Tasks, Directions, and Forms of Military-Political Work. Military Education. Military Courtesy: Genesis and Modernity. Military Discipline. Responsibility of Service Members and Its Types. The Principle of Single Command (Unity of Command). Commanders and Subordinates. Seniors and Juniors. Orders and Directives. Procedure for Issuing and Executing Orders. Military Ranks. Military Rituals and Holidays.

Aim

1. To shape students' firm understanding regarding the fundamentals of military-political work in the Armed Forces of the Russian Federation.
2. To shape students' firm understanding regarding the requirements of the General Military Regulations concerning personal training/education and the enhancement of military discipline.

Tasks

1. List the tasks of military-political education.
2. Mention the main goal of military education.
3. How is military discipline achieved?
4. What are the types of responsibility of service members?
5. What is the idea of Single Command (Unity of Command)?
6. What is the difference between an order and a directive?
7. Identify (write) the military ranks on the shoulder boards.



8. List the main military rituals established in the general military regulations of the Armed Forces of the RF.
9. Solve the situational tasks below.

TASK # 1

A service member on leave committed an administrative offense involving a breach of public order, for which he was detained by police officers and subjected to administrative arrest. Are such actions against the service member lawful?

Answer: Unlawful. For administrative offenses, service members bear disciplinary responsibility in accordance with the Disciplinary Regulations of the Armed Forces of the Russian Federation, except for specific offenses for which they bear responsibility on general grounds. However, administrative punishments in the form of administrative arrest or corrective labor cannot be applied to service members.

TASK # 2

For causing material damage, the unit commander issued an order for its reimbursement by the guilty service member. Additionally, the service member was brought to disciplinary liability. Were the service member's rights violated?

Answer: Not violated. According to Article 29 of the Internal Service Regulations (ISR), in the event of an offense causing material damage, service members reimburse the damage regardless of being brought to other forms of liability or the application of public influence measures.

TASK #3

While on leave, Private Sidorov received a reprimand from Senior Sergeant Klimov regarding a uniform violation, but refused to correct it, arguing that he does not belong to the same unit as Klimov and therefore Klimov is not his superior. Are Private Sidorov's actions lawful? Why?

Answer: Unlawful. According to Article 34 of the ISR, seniors in military rank have the right to make reprimands to juniors in military rank and demand compliance with military discipline, public order, proper dress code, as well as rules of conduct and military saluting. Juniors in rank are obliged to strictly comply with these demands of seniors.

TASK # 4

Squad Leader Junior Sergeant Ivanov assigned a task to Private Egorov. Unexpectedly, Ivanov was called over by the Platoon Commander. After executing the instruction, Private Egorov approached Junior Sergeant Ivanov, who was conversing with the Platoon Commander, to report on the execution. What should his actions be in this situation?

Answer: According to Article 66 of the ISR, when addressing another service member in the presence of a commander (superior) or senior, it is necessary to ask permission from that commander (superior) or senior beforehand.

TASK # 5

During a break in the smoking area, unit officers gathered. Private Mikhailov approached, pulled out a cigarette, and lit it while keeping his hand in his pocket. How correct are his actions?

Answer: Incorrect. According to Article 68 of the ISR, a service member is forbidden to keep hands in pockets, as well as to sit or smoke in the presence of a superior or senior without their permission. Thus, Private Mikhailov was required to ask permission from the superior/senior to remain in the area and to smoke.

TASK # 6

Service Member N received an order from his squad leader, and while executing it, received a new order from the platoon commander. What actions should Service Member N take in this case?

Answer: According to Article 45 of the ISR, if a service member executing an order receives a new order from a senior commander (superior) that prevents the execution of the first, he reports this to the superior who issued the new order. If the new order is reconfirmed, he executes it. The superior issuing the new order then notifies the superior who issued the first order.

TASK # 7

Service Member S, after receiving an order from the company commander, began discussing the expediency of its execution. Does he have the right to do so?

Answer: Does not have the right. According to Article 45 of the ISR, orders are given to be executed, not discussed. A subordinate has no right to evaluate or debate an order.

10. List the military rituals illustrated in the photographs:



РИТУАЛЫ ВС РФ

Ритуал – это торжественный или особый официальный акт, при проведении, которого установлен определенный порядок – церемониал. Ритуалы, проводимые в Вооруженных Силах Российской Федерации, концентрируют в себе высокие, благородные идеалы защиты Отечества, верности воинскому долгу, Военной присяге, Боевому Знамени части.



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Practical Class 5.2.1

Topic: Field Stripping and Reassembly of Small Arms. Loading the Kalashnikov Assault Rifle Magazine.

Outline:

1. Procedure for field stripping and reassembly of the assault rifle.
2. Conditions for completing performance standards for field stripping and reassembly of the assault rifle.
3. Procedure for field stripping and reassembly of the Makarov Pistol (PM).
4. Conditions for completing performance standards for field stripping and reassembly of the PM.

Rules for Field Stripping and Full Stripping:

Field stripping (incomplete disassembly): Used for cleaning, lubrication, and inspection of the rifle.

Full stripping: Used for cleaning when heavily fouled, after exposure to rain or snow, when changing to a new lubricant, or during repairs.

Excessive disassembly is harmful as it accelerates wear and tear on parts and mechanisms. Disassembly and assembly must be performed on a clean table or mat; parts must be laid out in order of removal, handled carefully, and not stacked on top of one another. When reassembling, verify matching serial numbers on major components.

Disassembly and assembly using battle guns shall be allowed only in exceptional cases with special caution measures taken.

1. Procedure for Field Stripping the Assault Rifle

Detach the magazine: Holding the rifle with the left hand by the neck of the stock or handguard, grasp the magazine with the right hand; pressing the release latch with the thumb, push the bottom of the magazine forward and detach it.

Check the chamber: Lower the selector lever, pull the bolt carrier handle back, inspect the chamber to ensure no round is loaded, release the bolt carrier, and press the trigger (dry fire).



Remove the cleaning kit container from the buttstock: Depress the trapdoor on the buttplate to release the container, open it, and extract the tools (cleaning rod head/jag, brush, screwdriver, punch, pin).

Detach the cleaning rod: Pull the end of the cleaning rod away from the barrel so its head clears the stop on the front sight base, and pull it upward/outward.



Detach the muzzle brake-compensator: Depress the locking pin using a screwdriver and unscrew the muzzle brake counterclockwise from the barrel threads.

Detach the receiver cover: Holding the stock neck with the left hand, depress the recoil mechanism guide rod lug with the left thumb, raise the rear end of the receiver cover with the right hand, and remove it.



Detach the recoil mechanism: Push the guide rod forward until its heel exits the longitudinal slot of the receiver, raise the rear end, and extract it from the bolt carrier channel.



Detach the bolt carrier with bolt: Pull the bolt carrier fully to the rear, lift its rear portion, and remove it from the receiver.



Detach the bolt from the bolt carrier: Hold the bolt carrier in the left hand with the bolt facing up; rotate and slide the bolt backward so its guide lug exits the cam slot, then pull it forward and out.



Detach the gas tube with handguard: Using the rectangular opening of the cleaning kit container, rotate the gas tube lock lever upward to a vertical position, then lift the gas tube off the gas block pipe.



2. Procedure for Reassembling the Assault Rifle After Field Stripping

Attach the gas tube with handguard: Push the front end onto the gas block pipe and press the rear end down onto the barrel; rotate the lock lever downward until its catch engages the notch on the sight block.

Attach the bolt to the bolt carrier: Insert the cylindrical end of the bolt into the carrier channel, rotate it so the guide lug enters the cam slot, and push it forward.

Attach the bolt carrier with bolt to the receiver: Hold the bolt in its forwardmost position with the thumb, guide the gas piston into the sight block cavity, align the carrier guide grooves with the receiver rails, press down lightly, and push forward.

Attach the recoil mechanism: Insert the spring assembly into the bolt carrier channel, compress the spring, and seat the guide rod heel into the receiver slot.

Attach the receiver cover: Insert the front end into the notch at the sight block and press the rear end downward and forward until the recoil rod lug snaps into the opening.

Release the hammer and engage safety: Pull the trigger (dry fire) and raise the selector lever all the way up.

Attach the muzzle brake-compensator: Screw it clockwise onto the muzzle threads until fully seated and locked by the pin.

Attach the cleaning rod: Insert it into its guide hole under the barrel until secured by the front sight base catch.

Insert the cleaning kit into the buttstock: Stow tools in the container, cap it, and insert it base-first into the stock compartment until the trapdoor closes.



Attach the magazine: Insert the front lug of the magazine into the receiver well and pivot the magazine rearward until the catch snaps securely into place.

Loading the Magazine with Cartridges and Loading the Weapon

1. Loading the magazine in the conventional manner

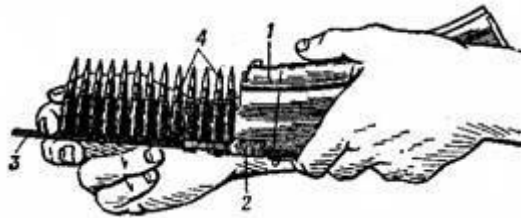
To load the magazine, hold it in your left hand with the feed neck pointing up and the convex side to the left, and hold the cartridges in your right hand with the bullets toward your pinky finger so that the case base slightly projects above the thumb and index finger. Holding the magazine with a slight left tilt, push the cartridges one by one under the feed lips with thumb pressure, base of the cartridge case facing the rear wall of the magazine.



2. Loading the magazine from a stripper clip

To load the magazine with cartridges from a stripper clip, you must: hold the magazine (1) in the left hand. Using the right hand, attach the adapter (2) to it so that its feed lips enter the corresponding grooves on the magazine neck; holding the magazine in the left hand, use the right

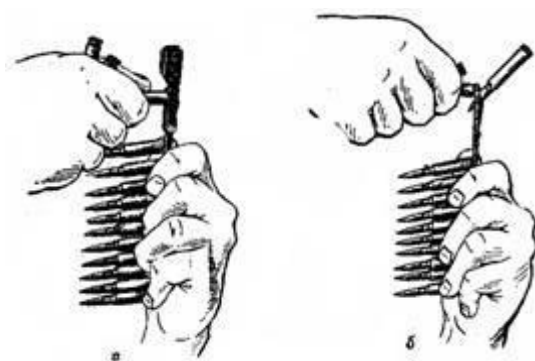
hand to insert the stripper clip (3) with cartridges (4) into the adapter, while the cartridges must be pointed with bullets facing up; pressing with the index finger of the right hand on the cartridge case body (near the base) of the top cartridge and passing the clip between the middle and index fingers, seat the cartridges down into the magazine; remove the empty stripper clip from the adapter, insert a new clip with cartridges, and complete loading the magazine; remove the adapter from the magazine. Using a stripper clip accelerates magazine loading with cartridges.



Loading the magazine with cartridges from a stripper clip: 1 – magazine; 2 – adapter; 3 – stripper clip; 4 – cartridges

3. Loading the stripper clip with cartridges

To load the stripper clip with cartridges, insert it into the adapter so that it enters the adapter grooves and rests against its stop (Fig. a). Holding the stripper clip with the attached adapter in the left hand, use the right hand to hold the cartridge by the bullet and the upper portion of the case with three fingers (thumb, index, and middle), inserting it into the grooves of the stripper clip. The stripper clip can also be loaded with cartridges without an adapter; to do this, take the stripper clip in the left hand and the cartridge in the right hand; pressing on the spring catch, insert the bullet between the clip and the spring (depressing the catch); insert cartridges into the clip grooves (Fig. b); withdraw the cartridge bullet from under the clip spring.



Loading the stripper clip with cartridges: a – with adapter; b – without adapter

4. Loading the automatic rifle

Upon the command Load or independently, the shooter must remove a loaded magazine from the pouch and attach it to the rifle. In doing so, holding the rifle with the left hand by the handguard, turn it so that the charging handle is facing upward. After that, using the right hand, insert the

upper front part of the magazine as deep as possible into the receiver port and vigorously rotate the magazine toward yourself to the limit until a click is heard, indicating that the magazine latch has engaged behind its locking lug. Disengage the safety selector and set the selector switch to semi-automatic (full-automatic) fire. Pull the charging handle all the way back and release it sharply.

Training in Standards 7 and 8

STAN DARD #.	NAME OF STANDARD	CONDITIONS (PROCEDURE) FOR EXECUTION OF STANDARD	TYPE OF WEAPON	TIME RATING		
				EXC	GOOD	SAT
7.	Field stripping of weapon	Weapon on mat, tool kit at the ready. Trainee is positioned at the weapon. Standard is executed by one trainee. Time is measured from the command Proceed to field stripping of weapon until the trainee's report Ready.	Automatic Rifle	15 s	17 s	19 s
8.	Assembly of weapon after field stripping	Weapon is field-stripped. Parts and mechanisms are neatly laid out on the mat, tool kit at the ready. Trainee is positioned at the weapon. Standard is executed by one trainee. Time is measured from the command Proceed to assembly until the trainee's report Ready.	Automatic Rifle	25 s	27 s	32 s

When evaluating the performance of the standard, the instructor, in addition to the requirements set forth in the execution conditions of the standard, shall be guided by the following additional requirements:

1. If the standard is executed several times during a training session, the grade for its performance is determined by the last demonstrated result or by the result of a control attempt.
2. A standard is considered executed if the conditions of its execution were met and no violations of regulations, manuals, instructions, directives, and safety measures were committed.
3. If, during the execution of the standard, the trainee makes at least one error that could lead to injury (casualty) of personnel or damage to equipment, the execution of the standard is stopped and evaluated as unsatisfactory.
4. For a violation of the execution sequence of the standard that does not result in equipment damage, as well as for each error specified in the execution conditions of the standard (in the manual or regulations), the evaluation grade is reduced by one point.

5. When executing standards while wearing a protective mask, the time limit is increased by 10%.
6. When executing standards at ambient temperatures of -20°C and below, +30°C and above, during heavy rain or snowfall, the time limit for standard execution increases by up to 20%, and during night operations, if procedures for night conditions are not defined, it increases by up to 30%.
7. Standard execution time is measured with a stopwatch from the moment the command Proceed to execution of standard (or another established command/signal) is given until the completion of the standard or the trainee's report of its completion.
8. The individual evaluation grade for a serviceman executing several standards is determined by the grades obtained for each standard, and is considered:

EXCELLENT	if at least half of the tested standards are executed with an excellent grade, and the rest with good
GOOD	if at least half of the tested standards are executed with a grade no lower than good, and the rest with satisfactory
SATISFACTORY	if at least 70% of the standards are rated positively, and when evaluated on three standards, two are passed

Field Stripping and Assembly of the Makarov Pistol

Disassembly of the pistol can be complete or field stripping (incomplete). Field stripping is performed for cleaning, lubrication, and inspection of the pistol; complete disassembly is performed for cleaning in cases of severe contamination, after exposure to rain or snow, when transitioning to a new lubricant, as well as during repair.

Frequent complete disassembly of the pistol is not permitted, as it accelerates the wear of parts and mechanisms.

When disassembling and assembling the pistol, the following rules must be observed:

- perform disassembly and assembly on a table or bench, and in the field, on a clean cloth mat;
- lay out parts and mechanisms in the order of disassembly, handle them carefully, and avoid excessive force or sharp impacts;
- during assembly, pay attention to the numbering of parts so as not to mix them up with parts from other pistols.

Perform field stripping of the pistol in the following order.

1) Remove the magazine from the grip frame (Fig. 3). Holding the pistol by the grip with your right hand, use the left thumb to pull the magazine catch back to the limit, while simultaneously using the left index finger to pull the protruding lip of the magazine base plate, removing the magazine from the grip frame.



Fig. 3. Removing the magazine from the grip frame

Check whether there is a cartridge in the chamber; to do this, disengage the safety (move the safety lever down), retract the slide to the rear position with the left hand, lock it on the slide stop, and inspect the chamber. Pressing down on the slide stop with your right thumb, release the slide.

2) Separate the slide from the frame. Holding the pistol in your right hand by the grip, use your left hand to pull the trigger guard down (Fig. 4) and, canting it to the left, rest it against the frame so that it remains held in this position. During further disassembly, hold it in this position with the index finger of your right hand.



Fig. 4. Pulling down the trigger guard

With your left hand, retract the slide to its rearmost position and, lifting its rear end, allow it to

move forward under the tension of the recoil spring. Separate the slide from the frame (Fig. 5) and return the trigger guard to its original position.

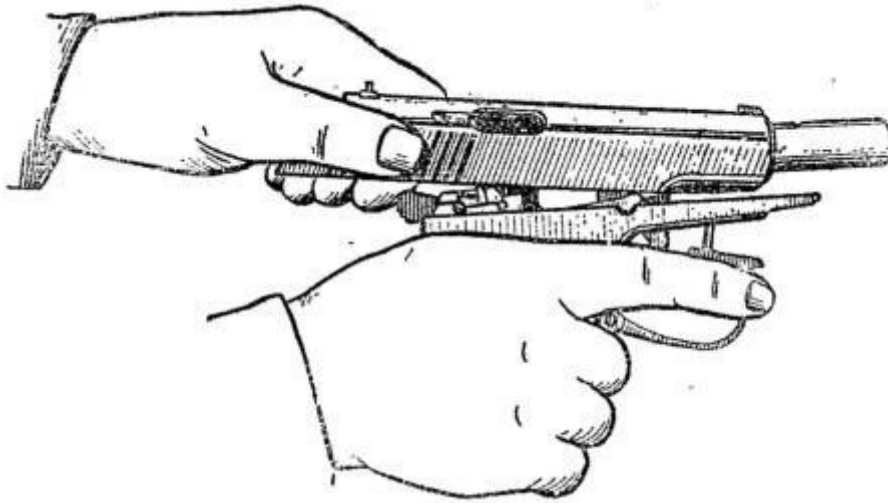


Fig. 5. Separating the slide from the frame

3) Remove the recoil spring from the barrel.

Holding the frame by the grip with your right hand and rotating the recoil spring toward yourself with your left hand, remove it from the barrel.

8. Assemble the pistol after field stripping in reverse order.

1. Install the recoil spring onto the barrel. Holding the frame by the grip in your right hand, use your left hand to install the recoil spring onto the barrel, strictly ensuring that the end with the smaller coil diameter relative to the other coils goes first.

Attach the slide to the frame. Holding the frame by the grip in your right hand and the slide in your left hand, insert the free end of the recoil spring into the slide channel (Fig. 6) and retract the slide to the rearmost position like so

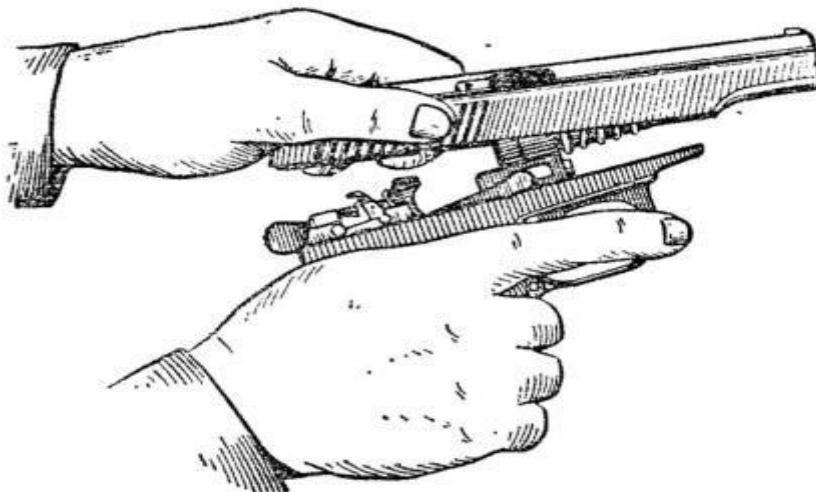


Fig. 6. Inserting the free end of the recoil spring into the slide channel

that the muzzle part of the barrel passes through the slide channel and projects outward (Fig. 7). Lower the rear end of the slide onto the frame so that the longitudinal slide rails seat into the frame grooves, and, pressing the slide against the frame, release it. Under the action of the recoil spring, the slide vigorously returns to the forward position. Engage the safety (move the safety lever up).

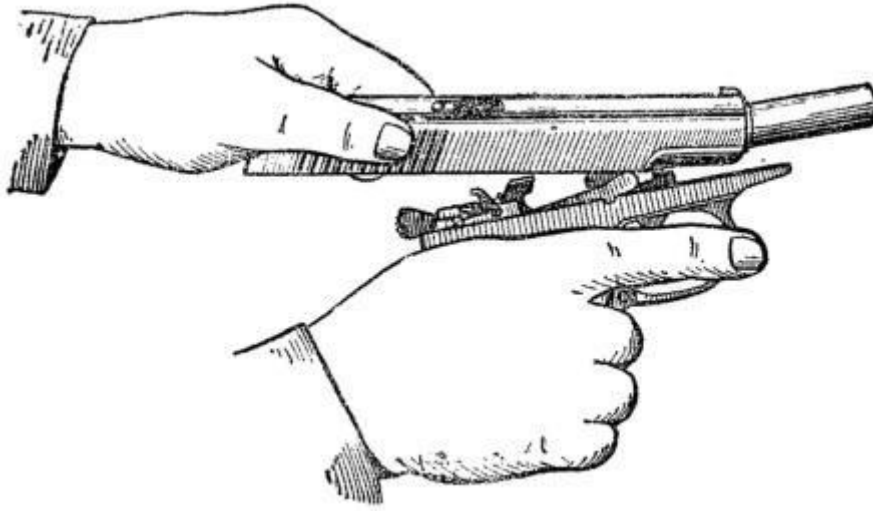


Fig. 7. Attaching the slide to the frame

Note. To attach the slide to the frame, it is not strictly necessary to pull down and cant the trigger guard. In this case, when retracting the slide to the rearmost position, it is necessary to lift its rear end up as far as it will go so that the lower front wall of the slide does not strike the lug of the trigger guard that limits the rearward movement of the slide.

3) Insert the magazine into the grip frame.

Holding the pistol in your right hand, use the thumb and index finger of your left hand to insert the magazine into the grip frame through the bottom opening of the grip frame (Fig. 8). Press on the magazine base plate with your thumb until the catch (the lower end of the mainspring) snaps over the lip on the magazine wall; a distinct click should be heard. Striking the magazine with the palm of the hand is not permitted.

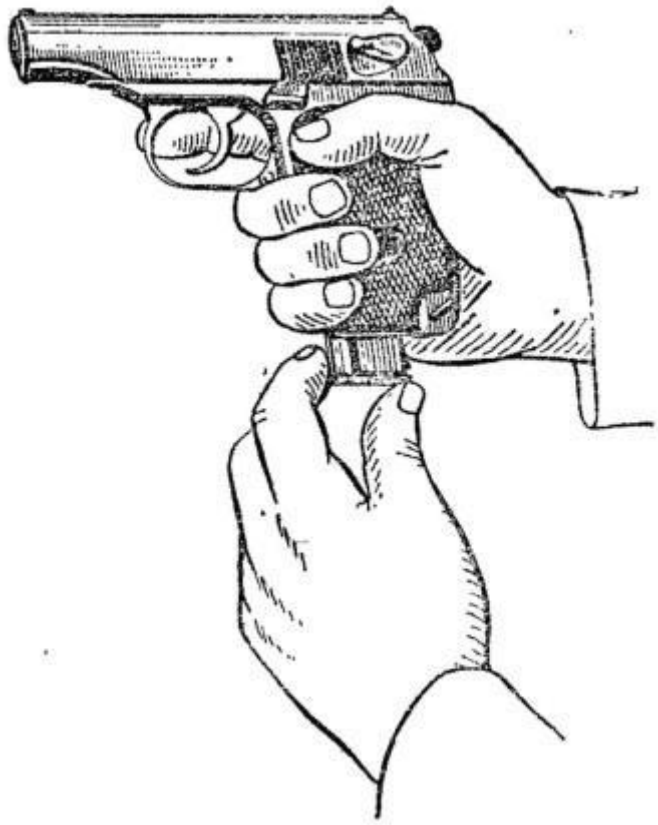


Fig. 8. Inserting the magazine into the grip frame

9. Check proper assembly of the pistol after field stripping. Disengage the safety (move the lever down). Retract the slide to the rear position and release it. The slide, after moving forward slightly, locks on the slide stop and remains in the rear position. Pressing on the slide stop with your right thumb, release the slide. Under the action of the recoil spring, the slide must vigorously return to the forward position, and the hammer must remain cocked. Engage the safety (move the lever up). The hammer must decock from the sear and lock in place.

ПОРЯДОК НЕПОЛНОЙ РАЗБОРКИ (СБОРКИ) ПИСТОЛЕТА ПМ

НЕПОЛНАЯ РАЗБОРКА ПИСТОЛЕТА



Извлечь магазин из основания рукоятки (рис.1). Удерживая пистолет за рукоятку правой рукой, большим пальцем левой руки отвести защелку магазина назад до отказа, одновременно оттягивая указательным пальцем левой руки выступающую часть крышки магазина, извлечь магазин из основания рукоятки. Проверить, нет ли в патроннике патрона, для чего выключить предохранитель, (опустить флажок вниз (рис.2), отвести левой рукой затвор в заднее положение, поставить его на затворную задержку и осмотреть патронник. Нажатием большим пальцем правой руки на затворную задержку отпустить затвор.



Отделить затвор от рамки. Взяв пистолет в правую руку за рукоятку, левой рукой оттянуть спусковую скобу вниз (рис. 3) и, перекосив ее влево, упереть в рамку так, чтобы она удерживалась в этом положении. При дальнейшей разборке удерживать ее в приданном положении указательным пальцем правой руки.



Левой рукой отвести затвор в крайнее заднее положение и, приподняв его задний конец, дать ему возможность продвинуться вперед под действием возвратной пружины. Отделить затвор от рамки (рис. 4) и поставить спусковую скобу на свое место.



Вращательным движением снять со ствола возвратную пружину (рис. 5). Удерживая рамку правой рукой за рукоятку, левой рукой отвести возвратную пружину вперед и снять со ствола.

СБОРКА ПИСТОЛЕТА ПОСЛЕ НЕПОЛНОЙ РАЗБОРКИ



Надеть на ствол возвратную пружину (рис. 6). Взяв рамку за рукоятку в правую руку, левой рукой надеть возвратную пружину на ствол обязательно тем концом, в котором крайний виток имеет меньший диаметр по сравнению с другими витками.



Присоединить затвор к рамке. Удерживая рамку за рукоятку в правой руке, а затвор в левой, ввести свободный конец возвратной пружины в канал затвора (рис. 7) и отвести затвор в крайнее заднее положение так, чтобы дульная часть ствола прошла через канал затвора и выступила наружу.



Опустить задний конец затвора на рамку так, чтобы продольные выступы затвора поместились в пазах рамки, и, прижимая затвор к рамке, отпустить его. Затвор под действием возвратной пружины энергично возвращается в переднее положение. Включить предохранитель (поднять флажок вверх).



Вернуть спусковую скобу в исходное положение (рис. 9). Вставить магазин в рукоятку (рис. 10). Удерживая пистолет в правой руке, большим и указательным пальцами левой руки вставить магазин в рукоятку через нижнее окно основания рукоятки. Нажать на крышку магазина большим пальцем так, чтобы защелка (нижний конец боевой пружины) заскочила за выступ на стенке магазина; при этом должен произойти щелчок. Удары по магазину ладонью не допускаются.



Проверить правильность сборки пистолета после неполной разборки. Выключить предохранитель (опустить флажок вниз). Отвести затвор в заднее положение и отпустить его. Затвор, продвинувшись несколько вперед, под действием затворной задержки должен остаться в заднем положении. Нажать на кнопку затворной задержки. Затвор, под действием возвратной пружины должен энергично возвратиться в переднее положение, а курок должен стоять на боевом взводе. Включить предохранитель (поднять флажок вверх (рис. 10). Курок должен сорваться с боевого взвода.

(notes for the image above)

PROCEDURE FOR FIELD STRIPPING AND ASSEMBLY OF THE MAKAROV PISTOL (PM)

FIELD STRIPPING OF THE PISTOL

1. Remove the magazine from the base of the grip (Fig. 1). Holding the pistol by the grip with your right hand, use your left thumb to pull the magazine catch back as far as it will go while simultaneously using your left index finger to pull the protruding lip of the magazine base plate, removing the magazine from the base of the grip. Check whether there is a cartridge in the chamber; to do this, disengage the safety (move the safety lever down) (Fig. 2), retract the slide to the rear position with your left hand, lock it on the slide stop, and inspect the chamber. Pressing down on the slide stop with your right thumb, release the slide.
2. Separate the slide from the frame. Holding the pistol in your right hand by the grip, use your left hand to pull the trigger guard down (Fig. 3) and, canting it to the left, rest it against the frame so that it remains held in this position. During further disassembly, hold it in this position with the index finger of your right hand.
3. With your left hand, retract the slide to its rearmost position and, lifting its rear end, allow it to move forward under the action of the recoil spring. Separate the slide from the frame (Fig. 4) and return the trigger guard to its original position.
4. Rotating the recoil spring, remove it from the barrel (Fig. 5). Holding the frame by the grip with your right hand, use your left hand to rotate and remove the recoil spring forward and off the barrel.

Assembly of the Pistol After Field Stripping

5. Install the recoil spring onto the barrel (Fig. 6). Holding the frame by the grip in your right hand, use your left hand to install the recoil spring onto the barrel, strictly ensuring that the end with the smaller coil diameter relative to the other coils goes first.
6. Attach the slide to the frame. Holding the frame by the grip in your right hand and the slide in your left hand, insert the free end of the recoil spring into the slide channel (Fig. 7) and retract the slide to the rearmost position so that the muzzle part of the barrel passes through the slide channel and projects outward.
7. Lower the rear end of the slide onto the frame so that the longitudinal slide rails seat into the frame grooves, and, pressing the slide against the frame, release it. Under the action of the recoil spring, the slide vigorously returns to the forward position. Engage the safety (move the safety lever up).
8. Return the trigger guard to its original position (Fig. 9). Insert the magazine into the grip (Fig. 10). Holding the pistol in your right hand, use the thumb and index finger of your left hand to insert the magazine into the grip through the bottom opening of the grip base. Press on the magazine base plate with your thumb until the catch (the lower end of the mainspring) snaps over the lip on the magazine wall; a distinct click should be heard. Striking the magazine with the palm of the hand is not permitted.

Check proper assembly of the pistol after field stripping. Disengage the safety (move the safety lever down). Retract the slide to the rear position and release it. The slide, after moving forward slightly, locks on the slide stop and remains in the rear position. Pressing on the slide stop button with your right thumb, release the slide. Under the action of the recoil spring, the slide must vigorously return to the forward position, and the hammer must remain cocked. Engage the safety (move the safety lever up) (Fig. 10). The hammer must decock from the sear.

Makarov Pistol			
#	Name of Standard	Time Rating (sec)	
		Satisfactory	Unsatisfactory
1	2	3	4
2.	Field stripping of the pistol. Conditions (procedure) for execution of standard: weapon on the table; trainee is positioned at the weapon. Procedure for field stripping of the pistol: – remove the magazine from the base of the grip; – check whether there is a cartridge in the chamber; to do this, disengage the safety (move the safety lever down), retract the slide to the rear position, lock it on the slide stop, and inspect the chamber; after that, pressing down on the slide stop with the thumb, release the slide; – separate the slide from the frame; to do this, pull the trigger guard down, canting it to the left (right), rest it against the frame, then retract the slide to its rearmost position, lifting its rear end, move it forward, removing it from the barrel, and return the trigger guard to its original position; – remove the recoil spring from the barrel. Parts of the pistol must be laid out on the table in the sequence of disassembly. Throwing pistol parts is prohibited.	no more than 8	in all other cases
3.	Assembly of the pistol after field stripping. Conditions (procedure) for execution of standard: weapon is field-stripped; parts and mechanisms are neatly laid out on the table; trainee is positioned at the weapon. Procedure for assembly of the pistol after field stripping: – install the recoil spring onto the barrel; – attach the slide to the frame; to do this, holding the frame, pull the trigger guard down, canting it to the left (right), rest the trigger guard against the frame, insert the free end of the recoil spring into the slide channel, and retract it to the rearmost position so that the muzzle part of the barrel passes through the slide channel and projects outward. Lower the rear end of the slide onto the frame, pressing it against the frame, release the slide, return the trigger guard to its place, engage the safety (move the safety lever up); – insert the magazine into the base of the grip; – place the weapon on the table with the safety facing up. Attaching the slide to the frame without pulling down the trigger guard is permitted.	no more than 10	in all other cases

Loading the AK magazine with cartridges is performed in the following order:

- hold the magazine in your left hand with the feed neck pointing up and the convex side to the left;
- hold the cartridges in your right hand with the bullets toward your pinky finger so that the case base slightly projects above the thumb and index finger;
- holding the magazine with a slight left tilt, push the cartridges one by one under the feed lips with thumb pressure, base of the cartridge case facing the rear wall of the magazine.

To load the magazine with cartridges from a stripper clip, you must:

- hold the magazine in the left hand;
- using the right hand, attach the adapter so that its feed lips enter the corresponding grooves on the magazine neck;
- holding the magazine in the left hand, use the right hand to insert the stripper clip with cartridges into the adapter, while the cartridges must be pointed with bullets facing up;
- pressing with the index finger of the right hand on the cartridge case body (near the base) of the top cartridge and passing the clip between the middle and index fingers, seat the cartridges down into the magazine;
- remove the empty stripper clip from the adapter, insert a new clip with cartridges, and complete loading the magazine;
- remove the adapter from the magazine.

To load the stripper clip with cartridges, you must:

- insert it into the adapter so that it enters the adapter grooves and rests against its stop;
- holding the stripper clip with the attached adapter in the left hand, use the right hand to hold the cartridge by the bullet and the upper portion of the case with three fingers (thumb, index, and middle), inserting it into the grooves of the stripper clip.

The stripper clip can also be loaded with cartridges without an adapter; to do this, take the stripper clip in the left hand and the cartridge in the right hand; pressing on the spring catch, insert the bullet between the clip and the spring (depressing the catch); insert cartridges into the clip grooves; withdraw the cartridge bullet from under the clip spring.

Loading the magazine with cartridges: hold the magazine in the left hand with the feed neck pointing up and the convex side to the left, and hold the cartridges in the right hand with the bullets toward your pinky finger so that the case base slightly projects above the thumb and index finger. Holding the magazine with a slight left tilt, push the cartridges one by one under the feed lips with thumb pressure (Fig. 62), base of the cartridge case facing the rear wall of the magazine.

Для снаряжения магазина патронами надо взять магазин в левую руку горловиной вверх и выпуклой стороной влево, а в правую руку — патроны пулями к мизинцу так, чтобы дно гильзы немного возвышалось над большим и указательным пальцами. Удерживая магазин с небольшим наклоном влево, нажимом большого пальца (рис. 62) вкладывать патроны по одному под загибы боковых стенок дном гильзы к задней стенке магазина.

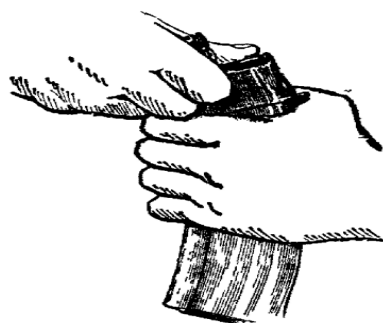


Рис. 62. Снаряжение магазина патронами

Fig. 62. Loading the magazine with cartridges

Questions for Reviewing the Covered Material:

1. Procedure for field stripping and assembly of the automatic rifle.
2. Conditions for executing standards for field stripping and assembly of the automatic rifle.
3. Procedure for field stripping and assembly of the Makarov pistol.
4. Conditions for executing standards for field stripping and assembly of the PM.

List of References (for the Teacher)

1. References: Life Safety: textbook / V. Yu. Mikryukov. – M.: KNORUS, 2019. – 282 p. – (Secondary Vocational Education).
2. <https://www.consultant.ru/>
3. <https://www.youtube.com/watch?v=oeGD6ja2pus>

Practical Class 5.2.2.

Topic: Firing Positions for Small Arms Firing, Safety Requirements

Outline:

1. Fundamentals of small arms marksmanship.
2. Rules of small arms marksmanship.
3. Taking a position for small arms shooting.
4. Conditions for executing standards for field stripping and assembly of the PM.

Fundamentals of Small Arms Marksmanship

Fundamentals of marksmanship include theoretical principles, knowledge of which is necessary for a conscious and deep study of matters related to the design and care of weapons.

A shot is the discharge of a bullet from the bore of a barrel under the action of powder gases formed during the combustion of the propellant charge. The impact of the firing pin on the primer ignites the powder charge. This produces a large quantity of highly heated gases, creating high pressure that acts equally in all directions. At a gas pressure of 250–500 kg/cm², the bullet moves from its seat and engages the rifling of the barrel bore, acquiring a rotational motion. The powder continues to burn; consequently, the volume of gases increases. Then, due to the rapid increase in bullet speed, the space behind the bullet expands faster than the influx of new gases, and pressure begins to drop. However, the bullet velocity inside the barrel bore continues to rise, as the gases – though to a lesser degree – continue to push against it. The bullet moves along the barrel bore with continuously increasing velocity and is discharged outward in the direction of the bore axis. The entire process of the shot occurs in a very short interval of time (0.001–0.06 s). Thereafter, the flight of the bullet in the air continues by inertia and depends significantly on its initial velocity.

Muzzle velocity (initial velocity) of the bullet is the speed at which the bullet leaves the barrel bore. Muzzle velocity is one of the most important characteristics of a weapon's combat effectiveness. The higher the muzzle velocity, the further the bullet travels, the more stable it is in flight, and the greater its penetrating power. A small-caliber rifle bullet exits at a speed of 350 m/s and at a distance of 25 m penetrates an iron plate 0.2 cm thick, brickwork 2 cm thick, and pine boards 8 cm thick. A bullet from a Kalashnikov automatic rifle exits at a speed more than twice that of a small-caliber rifle bullet, which is why the penetrating power of an automatic rifle bullet – considering its greater weight – exceeds that of a small-caliber rifle bullet many times over.

The rearward movement of the weapon during a shot is called recoil. The pressure of powder gases in the barrel bore acts equally in all directions. Gas pressure on the bullet base forces it forward, while pressure on the cartridge case base is transmitted to the bolt, causing the weapon to move backward. During recoil, a force couple is formed, under the action of which the muzzle portion of the weapon

tilts upward (Fig. 49). Recoil of small arms is felt as an impulse against the shoulder, hand, or ground. The effect of weapon recoil is characterized by its speed and the energy it possesses while moving backward. The recoil velocity of the weapon is approximately as many times less than the muzzle velocity of the bullet as the bullet is lighter than the weapon. The recoil energy of a Kalashnikov automatic rifle is small and absorbed comfortably by the shooter, while that of a small-caliber rifle is virtually imperceptible. To reduce the effect of recoil on shooting accuracy, marksmanship techniques must be strictly observed.



Fig. 49. Recoil

Recoil force

Recoil resistance force

The curved line described by the center of gravity of the bullet during its flight through the air is called the trajectory (Fig. 50). At the moment of firing, the weapon barrel occupies a specific position depending on the angle of elevation. Bullet flight in the air begins along a straight line representing the extension of the barrel bore axis at the moment the bullet exits. This line is called the line of departure. During flight through the air, two forces act upon the bullet: gravity and air resistance. Gravity increasingly pulls the bullet downward from the line of departure, while air resistance slows the bullet's movement. Under the action of these two forces, the bullet continues its flight along a curve situated below the line of departure. The shape of the trajectory depends on the elevation angle and muzzle velocity of the bullet; it affects the maximum point-blank range, covered space, beaten zone, and dead space. With an increase in elevation angle, the trajectory height and total horizontal range of the bullet increase, but only up to a certain limit. Beyond this limit, trajectory height continues to rise while total horizontal range decreases.



Рис. 50. Траектория полёта пули

Fig. 50. Bullet Flight Trajectory

Line of departure

Line of elevation

Direction of gravity force

Direction of air resistance force

Point of departure

Trajectory

Angle of elevation

The elevation angle at which the total horizontal range of the bullet reaches its maximum is called the angle of maximum range. The magnitude of the angle of maximum range for bullets of various types of weapons is approximately 35° .

Trajectories obtained at elevation angles smaller than the angle of maximum range are called flat trajectories.

A point-blank shot (direct shot) is a shot during which the bullet trajectory does not rise above the line of sight over the target throughout its entire extent (Fig. 51). Point-blank range depends on target height and trajectory flatness. The taller the target and the flatter the trajectory, the greater the point-blank range and, consequently, the distance at which a target can be engaged with a single sight setting. The practical significance of a point-blank shot lies in the fact that during intense moments of combat, firing can be conducted without adjusting the sight, with the vertical aiming point selected at the lower edge of the target.

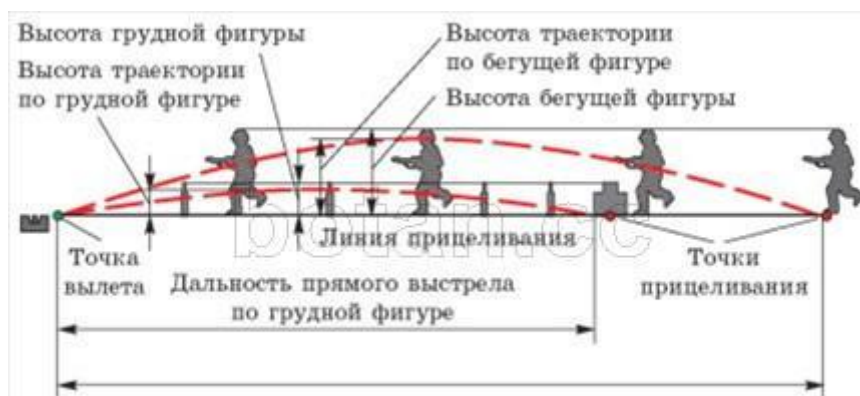


Рис. 51. Прямой выстрел

Fig. 51. Point-Blank Shot

Height of chest silhouette

Trajectory height for chest silhouette

Trajectory height for running silhouette

Height of running silhouette

Point of departure

Point-blank range for chest silhouette

Line of sight

Aiming points

The space behind an impenetrable cover, extending from its crest to the point of impact, is called covered space (Fig. 52). Covered space is larger when the cover is higher and the trajectory is flatter. The portion of covered space where a target cannot be hit by a given trajectory is called dead space (unbeaten space). It increases with higher cover, lower target height, and flatter trajectory. The remaining portion of covered space where the target can be hit constitutes the beaten zone (dangerous zone).



Fig. 52. Covered Space, Beaten Zone, and Dead Space

Trajectory

Cover

Dead space

Beaten zone

Point of impact

Covered space

Techniques and Rules of Small Arms Marksmanship

Firing an automatic rifle consists of taking a firing position, executing the shot (firing), and ceasing fire.

Taking a firing position includes adopting a body position for shooting and loading the automatic rifle. When firing from a stationary position, the rifleman adopts a standing, kneeling, or prone firing position, depending on terrain conditions and enemy fire. On the move, the rifleman can fire without stopping or with a short stop. Taking a firing position is performed upon command of the commander or independently. Guided by general rules for executing marksmanship techniques and taking into account individual physical traits, each rifleman develops and applies the most advantageous and

stable firing positions, achieving consistent positioning of the head, torso, arms, and legs.

Executing fire includes setting the sight, setting the selector switch to the required firing mode, mounting the weapon, aiming, pressing the trigger, and holding the automatic rifle during fire. Depending on the task assigned and the tactical situation, fire is conducted upon command of the commander or independently. In a fire command, the target, sight setting, and aiming point are usually specified, as well as who is to fire. When firing at targets at ranges up to 300 m, sight setting and aiming point may be omitted.

When firing in bursts, the rifle buttstock must be held firmly against the shoulder without altering elbow placement, maintaining a level front sight alignment below the chosen aiming point. When firing from a prone position, resting the automatic rifle on its magazine against the ground is permitted.

Depending on the situation, ceasing fire can be temporary or complete. For temporary cessation of fire, the command Cease fire or Halt is given. Upon these commands, the rifleman releases the trigger, engages the safety, and, if necessary, changes the magazine. For complete cessation of fire after the command Cease fire or Halt, the command Unload is given. Upon this command, the rifleman engages the safety, sets the sight to P (battle sight), and unloads the automatic rifle.

The sight setting and aiming point are chosen by the rifleman so that during firing, the mean trajectory passes through the center of the target. When firing at ranges up to 300 m, fire should generally be conducted with a sight setting of 3 or P, aiming at the lower edge of the target or at the center if the target is tall.

When firing at ranges exceeding 300 m, the sight is set according to the distance to the target, rounded to the nearest hundred meters. As a rule, the center of the target is taken as the aiming point. If tactical conditions do not allow changing the sight setting based on target distance, fire should be conducted within point-blank range using the P sight setting, aiming at the lower edge of the target.

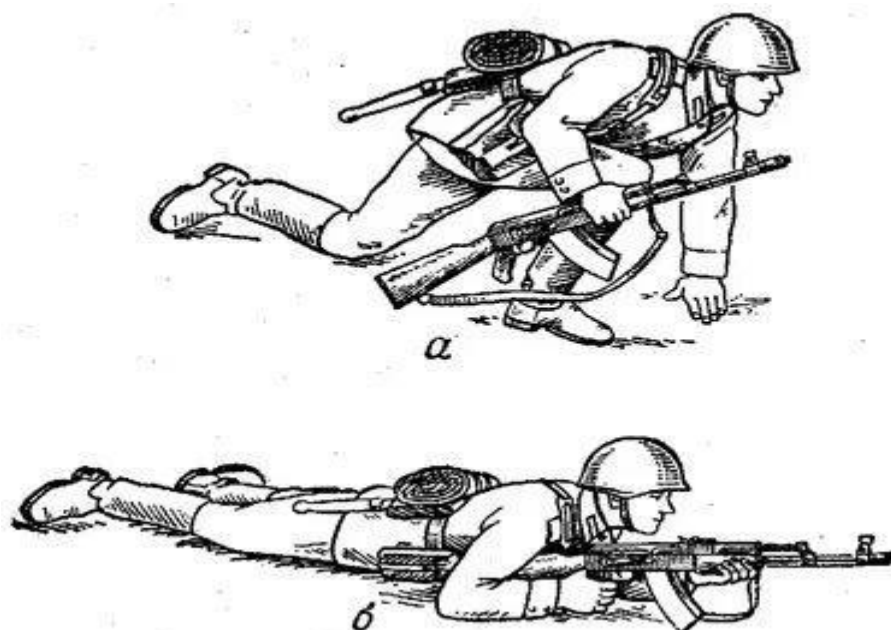
Preparing for Small Arms Firing

An automatic rifleman prepares for firing upon command or independently. During training exercises, the command to prepare for firing may be given separately, for example: **To the firing line, MARCH!** and then **LOAD!** If necessary, the firing position is specified prior to the command Load. Preparing for firing includes assuming the firing position and loading the automatic rifle.

Assuming the Prone Firing Position

If the automatic rifle is carried slung over the shoulder (sling arms), slide the right hand up the sling slightly; as the weapon is removed from the shoulder, catch it with the left hand by the trigger guard and receiver. Next, grasp the receiver cover and handguard with the right hand, muzzle pointing forward. Simultaneously, take a full step forward and slightly to the right with the right foot. Leaning

forward, lower onto the left knee and place the left hand on the ground in front of yourself, fingers pointing to the right. Then, leaning sequentially on the left thigh and left forearm, lie on your left side and quickly turn onto your stomach, spreading your legs slightly apart with toes turned outward; rest the handguard of the rifle on the palm of the left hand.



Sequence for assuming the prone firing position with an automatic rifle: a – rifleman supporting himself on left knee and left hand; b – rifle supported by left hand at the handguard

If the automatic rifle is in the cross-body position (port arms / across chest), first slip the sling over the head and grasp the handguard and upper handguard with the right hand, muzzle pointing forward. Thereafter, assume the prone firing position in the same manner as from the shoulder-slung position.

Assuming the Kneeling Firing Position

If the automatic rifle is carried slung over the shoulder, grasp the handguard and upper handguard with the right hand, muzzle pointing forward; simultaneously, move the right foot back, drop onto the right knee, and sit back on the right heel.

The lower left leg must remain vertical, while the thighs form an angle close to 90 degrees. Transfer the rifle handguard to the left hand, pointing the weapon toward the target.

When assuming the kneeling position with the weapon slung across the chest, the sling may remain around the neck to provide additional weapon stability during firing.



Kneeling firing position: a – without using the sling; b – using the sling

Aiming from the kneeling position should not be prolonged; take longer pauses between bursts. This is necessary because looking at the rear and front sights requires looking upward from a lowered head angle, which rapidly fatigues eye vision.

Assuming the Standing Firing Position

If the automatic rifle is carried slung over the shoulder, turn half-right relative to the target direction; without bringing the feet together, step the left foot to the left roughly shoulder-width apart (or as comfortable for the rifleman), distributing body weight evenly on both feet. Simultaneously, sliding the right hand slightly up the sling, remove the rifle from the shoulder, catch it from underneath with the left hand by the handguard and upper handguard, and thrust it vigorously forward toward the target.

When assuming the standing position with the weapon slung across the chest, the sling may remain around the neck to provide additional weapon stability during firing.



Standing firing position without using the sling / Standing firing position using the rifle sling

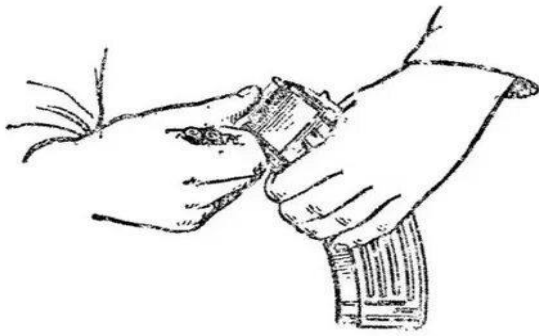
Loading the Automatic Rifle

- Attach a loaded magazine to the automatic rifle (if not previously attached).
- Disengage the safety selector.
- Set the selector lever to the required fire mode.
- Pull the charging handle fully to the rear and release it vigorously.
- Set the weapon back to safety if immediate firing is not required or if the command FIRE has not been given, then return the right hand to the pistol grip.

If the magazine was not loaded prior to preparing for firing, or if ammunition was depleted during firing, the magazine must be loaded.

Loading the Magazine

To load the magazine by hand, hold the magazine in the left hand with the feed lips pointing up and the curved side facing left. Hold cartridges in the right hand with the bullets pointing toward the pinky finger, so that the cartridge case head projects slightly above the thumb and index finger.



Loading the magazine

Holding the magazine at a slight tilt to the left, press down with the thumb to insert cartridges one by one under the feed lips, pushing the cartridge case head against the rear wall of the magazine.

Loading the Magazine Using a Stripper Clip

To load the magazine using a stripper clip: take the magazine (1) in the left hand.

Using the right hand, attach the guide adapter (2) to the magazine so that its guides fit into the corresponding grooves on the magazine feed neck. Holding the magazine in the left hand, use the right hand to insert the stripper clip (3) loaded with cartridges (4) into the adapter, ensuring bullets point upward. Press down with the right index finger on the base of the top cartridge case near the head (passing the clip between the middle and index fingers) to seat the cartridges into the magazine. Remove the empty stripper clip from the adapter, insert a new loaded clip, complete loading, and remove the adapter from the magazine. Using stripper clips speeds up magazine loading.

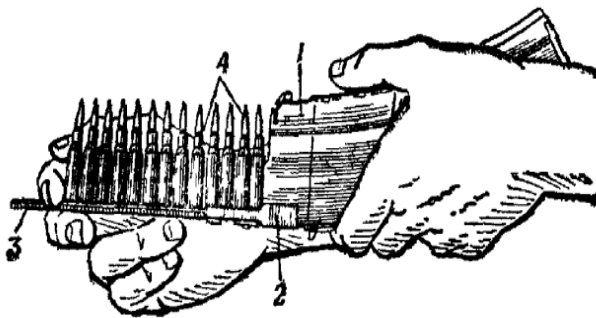


Рис. 63. Снаряжение магазина патронами из обоймы:

1 — магазин; 2 — переходник; 3 — обойма; 4 — патроны

Figure 63: Loading the magazine using a stripper clip: 1 – magazine; 2 – adapter; 3 – stripper clip; 4 – cartridges

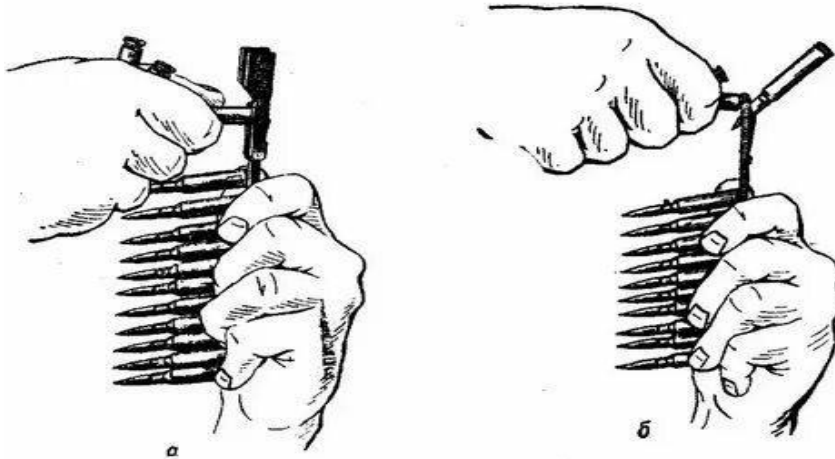
Loading the Stripper Clip

To load a stripper clip, insert it into the adapter until it fits into the adapter grooves and rests against its stop.

Holding the stripper clip with the attached adapter in the left hand, use three fingers of the right hand

(thumb, index, and middle finger) to hold the cartridge by the bullet and upper case body, then slide it into the clip grooves.

Stripper clips can also be loaded without an adapter: take the clip in the left hand and a cartridge in the right hand; press on the spring catch to insert the bullet between the clip and spring (depressing the catch); slide cartridges into the clip grooves (fig. b); then withdraw the bullet from beneath the clip spring.



Loading cartridges into a stripper clip: a – with adapter; b – without adapter

Preparing the Weapon for Firing

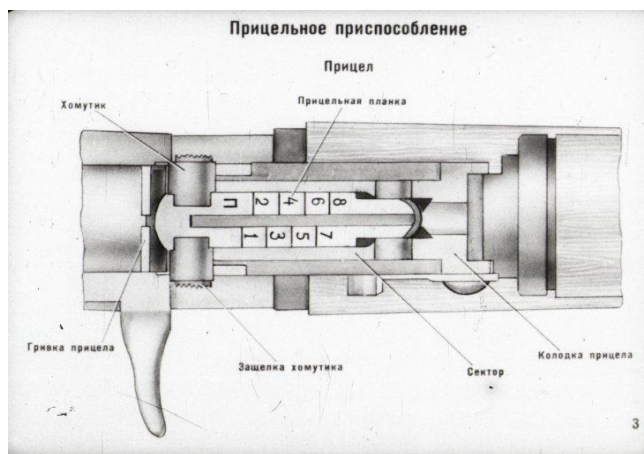
Fire is delivered on command or independently, depending on the assigned mission and tactical situation. The fire command specifies: designated shooter, target, sight setting, and aiming point. For example: **Private Smith (or Rifleman Smith), at the observer, sight four, aim bottom-center – FIRE! Squad, at the column, sight five, aim belt-line – FIRE!**

When firing at targets at ranges up to 400 meters, sight settings and aiming points may be omitted. For example: **Riflemen, at advancing infantry – FIRE!** Upon this command, the rifleman fires using sight setting 4 or P (Battle Sight), selecting the aiming point independently.

Preparation of the weapon for firing (firing procedure) includes setting the sight, setting the selector to the required fire mode, mounting the weapon (stock weld), aiming, pressing the trigger, and maintaining control during firing.

Setting the Sight

To set the sight, bring the rifle closer to you, squeeze the slide catch buttons with the thumb and index finger of the right hand, and move the sight slide until its front edge aligns with the line (graduation mark) under the corresponding number on the rear sight leaf. Given that automatic rifle fire is generally conducted at short ranges (typically within point-blank range), every shooter must be proficient in setting the sight primarily to 3 (4) or P. Setting 3 (4) is indexed by tactile clicks, while P is set by pulling the sight slide back as far as it will go.



Sighting mechanism / Rear sight / Sight slide / Sight leaf / Notch / Slide catch / Curved base / Sight base

Setting the Selector Lever

To set the selector lever to the desired mode of fire, push down on the selector lever tab with the right thumb: down to the first click for full-automatic fire (AV), or down to the second click for semi-automatic/single-shot fire (OD).

Weapon Mounting (Stock Weld)

To mount the weapon in the prone position, hold the handguard or magazine with the left hand and the pistol grip with the right hand without losing sight of the target. Firmly seat the buttstock into the shoulder pocket so that the entire buttplate contacts the shoulder snugly.

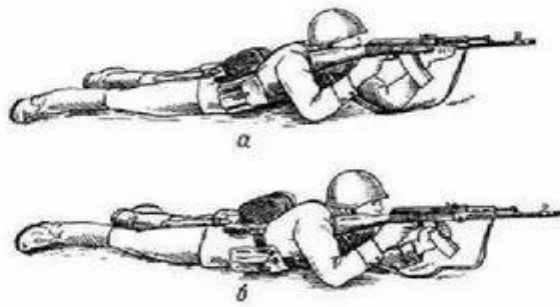
Place the first joint of the right index finger on the trigger. Tilt the head slightly forward without straining the neck, resting the right cheek against the stock.

Elbow positions:

- Rest elbows on the ground in the most comfortable position, roughly shoulder-width apart when firing prone or from a trench standing/kneeling;
- Rest the left elbow on the soft tissue of the left leg near the knee (or slightly off it) while elevating the right elbow to approximately shoulder height when firing kneeling outside a trench;
- Tuck the left elbow against the torso near the grenade pouch if supporting the weapon by the magazine, while keeping the right elbow elevated to roughly shoulder height when firing standing outside a trench.

If using the sling to stabilize the weapon during mounting, place the sling under the palm of the left hand so that it presses the hand against the handguard.

Удерживание автомата при стрельбе ЛЕЖА



а) левой рукой за цевье; б) левой рукой за магазин

Holding the automatic rifle while firing PRONE: a) left hand on handguard; b) left hand on magazine

Aiming

To aim, close the non-dominant eye and look through the rear sight notch at the front sight post with the dominant eye. Center the front sight post within the notch, leveling its tip with the top edges of the rear sight leaf (obtaining a flush sight picture). Firing with both eyes open is also permitted.

Holding your breath on the exhale, adjust elbow placement (and body/leg alignment if necessary) to align the flush sight picture with the designated point of aim, simultaneously squeezing the trigger with the first pad of the right index finger.

During aiming, ensure the rear sight leaf remains perfectly horizontal (preventing weapon cant).

104 Часть вторая. Приемы и правила стрельбы из автомата



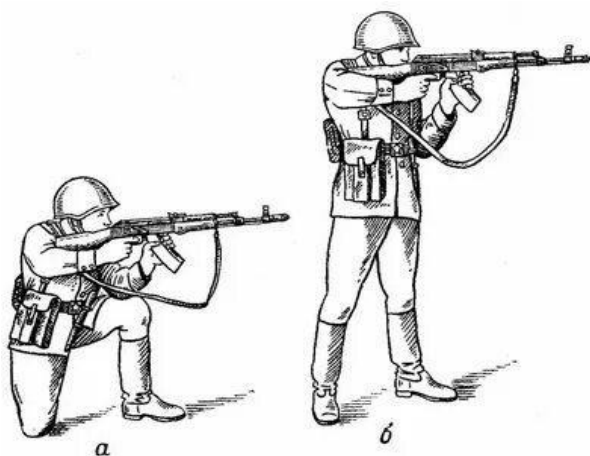
Рис. 69. Прикладка при стрельбе стоя с использованием ремня



Рис. 70. Прикладка при стрельбе с колена с использованием ремня

При прикладке для стрельбы с упором приклада в плечо и с использованием ремня для более прочного удержания автомата при стрельбе надо, если позволит длина ремня, взять автомат за цевье так, чтобы ремень проходил под кистью руки (рис. 69 и 70).

Figure 69: Stock weld when firing standing with sling / Figure 70: Stock weld when firing kneeling with sling



Mounting the automatic rifle for firing from position: a – kneeling; b – standing

Trigger Squeeze

To squeeze the trigger, firmly hold the automatic rifle with the left hand by the handguard or magazine, while pressing the weapon to the shoulder with the right hand by the pistol grip. Holding your breath, continue to smoothly press the trigger until the hammer releases from the sear unnoticeably to the shooter, i.e., until the shot occurs. The index finger is placed on the trigger with its first joint.

The trigger must be pressed smoothly and straight back. If during aiming the flush sight picture deviates significantly from the point of aim, refine the sight alignment without increasing or relaxing pressure on the trigger, then increase trigger pressure once more until the shot occurs.

When squeezing the trigger, do not attach importance to slight oscillations of the sight picture around the point of aim. Attempting to jerk the trigger at the moment of optimal sight alignment generally results in pulling the trigger and an inaccurate shot.

If the shooter, while pressing the trigger, feels unable to hold their breath any longer, they should – without increasing or decreasing finger pressure on the trigger – resume breathing, hold it again on the exhale, refine the sight alignment, and continue pressing the trigger.



Direction of pressure on the trigger

Controlling the Automatic Rifle During Firing

When firing, especially in bursts, firmly maintain the buttstock in the shoulder without changing elbow positions, keeping the flush sight picture centered under the selected point of aim. After each burst, quickly re-establish proper sight picture. When firing prone, resting the magazine on the ground is permitted. When delivering continuous fire across a wide target, smoothly traverse the flush sight picture from one flank of the target to the other.

Safety Requirements

When observing safety measures during weapons handling, three primary requirements must be kept in mind:

1. Do not point a weapon at a human being.
2. Do not chamber a round unnecessarily.
3. Never leave your weapon unattended.

These requirements can be unified into one golden rule to always remember: **Do not point, do not chamber, do not leave unattended!**

Violation of weapons handling rules incurs criminal liability.

Upon receiving (taking) a weapon, personally ensure that it is set to safety and unloaded.

To verify that there is no round in the chamber, without taking the weapon off safety, point the muzzle in a safe direction, detach the magazine (if attached), disengage the safety, pull the slide/charging handle to the rear, inspect the chamber, release the hammer from the cocked position (dry fire in a safe direction), and set the weapon back to safety. Inspect the magazines.

Pointing weapons at people is strictly prohibited, even if unloaded.

Do not take or fire someone else's weapon or a weapon whose operating rules you do not know, and do not give your weapon to anyone without permission (order) from the commander (supervisor).

Upon receiving a weapon from another person, personally check that it is set to safety.

Leaving a weapon anywhere without permission (order) from the commander (supervisor) is prohibited.

Upon receiving a weapon, ensure there are no foreign objects in the barrel bore.

Exercise extreme caution when handling weapons while moving, skiing, or traveling in vehicles, trains, or aircraft.

When boarding or disembarking a vehicle, train, or aircraft, weapons are carried in the most convenient manner.

When running, press the automatic rifle to the waist; when traveling in a vehicle, train, or aircraft, hold it between the knees with the muzzle pointing up.

Upon detecting a weapon malfunction, report it to the commander (supervisor).

Review Questions and Tasks

1. Explain the phenomenon of a shot.
2. How is bullet flight trajectory formed?
3. Characterize recoil. How does it affect firing?
4. What is a point-blank shot, and what is its practical significance?
5. Characterize covered, dead (defended), and beaten (beaten zone) spaces. What determines their sizes?
6. Describe, comment on, and demonstrate the shooter's position when firing from a stationary posture.
7. In your opinion, why are firing preparation drills conducted?
8. Describe aiming. What errors occur during aiming, and what are their consequences?
9. What are the techniques for firing the Kalashnikov automatic rifle? Characterize them.
10. How should the automatic rifle be held when running and moving at a double-time pace?
11. Study the Law on Weapons.

References:

1. Babak, F. K. *Basics of Small Arms* / Series: Arsenal. St. Petersburg: Polygon Publishing House, 2003. - 254 p.
2. Federal Law On Weapons dated December 13, 1996 N 150-FZ (latest revision).
3. Yusupova, O. A. *Firearms Training for Cadets of Educational Organizations of the Ministry of Internal Affairs of Russia at Initial and Basic Training Stages: Study Guide* / O. A. Yusupova, A. V. Afanasyev. – Krasnoyarsk: Siberian Law Institute of the MIA of Russia, 2020. – 220 p.
4. <https://www.youtube.com/watch?v=OyCct0anRvo>

Practical Lesson 5.2.3

Topic: Preparation of a Single Trench for Firing an Automatic Rifle

Outline:

1. Nature of field fortifications for artillery unit firing positions.
2. Field fortifications of covered firing positions.
3. Construction of individual firing trenches for an automatic rifle.
4. Camouflage and concealment.

1. Nature of field fortifications for artillery unit firing positions

Primary, and when time permits, alternate and temporary firing position areas are prepared for artillery battalions (batteries). Alternate areas are generally prepared during defense for unit maneuvering during battle.

Within the battalion firing position area, one or several firing positions are selected and prepared for each battery (Fig. 1). The firing position occupied by the battery is fortified most comprehensively.

Field fortifications of battalion (battery) firing position areas must ensure:

- Convenience of delivering fire from guns, mortars, and combat vehicles;
- Protection of personnel, weapons, and special equipment from enemy fires;
- Defense sustainability of firing positions against enemy tanks, infantry, reconnaissance/sabotage groups, and airborne landings;
- Rapid displacement of firing positions during battle;
- Concealed positioning in the terrain.

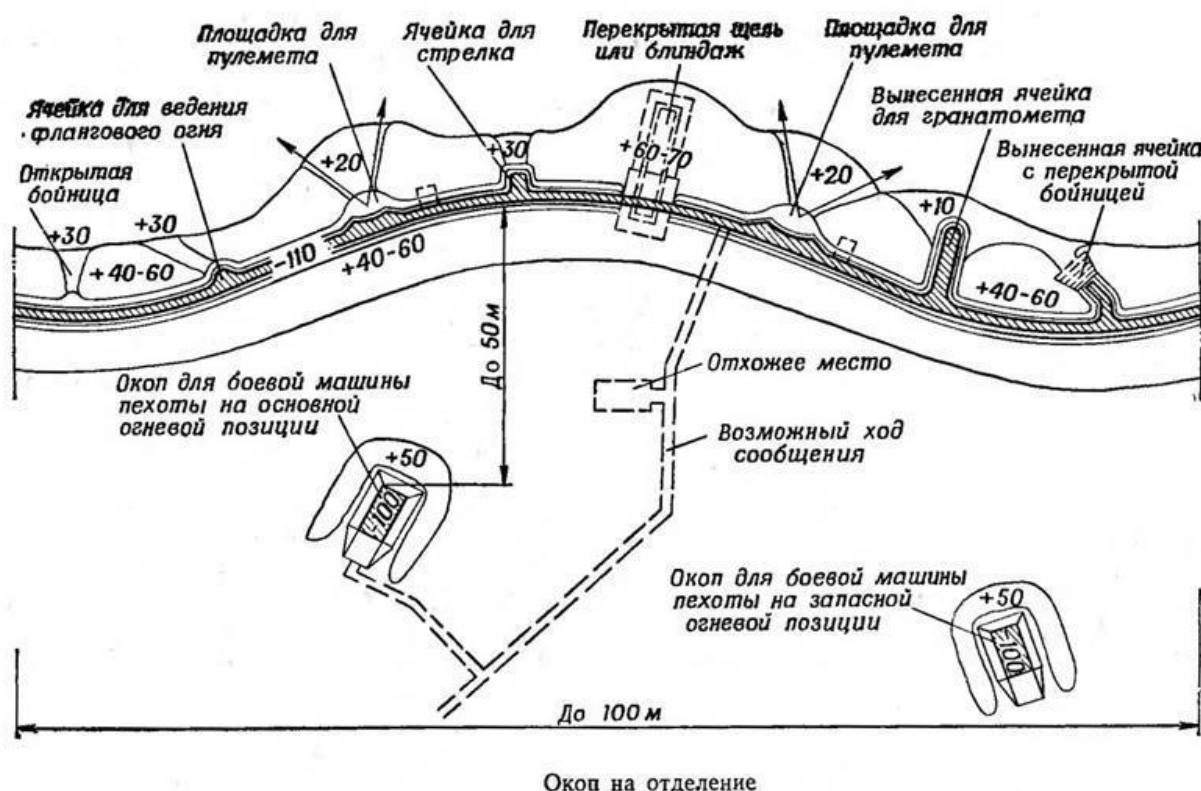
Field fortifications of a firing position include:

- Mine clearing/verification of the terrain;
- Clearing sectors of observation and fire;
- Digging gun pits with ammunition niches and covered revetments (dugouts) for gun crews;
- Constructing an open emplacement for the battery senior officer's command post with a covered revetment or dugout (firing trench for a 1V110 or 1V13 vehicle) and an open emplacement for the firing platoon commander;
- Emplacing explosive minefield obstacles;
- Digging open emplacements for observation posts, defensive trenches, and ammunition supply points (bunkers);
- Preparing access routes;
- Executing camouflage/concealment measures;
- Establishing a water supply point.

When time permits, a battery shelter is constructed at the firing position, and all emplacements are

interconnected with communication trenches.

To conceal artillery prime movers and ammunition transport vehicles, terrain folds are utilized first; when time, manpower, and resources permit, pit-type vehicle shelters are excavated. Open (covered) trenches or dugouts are constructed for drivers. In all cases, trenches, shelters, and equipment are camouflaged.



Squad fighting position

Machine gun platform / Rifleman prone trench / Covered revetment or dugout / Flanking fire trench / Open embrasure / Standalone grenade launcher trench / Standalone trench with covered embrasure / IFV emplacement at primary firing position / Latrine / Communication trench / IFV emplacement at alternate firing position

Firing positions are fortified in a sequence that ensures constant readiness of artillery units to perform fire missions, observing camouflage requirements and continuous enhancement of protection against all threat capabilities.

In defense, after mine clearing/verification and establishing the primary direction of fire, open firing platforms for guns (mortars, combat vehicles) are prepared at firing positions, and observation/fire sectors are cleared. Firing positions are then fortified in the following priority order:

- **First priority:** Dig gun pits with crew revetments; construct open emplacements for the battery senior officer's command post (emplacement for 1V110, 1V13 vehicles) and the firing platoon commander; driver trenches in the prime mover area; water supply points (water supply point at the battalion level); open emplacements for observation posts, defensive trenches, and emplacement of explosive minefield obstacles.
- **Second priority:** Dig ammunition niches/bunkers; covered revetments and dugouts for personnel; shelters for prime movers and transport vehicles; prepare movement and maneuver routes.
- **Third priority:** Enhance field fortifications of primary battery firing positions, construct troop shelters, and fortify alternate battery firing positions.
- When preparing for an offensive, field fortification of firing positions is conducted in the same sequence as in defense.

Field fortifications of an artillery battalion (battery) assembly area include:

- Mine clearing/verification of terrain; preparing access routes; constructing revetments for personnel and shelters for weapons and combat equipment;
- Constructing observation and security posts; digging defensive trenches; equipping water supply points; conducting engineering camouflage measures, as well as preparing concealed movement routes to the firing position area. When time permits, dugouts (shelters) for personnel and vehicle shelters are constructed.

During an offensive, terrain at firing positions is cleared of mines, sectors of observation and fire are cleared, gun firing platforms and movement/maneuver routes are prepared, crew revetments are dug, and camouflage measures are conducted, maximizing terrain cover and concealment properties.

Field fortification tasks are performed across all types of combat and begin immediately after selecting firing positions, employing all personnel and maximizing the use of mechanization equipment, prefabricated fortification structures, components, and local building materials.

2. Field Fortification of Covered Firing Positions

Field fortification of a battery covered firing position includes: digging gun pits; constructing open emplacements for the command post (vehicle) of the battery senior officer, the firing platoon commander, and ammunition supply niches; erecting personnel protective shelters; constructing vehicle (transport) shelters, open emplacements for observation posts, and defensive fighting positions.

At battery firing positions, gun pits are arranged in staggered-right (left), line, echelon-forward (backward), or other geometric patterns depending on terrain conditions.

The layout of guns at a firing position should, where possible, enable simultaneous anti-tank fire by

all guns in any direction, while preventing multiple guns from being destroyed in a single air strike pass.

Intervals between gun (mortar) pits at a firing position may be 20–40 m or more; between MLRS combat vehicles, 50–60 m or more; and when operating in mountains or forested terrain, based on specific conditions.

At a gun firing position, a gun pit or open platform, trenches with ammunition niches, a crew shelter (covered revetment or dugout), one or two ammunition bunkers, and a communication trench are constructed. A gun pit must feature entry/exit ramps, parapets, and a drainage sump.

Gun pits are built primarily with a limited sector of fire (40–60°) to increase their protective qualities. Open firing platforms are prepared alongside them for engaging targets in other sectors.

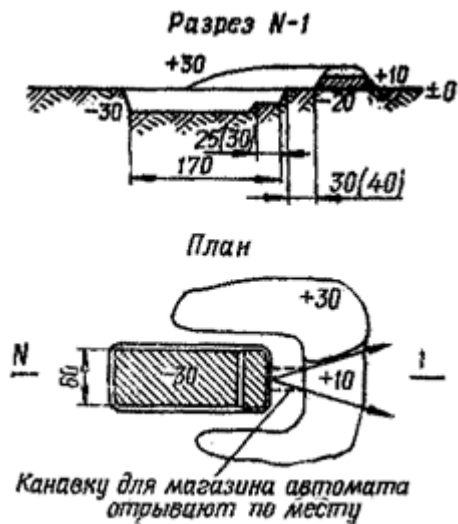
Pits with limited sectors of fire also serve as weapon shelters. To optimize protection, barrels of guns, mortars, and MLRS launch rails are lowered to their lowest position when not firing and camouflaged with local materials and issued concealment systems.

When constructing firing positions in loose/soft soil, trench wall revetments are built using small-diameter logs, poles, brushwood, and other local materials. Additionally, to reduce dust creation during firing, soil within the muzzle blast cone zone should be reinforced with sod, brushwood mats, or wickerwork.

The dimensions, shape, and mutual arrangement of trench elements in each case are determined by the gun system, assigned fire tasks, terrain relief, and the feasibility of mechanized excavation. In all cases, field fortification construction must leverage terrain cover and concealment, minimizing labor and resource expenditure.

3. Construction of Individual Firing Trenches for an Automatic Rifle

To deliver fire, observe, and protect against weapon effects, personnel occupying positions first construct individual prone firing trenches, then deepen them for kneeling and standing firing positions.



Cutaway N-1

Plan view

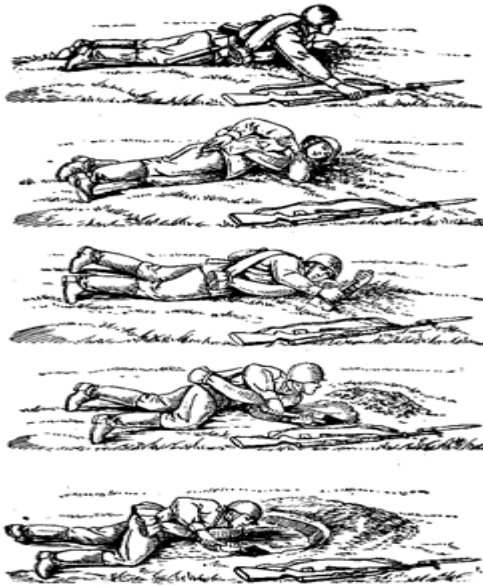
Trench for automatic rifle prone firing

Trench for rifle magazine excavated on site

Before digging a trench, each soldier adapts to the terrain, positioning themselves to maintain good observation and fields of fire within the assigned sector without revealing their position to the enemy. The soldier then digs an individual prone firing trench and clears their sector of observation and fire if obstructed by terrain features.

Individual Prone Firing Trench

An individual trench is an excavation with a parapet in front and on the sides, providing convenient placement for weapons and the soldier when delivering fire, as well as protection against enemy weapon effects. In an individual prone firing trench, the excavation is made 60 cm wide, 170 cm long, and 30 cm deep to ensure the soldier is fully concealed.



Digging an individual prone firing trench under enemy fire

For firing convenience, an elbow rest is left in the front part of the excavation, 25–30 cm wide and 10 cm above the trench floor. Earth excavated during digging is thrown forward (toward the enemy) to form an embankment called a parapet.

When delivering fire from the trench toward one of the flanks, the height of the frontal parapet facing the enemy is made 20 cm higher than in the firing sector. Spoil volume is 0.3 m³. Construction requires 0.5 man-hours.

Digging an individual prone firing trench under enemy fire is executed as follows:

- Lying at the selected spot, the soldier places the automatic rifle to their right at arm's length, muzzle pointed toward the enemy;
- Turning onto their left side, the soldier uses their left hand to draw the entrenching tool (entrenching shovel) by the blade from its carrier, grips the handle with both hands, and cuts the sod or upper compacted soil layer with inward strikes toward themselves, marking the front and side boundaries of the excavation;
- After that, the soldier shifts their grip on the entrenching shovel and flips the sod over with outward strikes away from themselves, places it in front, and begins excavation.

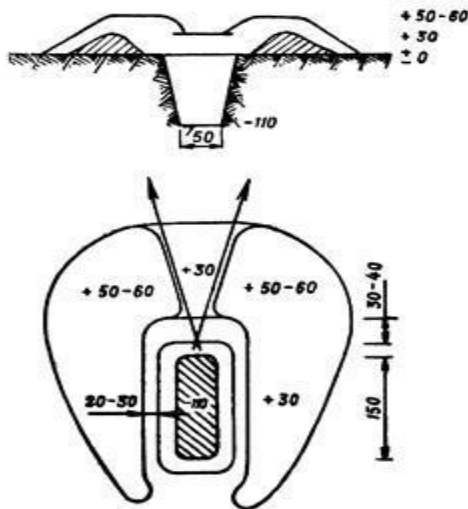
During work, the soldier must:

- Insert the entrenching shovel into the ground at an angle using the corner of the blade, not vertically;
- Cut thin roots with the sharp edge of the blade;
- To form the parapet, throw sod and soil forward toward the enemy, leaving a small flat space between the edge of the excavation and the parapet called a berm, 20–40 cm wide;

- Keep the head close to the ground while maintaining continuous observation of the enemy.
- Once the required depth is reached in the front part of the trench, the soldier shifts backward and continues digging the excavation to the required length to cover their torso and legs.
- Upon completing excavation, the parapet is leveled with the entrenching shovel and camouflaged to match the appearance and color of the terrain using materials at hand: grass, branches, topsoil, etc.
- Without waiting for orders from the commander, every soldier deepens the prone firing trench, converting it into an individual kneeling firing trench, and subsequently into a standing firing trench excavated from the bottom of the pit.

Individual kneeling and standing firing trenches are constructed by further deepening the individual prone firing trench to 60 cm and 110 cm, respectively. During excavation, soil is thrown forward and to the sides, creating a parapet 40–60 cm high. In the firing sector, the parapet height is reduced to 30 cm, forming a depression with gentle slopes – an open embrasure.

Cutaway N-1 / Plan view / Individual trench for automatic rifle kneeling firing



Individual trench for automatic rifle standing firing

Spoil volume when constructing an individual kneeling firing trench for an automatic rifle is 0.8 m³; construction requires 1.2 man-hours. Spoil volume when constructing an individual standing firing trench for an automatic rifle is 1.4 m³; construction of this trench requires 1.5 man-hours.

An individual standing firing trench excavated from the bottom of the pit reduces the casualty radius of nuclear weapons by 1.5 times compared to exposure in open terrain.

Trenches are camouflaged against aerial observation using camouflage netting interwoven with grass, branches, and other materials at hand.

4. Camouflage and Concealment

Selecting Trench Positions and Camouflage

The location of trenches must meet the following primary conditions:

- Provide clear observation and fields of fire over the terrain ahead to a range of at least 400 m, as well as observation and fire coverage along approaches to adjacent trenches;
- Facilitate trench camouflage, significantly reducing the effectiveness of enemy fire;
- Ensure the most concealed communication possible with the rear and adjacent trenches;
- Favor trench construction and fortification operations.

Clear fields of fire imply the absence of dead space (uncovered zones) within the assigned sector of fire.

The best observation and coverage of approaches to a position are achieved by locating trenches on forward slopes facing the enemy. Placing trenches at the toe of a slope provides grazing fire, where targets can be engaged along the entire bullet trajectory.

Locating trenches at the topographic crest usually offers long-range observation, but fire coverage without dead space is typically limited to very close ranges.

From a firing standpoint, the most advantageous trench position is the military crest. The military crest is defined as a line along the forward slope (facing the enemy) from which fire can cover terrain down to the toe of the slope without dead space.

Trench camouflage is generally achieved through skilled position selection in the terrain. A trench is easily and effectively camouflaged when positioned in brushwood, high grass, or areas poorly visible to the enemy and concealed from ground observation posts.

However, while pursuing position concealment, care must be taken not to complicate execution of the assigned fire mission or degrade fields of fire in the designated sector.

One of the primary techniques for trench camouflage is sodding. If sod for parapet camouflage is insufficient, additional sod is harvested away from or to the rear of the trench and carried to the work site on litters. Sod harvesting is best conducted in areas designated for dummy trench construction. The area from which sod is stripped should resemble a standard trench in shape and size.

Engineering Training Standard # 1

2.1. Specific Features of Engineering Training Standards

1. Standards for trench construction during lessons and drills are executed using an entrenching tool (entrenching shovel / engineer shovel).
2. A standard is considered completed if execution conditions are met, safety requirements are observed, and military regulations, manuals, guidelines, and instructions are followed.
3. If during execution a student makes even a single error that could result in personnel injury/casualty, equipment or weapon breakdown, or an accident, performance is halted and evaluated as unsatisfactory.
4. For violating the execution sequence that does not lead to accidents, equipment/weapon damage, or for each error leading to a breach of performance conditions, regulatory requirements, manuals, instructions, or process cards, the mark is downgraded by one grade.
5. When executing standards in chemical protective clothing (OZK, L-1, etc.), time is increased by 25%, and when working in respiratory protection (gas mask, respirator) – by 10%, except for standards specifically prescribed to be performed in protective gear only.
6. At ambient temperatures of -10°C and below, + 30°C and above, in heavy rain, snowfall, or at altitudes exceeding 1,500 m above sea level, execution time increases by up to 20%; for night operations, if nighttime standards are not specified separately, time increases by up to 30%.
7. When executing standards involving frozen soil (frost depth of 1 m or more) or hard (rocky) soil, whether manually or using explosives and machinery, time increases by 3 times for frozen ground and 5 times for rocky ground.

8. Under winter conditions with snow depth of 80 cm or more, trenches and shelters may be constructed from snow. In such cases, execution time relative to specified norms is reduced by 1.5–2 times.

9. When standards are executed by a reduced-strength unit, time is increased (decreased) by the corresponding percentage of absent personnel, but by no more than 15%. In units manned solely by driver-mechanics, during group standards requiring joint effort by two or more crew members, driver-mechanics from other vehicles within their unit are assigned.

10. Execution time for an individual servicemember (unit) is measured with a stopwatch from the command COMMENCE STANDARD (or another established command/signal) until execution is complete by all personnel (unit) and the commander (student) reports completion.

2.2. Evaluation Procedure for Standards Completion

1. If a standard is practiced multiple times during training, the grade is determined by the last demonstrated result or by the evaluation lesson result.

2. An individual grade for a servicemember executing multiple engineering training standards is determined based on marks received for each standard as follows:

Excellent	if at least 90% of evaluated standards are passed, with no less than 50% graded excellent
Good	if at least 80% of evaluated standards are passed, with no less than 50% graded no lower than good
Satisfactory	if at least 70% of standards are passed; when evaluated on three standards, two must be passed, with at least one graded no lower than good
Unsatisfactory	if conditions for a satisfactory grade are not met

Unit grades for individual standards are derived from individual student marks and determined as follows:

Excellent	if at least 90% of students receive passing marks, with no less than 50% receiving excellent
Good	if at least 80% of students receive passing marks, with no less than 50% receiving no lower than good
Satisfactory	if at least 70% of students receive passing marks
Unsatisfactory	if conditions for a satisfactory grade are not met

Time Metrics and Evaluation for Completing Standard # 1

Category of Trainees	Time Evaluation (seconds)
----------------------	---------------------------

	Excellent	Good	Satisfactory
Service member			
Individual prone firing trench	25/18	27/20	32/24
Individual kneeling firing trench	55/40	60/45	70/55
Individual standing firing trench	1 h 30 min / 1 h 05 min	1 h 40 min / 1 h 10 min	2 h / 1 h 15 min

Note: Numerator indicates time for excavation using a small entrenching shovel (infantry shovel); denominator indicates time using a large engineer shovel

STANDARD #1 – TRENCH EXCAVATION AND CAMOUFLAGE

Initial Position: Excavation site designated by the squad leader

Standard	Conditions (Procedure)	Category of Trainees	Time Evaluation		
			Excellent	Good	Satisfactory
TRENCH EXCAVATION AND CAMOUFLAGE	Excavation performed using an infantry shovel, camouflage executed using materials at hand	Enlisted personnel, sergeants	Automatic rifle prone firing trench		
			25 min	27 min	32 min
			Automatic rifle kneeling firing trench		
			55 min	1 h	1 h 10 min
			Automatic rifle standing firing trench		
			1 h 30 min	1 h 40 min	2 h

Review Questions and Tasks

1. Defensive properties of terrain.
2. Field fortification of individual and two-man firing trenches for an automatic rifle.
3. Camouflage and concealment.
4. Mission comprehension and situation assessment.
5. Elements included in the assessment of friendly forces and resources.

References:

1. *Tactics. Field Fortification Support for Artillery Unit Combat Operations: Study Guide for Practical Classes* [Electronic Resource] / Compilers: S. I. Bovaev, A. V. Zakhryapin. – Krasnoyarsk: Siberian Federal University, 2014.
2. *Military Engineering Manual*. Moscow: Military Publishing House, 1984. – 575 p.
3. <https://yandex.ru/video/preview/3329755169826570456>

Practical Class 5.3.1

Topic: Tactical and Technical Characteristics (TTC) of the Main Types and Models of Armament and Equipment of the Armed Forces of the Russian Federation (AF of RF)

Aim

1. To develop students' stable understanding of the system and structure of the Armed Forces of the Russian Federation.
2. To develop students' stable understanding of the purpose of the Ground Forces.
3. To consolidate the knowledge gained regarding the TTC of the main models of armament and military equipment of units of the Ground Forces of the Armed Forces of the RF.

Tasks

1. What is understood by a Branch of the Armed Forces?
2. What is understood by a Service Arm?
3. Diagrammatically depict the organizational chart of the RF Armed Forces.
4. Identify the errors in this slide:



1. List the purpose of the Ground Forces (in 3 scenarios: peacetime, period of threat, and war time).
2. List the air defense weapons of motorized rifle units.
3. Specify the TTC of anti-tank weapons of motorized rifle units.

4. Specify the TTC of the following types of small arms: RPK-74, PKM, SVD.
5. What are the differences between the AK-47 and AKS-74 assault rifles in terms of tactical and technical characteristics?
6. What equipment is part of a motorized rifle squad?
7. According to this diagram of an MRV (Motorized Rifle Platoon) on APCs (BTRs), determine what is in service with this unit and in what quantity:



[Diagram Text: Motorized Rifle Platoon on APCs]

(left chart) Platoon Headquarters: Platoon Commander (АК-74, ПМ), Deputy Platoon Commander (АК-74), Sniper (СВД), PK Machine Gunner (ПК), Assistant Machine Gunner (АК-74), Rifleman-Medic (АК-74).

(right chart) Motorized Rifle Squad: Squad Leader (АК-74), Operator-Gunner (АКС-У), APC Driver (АКС-У), Grenadier (РПГ-7В), Assistant Grenadier (АК-74), Machine Gunner (РПК-74), Senior Rifleman (АК-74), Rifleman-2 (3 мсо-1) (АК-74).

1. Name the armaments of motorized rifle units shown in the pictures

a



b



c



d



e



f



2. What is the vehicle shown in Question 12 under letter **f** intended for?
3. Which service arm of the Ground Forces does the vehicle shown in Question 12 under letter **a** belong to?

Practical Class 5.3.2.

Topic: Tactical and Technical Characteristics (TTC) of the Main Types and Models of Armament and Equipment of the AF of the RF

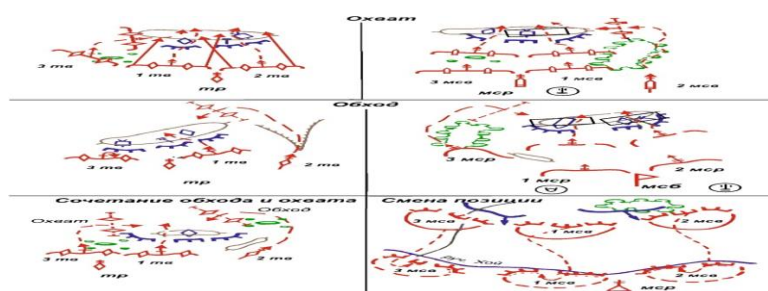
Aim

1. To develop students' stable understanding of the fundamentals of combined arms combat, its characteristics, and types.
2. Methods of conducting modern combined arms combat.
3. Forces and means of armed struggle.
4. Features of the combat application of new technologies and technical means (EW, UAVs).

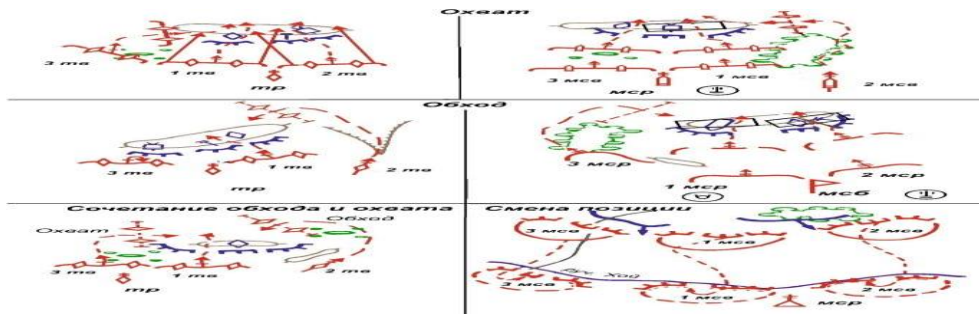
Tasks

1. Explain what constitutes the essence of combined arms combat.
2. What is combat?
3. List the characteristic features of modern combined arms combat.
4. How do you understand simultaneous powerful firepower and electronic suppression across the entire depth of the opposing forces' disposition?
5. Complete the sentence: *Combined arms combat requires the participating units to conduct continuous reconnaissance, ...*
6. What is defense?
7. What requirements are imposed on defense?
8. What is an offense (attack)?
9. Complete the sentence: *Depending on the readiness of the enemy's defense and the degree of their fire damage, a platoon's (squad's, tank's) offense against a defending enemy is carried out ...*
10. What types of maneuver exist?
11. How does an turning movement (outflanking) differ from an envelopment?
12. List the types of maneuvers shown in the figures below:

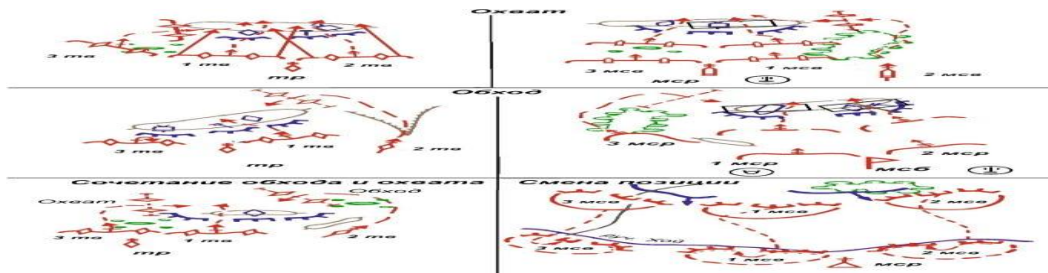
a



b



c



13. What types of armament can be used to conduct combined arms combat?
14. List the main armament of a U.S. Army mechanized infantry platoon.
15. Knowing the ratio of forces of the attacking side to the defending side as 3 to 1, calculate what forces you can use to attack a German Army mechanized infantry platoon.
16. Prepare a brief report on either *Electronic Warfare in Modern Combined Arms Combat* or *The Use of Unmanned Aerial Vehicles in Modern Armed Conflicts* (optional), utilizing combat experience from Syria and the Special Military Operation (SMO).

Practical Class 5.4.1.

Topic: Radiation Reconnaissance Instruments

1. Aim and contents

To get to know the main instruments used for conducting radiation reconnaissance, and the principles of operation of ionizing radiation detectors.

2. Theoretical Rationale

Radiation reconnaissance is a specialized form of reconnaissance consisting of a set of measures to collect data on the radiation situation resulting from natural disasters, accidents, and catastrophes, in order to successfully fulfill civil defense tasks for population protection.

Radiation reconnaissance is conducted primarily by two methods: observation and direct survey of contaminated areas. Radiation reconnaissance is organized by heads of Civil Defense and Emergency Situations (CD&ES) control bodies of all levels, heads of services, and commanders of formations (units).

The following entities are involved in executing this measure:

- Duty officers (operational duty officers) of CD&ES control bodies, services, ministries, departments, and economic facilities; general reconnaissance formations (reconnaissance groups, river (maritime) and air reconnaissance squads, railway transport reconnaissance squads, etc.);
- Special reconnaissance formations (radiation and chemical reconnaissance groups, radiation and chemical observation posts, epidemiological reconnaissance groups, veterinary and phytopathological reconnaissance squads, etc.);
- Institutions of the observation and laboratory control network (hydrometeorological stations, sanitary-epidemiological surveillance centers, facility-level, veterinary, and agrochemical laboratories, etc.);
- Radiation and chemical reconnaissance subunits of CD formations and units;
- Relevant specialists of search and rescue services (search and rescue detachments, teams, groups).

For this purpose, radiation reconnaissance is conducted to solve the following tasks:

- Detecting contamination of the terrain and the surface air layer by radioactive substances, and transmitting information about this to the work supervisor;
- Determining the gamma radiation dose rate along the movement routes of Search and Rescue Formations (SRF) and marking the boundaries of radioactive contamination zones;
- Finding (if necessary) bypass routes to cross contaminated areas;
- Monitoring the dynamics of changes in the radiation situation;

- Sampling water, food, vegetation, soil, equipment, and property, and dispatching them to laboratories;
- Meteorological observation;
- Dosimetric control of SRF personnel upon exiting the radioactive contamination zone.

Centers for collecting, processing, and issuing information on radiation and chemical situations are the unified dispatch services of administrative-territorial units, dispatch services of economic facilities, the All-Russian Center for Monitoring and Forecasting, and, in wartime, additionally deployed calculation-and-analytical stations and groups of CD&ES control bodies at all levels.

In accordance with Order of the EMERCOM of RF dated 23/12/2005 # 999 *On Approval of the Procedure for Creating Non-Standard Emergency Rescue Formations* (as amended by Order of EMERCOM of RF dated 22/08/2011 # 456), each subunit must be equipped with radiation, chemical, and biological reconnaissance and control equipment, as listed in Table 2.1. Classifications of radiation reconnaissance instruments are shown in Figure 2.1.

Table 2.1 – Radiation Reconnaissance and Control Means

#	Name of Property	Unit of Measure	Issue Quantity	To Whom Allocated
1.	Dosimeter-radiometer type DRP-03, DPG-03D Grach, DKG-07BS, DKG-02U Orbitr-M	pcs	1 to 4	To every chemical scout of all formations. To every reconnaissance squad on transport vehicles. To every rescue team, every laboratory designated for deployment to analyze food products and drinking water for RV contamination. To every protective shelter. To every decontamination station.
2.	Individual dosimeter type DKG-05B, DKG RM-1621	pcs	1	To executive personnel of the formation
3.	Set of individual dosimeters type ID-02 (DDNT-02), DVG-02T	set	1 to 5	To every NBC reconnaissance and observation unit, every engineering reconnaissance group, Medical squad, every clothing decontamination station, every personnel decontamination station, every communications group, every rescue group, to every vehicle decontamination station
4	Meteorological set type MK-3 (and its modifications)	set	1–2	To every chemical scout of all formations, To every first-aid detachment, To every NBC observation post, To every personnel decontamination station, To every equipment decontamination station, to every railway division, to every Protected Reserve Command Post (ZZPU), to every protective shelter
5	Set of portable warning signs type KZO-1	set	2	To all communications formations and firefighting formations
6	Sampling kit type KPO-1M	set	1–2	To every chemical scout of all formations, To every first-aid detachment, To every NBC observation post, To every personnel decontamination station, To every equipment decontamination station, to every railway division, to every Protected Reserve Command Post (ZZPU)

По принципу действия	По назначению	По степени мобильности	По функциям
•химический •ионизационный •сцинтилляционный •фотографический •тепловой •проводимость кристаллов	• индикаторы • рентгенметры • радиометры • дозиметры	• стационарные • переносные • носимые	• радиационная разведка • контроль степени загрязнения • контроль индивидуальных доз облучения

[Figure 2.1 – Types of Classifications of Dosimetric Instruments, left to right]

- **By Operating Principle:** Chemical, Ionization, Scintillation, Photographic, Thermal, Crystal Conductivity
- **By Purpose:** Indicators, Roentgenmeters, Radiometers, Dosimeters
- **By Degree of Mobility:** Stationary, Portable, Wearable
- **By Functions:** Radiation reconnaissance, Contamination level control, Individual exposure dose control

At the core of any dosimetric instrument is an ionizing radiation detector. Detectors vary: Geiger counters, ionization chambers, semiconductor, scintillation. They differ somewhat in their operating principles. The main principles include:

- **Ionization:** utilizes the ionization effect on a gaseous medium caused by exposure to IR, resulting in a change in its electrical conductivity;
- **Scintillation:** consists of light flashes occurring in certain substances under the influence of IR, registered by direct observation or photomultipliers;
- **Chemical:** IR is detected via chemical reactions, changes in acidity and conductivity occurring during the irradiation of liquid chemical systems;
- **Photographic:** when IR acts on photographic film, silver grains precipitate in the emulsion layer along particle (quantum) trajectories. The spot where metallic silver precipitation occurs is perceived as a black dot, and a collection of such dots as a black spot;
- **Method based on crystal conductivity:** electric current arises in crystals made of dielectric materials under IR exposure, changing the conductivity of semiconductor crystals;
- **Thermal or calorimetric method:** based on using direct or indirect thermal effects arising from the interaction of IR with matter.

Based on these IR detection methods, various detectors are manufactured, serving as one of the three components of dosimetric instruments (Fig. 2.2). An IR detector is a device designed to convert the energy of these radiations into another form of energy suitable for subsequent registration by a measuring device.

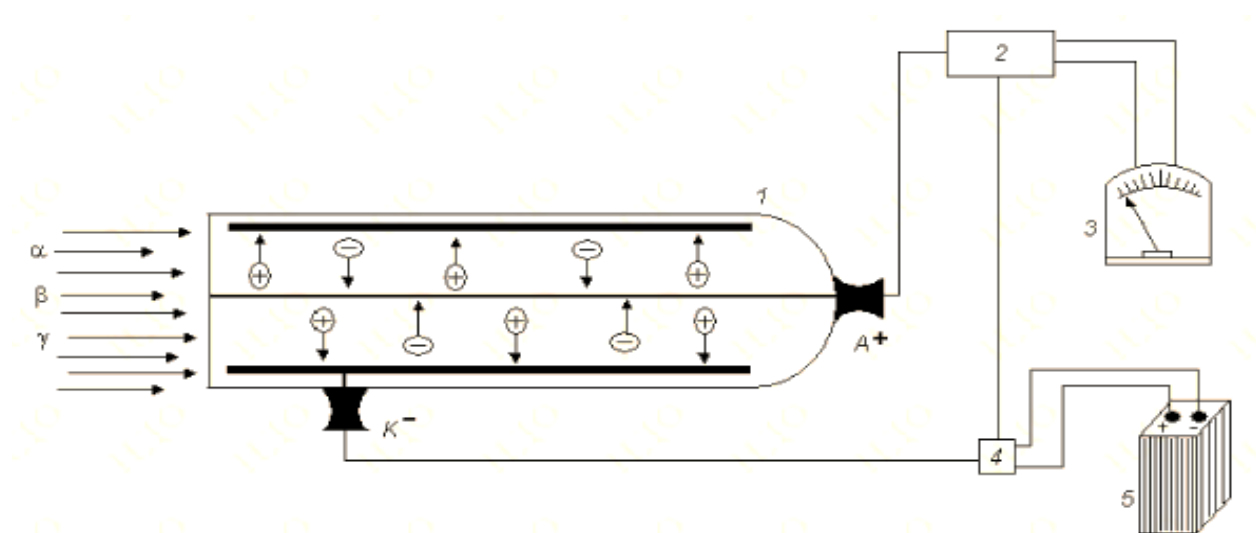


Figure 2.2 – Schematic Diagram of Dosimetric Instruments Design

1 – Recording device; 2 – Ionization current amplifier; 3 – Measuring instrument; 4 – Voltage converter; 5 – Power source.

An **ionization chamber (IC)** is a device consisting of two mutually insulated electrodes to which a voltage is applied. When ionization occurs in the air space between the electrodes, the ions acquire directional movement under the influence of the electric field, and an electric current, called ionization current, flows in the circuit. Its magnitude depends on the intensity of ionizing radiation (IR). A schematic diagram of the ionization chamber operation is shown in Figure 2.3. Ionization chambers are manufactured as containers of various shapes (cube, rectangular cuboid, cylinder) and are filled with ordinary air at normal pressure. A disadvantage of the ionization chamber is its very low currents.

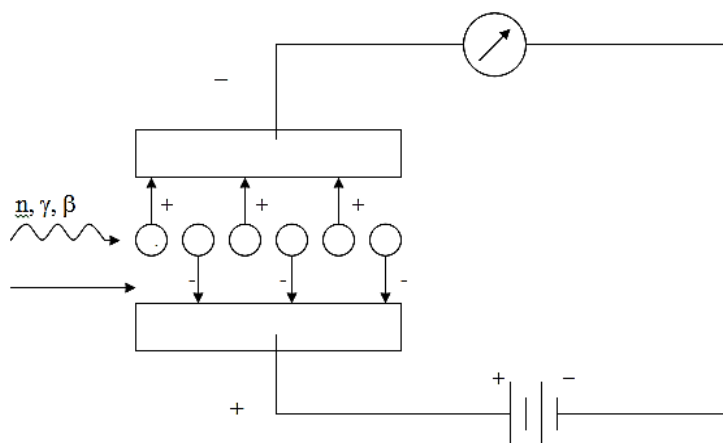


Figure 2.3 – Schematic Diagram of Ionization Chamber Operation

A **gas-discharge counter (GC)** is a metallic or glass cylinder (in the latter case, a conductive material is applied to the inner wall) inside of which a thin steel wire is coaxially placed. The housing acts as the negative electrode (cathode) and the wire as the positive electrode (anode), to which a fairly high

voltage is applied. The space between the electrodes is filled with inert gases (neon, argon, helium, or their mixtures) at reduced pressure.

The fundamental difference between a GC and an IC is that a GC utilizes amplification of the ionization current through the phenomenon of impact ionization. Impact ionization occurs at significantly higher voltage values compared to an IC. Under these conditions, electrons formed by the direct impact of IR acquire energy sufficient to ionize gas atoms. Secondary ionization electrons, together with primary ionization electrons, ionize other atoms in subsequent collisions. Thus, an avalanche-like multiplication of charges occurs. When electrons reach the positive electrode (wire), they are neutralized, which reduces the potential applied to the wire, and a voltage pulse appears in the circuit to replenish it. The pulse frequency will be proportional to the intensity of the IR.

Structurally, a **proportional counter** is usually made in the form of a cylindrical capacitor with an anode in the form of a thin metallic wire along the cylinder axis (Fig. 2.4), which provides an electric field strength near the anode significantly higher than in the rest of the detector region.

With a potential difference between the anode and cathode of 1000 Volts the field strength near the anode wire can reach 40,000 Volt/cm, while at the cathode it is equal to hundreds of V/cm. The time resolution of a proportional counter can reach 10^{-7} s. Gas-discharge counters can be steel, glass, thin-walled, thick-walled, end-window, etc.



Figure 2.4 – Schematic Diagram of GC Design (Registered particle; Cathode; Anode; High-voltage source)

Semiconductor detectors are increasingly used in modern dosimetric equipment operating on the basis of the ionization method of IR registration. Their principle of operation is similar to that of an ionization chamber; however, the operation of a semiconductor detector is based on the ionization of atoms of a solid substance – a semiconductor – rather than a gas. Germanium and silicon are used as the primary materials for manufacturing semiconductor detectors.

For high-precision determination of particle coordinates, **semiconductor microstrip detectors** are used. They consist of single-crystal silicon wafers, on one surface of which thin electrodes (strips) are applied at a distance of 20 mcm, from each other, while the other surface is covered with a metallic layer. A voltage of several volts is applied to the electrodes. Electron-hole pairs formed by a passing

charged particle in the crystal move toward the nearest electrodes and are recorded as current pulses. The spatial resolution of microstrip detectors is second only to nuclear emulsions and reaches 10 mcm. The time resolution is 10^{-8} s. The structure of a silicon microstrip detector is shown in Figure 2.5.

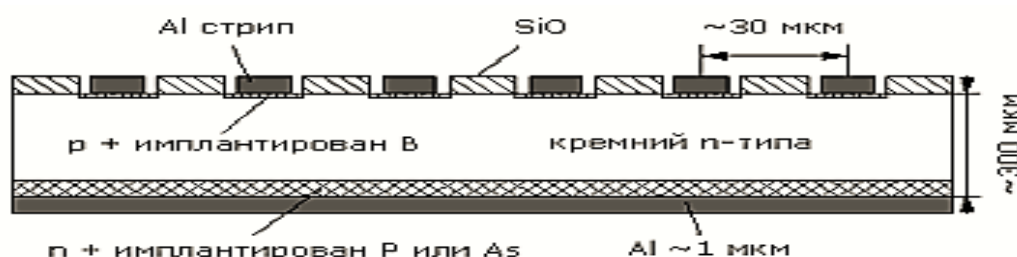


Figure 2.5 – Structure of a Silicon Microstrip Detector (Al strip; SiO₂; appr. 30 mcm; appr. 300 mcm; p+ implanted in n-type silicon; n+ implanted P or As; Al appr. 1 mcm).

A major advantage of semiconductor detectors is their small size and weight.

The first **scintillation detector**, called a *spinthariscopes*, was a screen coated with a layer of ZnS. Light flashes occurring when charged particles hit it were recorded using a microscope. It was with such a detector that Geiger and Marsden conducted the gold foil alpha-particle scattering experiment in 1909, which led to the discovery of the atomic nucleus. Starting in 1944, light flashes from a scintillator have been recorded using photomultiplier tubes (PMTs). Later, LEDs also began to be used for these purposes.

A scintillator can be organic (crystals, plastics, or liquids) or inorganic (crystals or glasses). Gaseous scintillators are also used. Anthracene (C₁₄H₁₀), stilbene (C₁₄H₁₂), naphthalene (C₁₀H₈) are often used as organic scintillators. Liquid scintillators are usually known under brand names (e.g., NE213). Plastic and liquid scintillators are solutions of organic fluorescent substances in a transparent solvent. For example, a solid solution of anthracene in polystyrene or a liquid solution of p-terphenyl in xylene.

The concentration of the fluorescent substance is usually low, so the registered particle mainly excites the solvent molecules. Subsequently, the excitation energy is transferred to the molecules of the fluorescent substance. Since molecular levels are excited in organic scintillators that emit in the ultraviolet region, wave-shifters (light converters) are used to match the spectral sensitivity of light-recording devices (PMTs and photodiodes). These wave-shifters absorb ultraviolet radiation and re-emit visible light in the 400 nm.

The intensity of the light flash is proportional to the energy lost by the particle; therefore, a scintillation detector can be used as a spectrometer – a device that determines particle energy. A scintillation detector is a combination of a scintillator (in which IR energy is converted into light

energy) and an optically coupled photomultiplier tube (PMT), which converts light energy into an electrical pulse (Fig. 2.6).

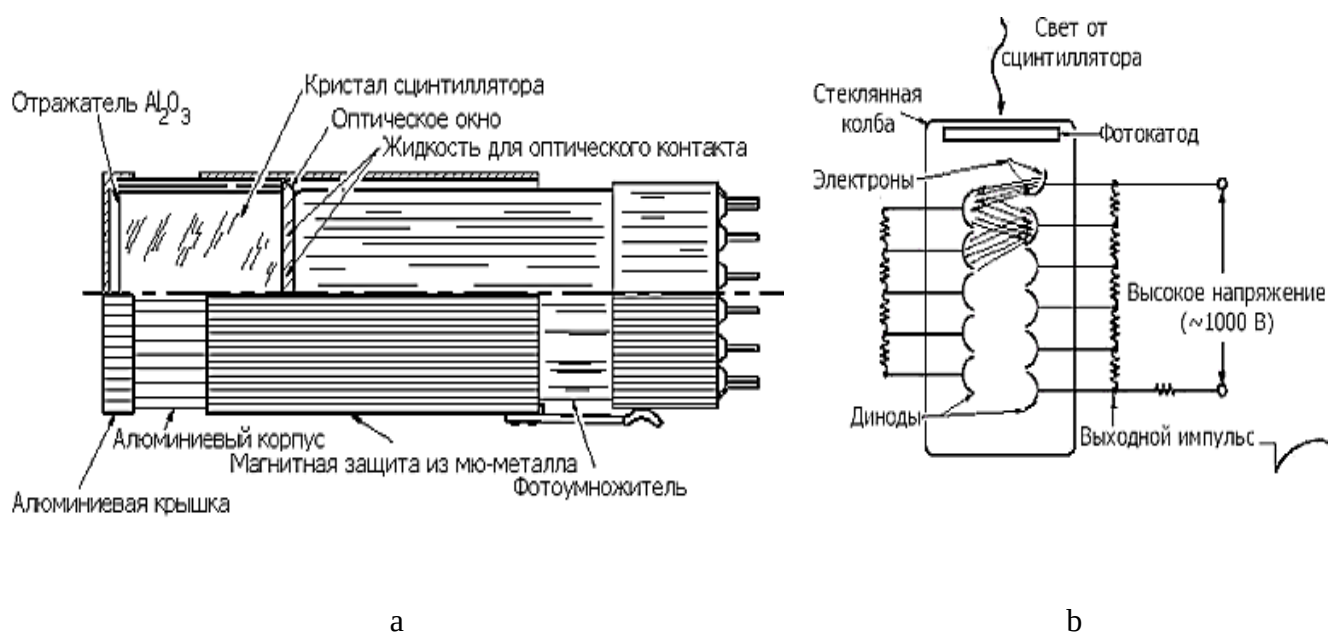


Figure 2.6 – Scintillation Detector: a) Scintillator and PMT (Al_2O_3 reflector; Scintillator crystal; Optical window; Optical coupling fluid; Aluminum casing; Mu-metal magnetic shield; Photomultiplier; Aluminum cap); b) Structure of a PMT (Light from scintillator; Glass envelope; Photocathode; Electrons; Dynodes; High voltage ppr. 1000 V/; Output pulse)

Radiothermoluminescent detectors. Radiothermoluminescence refers to a process in which IR energy stored in a crystal is converted into fluorescence energy under the influence of thermal excitation. For brevity, the term thermoluminescence is usually used instead of radiothermoluminescence. Among the most widely used thermoluminescent materials are calcium fluoride CaF_2 and lithium fluoride LiF . Thermoluminophores based on aluminophosphate glasses are also used. The main glass components are MgO , P_2O_5 , Al_2O_3 . MnO_2 or silver is used as an activator for this glass.

Chemical detectors involve the use of liquid chemical systems. They can be prepared from tissue-equivalent reagents. The products of radiation-chemical reactions in them are relatively stable and can be measured directly by color changes.

3. Equipment and Materials

Radiation Reconnaissance Instruments (DP-5V, IMD-1R, IMD-2, IMD-5)



Purpose. DP-5V Exposure Rate Meter. Designed to measure gamma radiation levels and radioactive contamination of various objects based on gamma radiation. The exposure dose rate of gamma radiation is determined in milliroentgens per hour or roentgens per hour at the location of the instrument's detection unit during measurement. Additionally, it is capable of detecting beta radiation.

Properties & Performance. Reaches required operational specifications after 1 minute of self-heating. **Gamma measurement range:** from 0.05 mR/h to 200 R/h across an energy range of 0.084 MeV до 1.25 MeV;

- Features six measurement sub-ranges. Readings are taken from the analog scale and multiplied by the corresponding sub-range multiplier. Scale intervals from zero to the first digit are non-working zones;
- Offers audio indication on all sub-ranges except the first. Settling time varies by sub-range and affects response speed (lower radiation levels require longer measurement time).

IMD-2



Purpose. Measurement of gamma radiation dose rate within the energy range of 0.08 to 3.0 MeV.

Identification of radioactive contamination levels of terrain, military equipment, and structures;

Measurement of beta particle flux density within the energy spectrum of 0.3 to 3.0 MeV.

Composition: UI-177S measuring unit, BDZS-10S detection unit, extension rod, connecting cable, check source, battery case, strap, and transport case.

General Military Dose Meters (ID-1 Set)

Purpose



Measures absorbed doses of gamma-neutron radiation in the range from 20 to 500 radf.

Composition: 10 individual dose meters and a piezo-based charging unit. No external power supply is required to reset the scale to zero.

Design & Operation:

Designed in a fountain-pen form factor, containing an ionization chamber, electroscope, capacitor, optical microscope, and contact assembly within an aluminum body.

Under ionizing radiation, ionization within the chamber (equipped with tissue-equivalent plastic electrodes) creates a current that reduces the voltage across the chamber and capacitor. The electroscope filament deflects proportionally, and its position is read via the internal microscope against a scale calibrated in rads (25 points; each point value – 20 rad). The charging potential is maintained between 180-250 V to ensure scale linearity. The contact group facilitates charging via the piezo charger and prevents self-discharge when detached.

The charging unit uses four parallel piezo elements actuated by a manual mechanical drive.

Status: Discontinued in 1987. Direct operational equivalent: **DDG-01D** direct-reading dosimeter set

ID-0.2 Personal Dosimeters

Purpose

Used for personal dosimetric monitoring of personnel working with continuous and pulsed radiation sources. Operating principle relies on measuring voltage change in an ionization chamber. Accumulated dose is read directly via the integrated microscope scale.



TECHNICAL SPECIFICATIONS

Detector Type: Ionization chamber.

Gamma Energy Range:, keV – 50-2200 (100-2000)

Absorbed Dose Range, millirad: - 0-200 (0-200 mR)

Operating Temperature: -20 to +40

Accuracy: Error no more than 10% of full scale



Recharge Cycles: at least 10000

Weight, g: 32 (25)

Dimensions, mm: 19 x 110 (19x115)

Radiation Survey Meters (IMD-12, RUB-OTP4)



Purpose

IMD-12 Multi-purpose meter designed to measure:

- Gamma exposure dose rate.
- External surface beta radiation.
- Specific alpha and beta activity in food, water, and forage.

Properties

1. **Gamma Exposure Dose Rate:** 10 mcxR/h to 1000 R/h.
2. **External Beta Radiation:** from $5 \cdot 10^3$ to $5 \cdot 10^6$ particles/(cm²·min).
3. **Specific Beta Activity:** from 10^{-6} to 10^{-3} Ci/kg.
4. **Specific Plutonium-239 Alpha Activity:** from 10^{-4} to 10^{-1} Ci/kg.

KDT-02 Thermoluminescent Dosimeter Set



Purpose

Monitoring of chronic radiation exposure and coverage of potential emergency dose ranges. Measures X-ray and X γ -radiation from 0.06 to 1.25 MeV within the range of $(0.03 \div 1) \cdot 10^3$ R with a basic uncertainty of $\pm(10+3/X)\%$. Energy dependence remains within $\pm 30\%$ E γ . **System Components:** DPG-02 and DPS-11 dosimeters (lithium fluoride detectors), DPG-03 dosimeters (magnesium borate detectors), UPF-02 desktop reader unit, reference source, and accessories. Each dosimeter contains three detectors for enhanced data reliability.

Here below comes **Equipment Specified for Non-Freelance Emergency Rescue Formations (NASF)**

(subject to EMERCOM Order # 999 dated Dec 23, 2005).

**DPG-03D Grach
Dosimeter-Radiometer**



Purpose

- Measurement of gamma radiation ambient dose equivalent rate $H^*(10)$ gamma-radiation;
- Measurement of $H^*(10)$ gamma-radiation (operator dose).

Properties

- Dual independent channels for dose rate and cumulative dose;
- Independent restart of measuring dose rate and cumulative dose;
- Continuous measurement with real-time result refinement and statistical error display;
- Audio evaluation via click rate proportional to dose rate;
- Automatic fast-restart mechanism if dose rate shifts by 3.4σ ;
- Indication of statistical inaccuracy;
- Indication of measurement unit;
- Compact pocket size with backlit LCD screen and high sensitivity.

DKG-02U



Purpose

- Measurement of gamma dose and dose rate, photon pulse counting, area search via analog indicator, and pedestrian gamma surveys.

Properties

Wide range (natural background to emergency levels), dedicated visual Search mode, audio/visual threshold alarms, and a ruggedized waterproof/decontaminable housing.

**DKG RM-1621 Personal
Dosimeter**



Purpose

Professional-grade measurement of personal dose equivalent $H_p(10)$ (ED) and personal dose equivalent rate $H_p(10)$ (MED) for X-ray and gamma radiation.

Properties

- Energy range of 10 keV to 20 MeV;
- measurement range up to 1 Sv/h;
- dual alarm thresholds;
- non-volatile memory storing up to 1000 history events;
- electro-luminescent backlit LCD;
- IP-rated impact-resistant sealed casing;

- light with small size;
- two-button control.

Individual Dosimeter

Sets (ID-02 / DDNT-02 / DVG-02T)



Purpose

Personal dosimetric monitoring for personnel exposed to radiation (nuclear facilities, medical radiology, radiation therapy).

System Components: TLD dosimeters, automated reader unit, software suite, PC, and printer.

Specifications

- **Gamma Energy Range, MeV:** 0.015 – 3.0;
- With TLD-500K (Al₂O₃): 0.5 to 1*10⁶ mSv;
- With DTG-4 (LiF), mSv - 20 – 1*10⁷

Detector Reuse Limit: no fewer than 500

Weight, kg: no more than 18



Individual equivalent of gamma-radiation H_p(10)



Dose in face skin H_p(0.07)

Dose in eye lens H_p (3)

Dose in finger skin H_p(0.07)



Deep personal dose equivalent H_p(10) for photon and neutron radiation

MK-3 Weather Kit (and Modifications)

Purpose



Meteorological observation of wind speed, air/soil temperatures, and local wind profiling.

Kit Contents

Carrying bag, hand-held cup anemometer, sling psychrometer/thermometer, white and camo pennants, compass, cardinal direction pegs, stopwatch, signal flashlight, and collapsible pole

Parameters

Total weight: 3 kg

Bag, mm: 225x190x115

Pole (when collapsed), mm: 65x675

Crew: 1 observer

Deployment time, min: 8

Teardown time, min: 6

KZO-1 Portable Warning Sign Set



Purpose

Marking boundaries of areas contaminated with CBRN agents and indicating bypass routes during reconnaissance.

- **Design & Features:** Yellow marker sign boards marked ЗАПЯЖЕНО (CONTAMINATED) mounted on collapsible stakes. Features dual brackets for data slips (hazard type, dose rate, date/time) and a flashlight attachment point.



Kit Contents: Canvas transport bag containing 10 yellow sign boards, 5 flashlights (48-hour continuous runtime), 20 paper record cards, 2 pencils, ground stake, manual, and a canvas carrier with 10 aluminum stakes.

Visibility: Up to 200 m, at night – up to 100 m.

KPO-1M Environmental Sampling Kit

Purpose

Sampling soil, air, water, vegetation, and surface materials contaminated with radioactive substances, toxic chemicals, or biological agents for laboratory analysis.

Provides multi-matrix sampling across 10 points per area under any seasonal conditions in compliance with military/civil defense protocols.

Specifications



- weight, kg – 4.5
- dimensions: length, mm 320; width, mm 170; height, mm 230.

Subject to Order of the EMERCOM of Russia dated May 27, 2003 (as amended by Order # 410 dated March 10, 2006) *On Approval and Enforcement of the Rules for the Use and Storage of Personal Protective Equipment, Radiation and Chemical Reconnaissance Instruments, and Monitoring Devices*, the following requirements are established for the storage of radiation reconnaissance and monitoring instruments:

- They must be stored in heated premises in their original manufacturer packaging.
- Power supply units included with the instruments must be removed from the devices and stored separately.
- Direct-reading dosimeters included in personal dosimeter sets must be stored in a charged state.

Monitoring the technical condition of instruments can be carried out in two ways:

1. Inspection of packaging/containers and determination of the instrument condition by external appearance.
2. Periodic testing and calibration (verification of dosimetric instruments).

During external inspection, the following are checked:

- Condition of packaging, availability and completeness of items, condition of units, assemblies, and the instrument housing;
- Operational integrity of glass panels, position of the analog meter needle, serviceability of handles and toggle switches, absence of corrosion on the housing and metallic components;
- Expiration dates of reagents and power cells, condition of ampoules, coloration of indicator tube fillers;
- Operational performance of 5% of devices per batch;
- Availability and correct completion of technical documentation.

The schedules for inspections and storage of CBRN protection equipment are presented in Tables 2.2 and 2.3.

Table 2.2 – Schedule of Inspections, Laboratory Tests, Verifications, and Inspection Volumes for the Technical (Qualitative) Condition of Radiation and Chemical Protection Equipment

Equipment Category	Storage Inspection Frequency (% per batch)	Frequency of Laboratory Tests, Verifications, and Number of Samples Drawn from Manufacturer Batch for Control
1. Radiation Reconnaissance and Monitoring Instruments	Once per year, 5% of batch (minimum 2 crates)	Once every five years: 100% calibration/verification and preservation of all stored instruments
2. Chemical Reconnaissance Instruments	Once per year, 5% of batch (minimum 2 crates)	Once every five years: 100% performance verification, servicing, and replacement of component parts for stored instruments
3. Indicator Tubes (for VPKhR-type devices)	Once per year, 20 pcs per batch	First test: 6 months prior to expiration of guaranteed shelf life; thereafter, once per year (IT-44 indicator tubes: once every 6 months)

Table 3.3 – Recommended Designated Storage Lifespans for Personal Protective Equipment, Radiation, and Chemical Reconnaissance Instruments

#	Equipment Description	Recommended Designated Storage Lifespan (Years)
1	Exposure/dose rate meters for detecting and measuring radioactive radiation	25
2	Personal dosimeter sets for monitoring personnel radiation exposure	25
3	Power supply cells for exposure rate meters, chemical reconnaissance instruments, and personal dosimeter sets	2

4. Safety Instructions

Do not open the instrument casing. Prevent the instrument from being dropped.

5. Lab Methodology and Procedure

Task 1. Study the operating principles of ionizing radiation detectors.

Task 2. Review the list of radiation reconnaissance instruments required for a facility pursuant to the Methodological Recommendations for Developing the Nomenclatures and Storage Volumes of Radiation, Chemical, Biological, and Medical Protection Equipment within Civil Defense Reserves (Stavropol, 2010) and Methodological Recommendations for Determining the Nomenclature and Volumes of Material-Technical, Food, Medical, and Other Civil Defense Stockpiles Created by Federal Executive Bodies, Executive Authorities of Subjects of the Russian Federation, Local Authorities, and Organizations (Approved by EMERCOM of Russia, Dec 29, 2000).

Task 3. Study the design and operating procedure of the DP-5 exposure rate meter (Fig. 2.7).

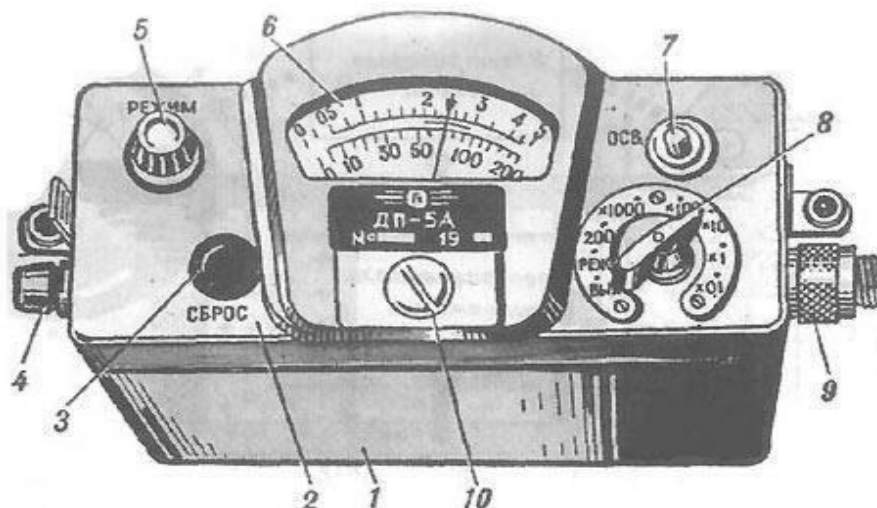


Figure 2.7 – Measuring Unit Panel of DP-5A Exposure Rate Meter

1 – Casing; 2 – Control Panel; 3 – Microammeter Reset Button; 4 – Headphone Jack; 5 – Operating Mode Adjustment Potentiometer Knob; 6 – Microammeter Analog Scale; 7 – Scale Backlight Toggle Switch; 8 – Sub-range Selector Switch; 9 – Probe Cable Quick-Disconnect Connector; 10 – Mechanical Zero Adjustment Screw

Preparation for Operation:

1. Unpack the instrument from the transit box, open the case cover, conduct a visual inspection, and attach the waist and shoulder straps.
2. Remove the probe or detection unit. Attach the handle to the probe, or attach the extension rod (used as a handle) to the detection unit.
3. Set the mechanical zero on the microammeter scale using the adjuster screw.
4. Install power supply cells.
5. Power on the device by setting the sub-range selector knob to: **Реж.** (Mode) on the DP-5A or **A** (Mode Check) on the DP-5V (the pointer must align within the mode sector).
6. On the DP-5A, use the potentiometer knob to align the meter needle with the **T** mark inside the mode sector. If the microammeter needle cannot reach the mode sector, replace the power supply cells.

Operational Check: Verify instrument functionality across all sub-ranges except the first (**200**) using the integrated check source. Set the probe shield to position **Б** (Beta) or detection unit shield to **К** (Check), and connect headphones. Turn the sub-range selector sequentially through **X 1000**, **X 100**, **X 10**, **X 1**, and **X 0.1**, observing meter deflection and listening for clicks in the headphones.

The meter pointer should peg off-scale on sub-ranges VI and V, deflect on sub-range IV, and may show minimal to no deflection on sub-ranges III and II due to lower activity of the beta reference source. After checking, turn the switch to **Выкл.** (Off) on DP-5A or **A** on DP-5V; press the **Reset** button; turn the shield back to position **Г** (Gamma). The instrument is now ready for operational use.

Measurement Protocols

1. Terrain Reconnaissance

- **Radiation levels 0.5 to 5 R/h:** Conduct measurements on the second sub-range (probe/detection unit remains inside the instrument case with shield set to **Г**).
- **Radiation levels 5 R/h:** Conduct measurements on the first sub-range (**200**).
- Maintain the instrument at a height of 0.7 to 1.0 m above ground level during measurement.

2. Surface Contamination Assessment

Determine radioactive contamination of human skin, clothing, livestock, vehicles, and equipment as follows:

1. Measure background gamma radiation at a distance of at least 15-20 m away from the object being inspected.
2. Move the probe (detection unit) with bumpers facing forward to within 1.5-2 cm of the object's surface (shield in position **Г**). Slowly sweep across the surface.
3. Subtract the background gamma value from the maximum measured surface dose rate. The net value indicates the degree of radioactive contamination.

3. Induced Activity & Beta Radiation Detection

- **Induced Activity:** To check equipment exposed to neutron radiation, take two readings: one outside and one inside the vehicle/structure. If readings are nearly identical, induced activity is present.
- **Beta Radiation:** Set the probe shield to position **Б** and hold 1.5-2 cm from the target surface. Turn the selector switch through **X 0.1**, **X 1**, and **X 10** until an on-scale reading is achieved. An increased reading compared to the pure gamma measurement indicates beta contamination.
- **Side-Specific Contamination:** For tarpaulins, thin walls, or structures transparent to gamma rays, take readings on both sides with the shield in positions **Б** and **Г**. The side yielding significantly higher readings in position **Б** is the contaminated surface.

4. Water Contamination Testing

Collect two samples totaling 1.5 to 10 L (one from the surface layer, one near the bottom). Place the probe with shield in position **Б** at a distance of 0.5-1 cm from the water surface and read values off the upper scale. Refer to the reference plates inside the instrument lid for allowable radioactive contamination limits and corresponding measurement sub-ranges.

Task 4. Study the rules for operating and storing radiation reconnaissance instruments

6. Lab Report Requirements & Format

The laboratory report must contain:

1. Title page
2. Objective of the work
3. Brief theoretical summary answering instructor-assigned study questions
4. Schematic diagram/sketch of the DP-5 instrument
5. Conclusions

7. Review Questions

1. What are the primary objectives of radiation reconnaissance, and by what methods is it conducted?
2. List the classification categories for dosimetric instruments and provide specific examples for each.
3. Describe the operating principles of ionizing radiation detectors.
4. Offer examples of radiation reconnaissance instruments: indicators, radiometers, spectrometers, and roentgenmeters.

Practical Class 5.4.2

Topic: Chemical Reconnaissance Instruments

1. Aim

To get to know the main instruments used for conducting chemical reconnaissance, acquire skills in using chemical reconnaissance instruments, and analyze the obtained results.

2. Theoretical Rationale

A chemical situation is created as a result of the release (spill) of hazardous chemical substances (HCS) into the atmosphere or onto the underlying surface during an accident (destruction) involving technological equipment, storage facilities, or tanks containing hazardous chemical substances. This leads to the formation of chemical contamination zones and chemical lesion areas.

Chemical Situation Assessment

Chemical situation assessment includes:

- Determining the scale and nature of chemical contamination.
- Analyzing the impact of contamination on the operations of facilities, Civil Defense (CD) forces, and the population.
- Selecting the most appropriate courses of action to prevent casualties.
- Assessment is carried out using forecasting methods and reconnaissance data.

Based on goals, methods, and timing, forecasting is divided into **advance (preliminary)** and **emergency (in an accident scenario)**.

Assessment at facilities with HCS involves determining the depth and area of contamination zones, the evaporation time and hazardous duration of substances, as well as potential casualties among personnel and the population. It is conducted primarily according to the Methodology for Forecasting the Scale of Contamination by Highly Toxic Substances in Accidents (Destructions) at Chemically Hazardous Facilities and Transport.

Key Tasks in Chemical Situation Assessment:

1. Determining potential casualties among the population, CD, and RSCHS (Unified State System of Prevention and Elimination of Emergency Situations) forces in lesion areas.
2. Determining the amount of contaminated people, equipment, transport, and other material assets requiring decontamination.
3. Determining the persistence (duration) of self-evaporation of toxic substances (TS) and HCS.
4. Determining the time required for a contaminated cloud to reach a specific line or facility.

Stages of Chemical Situation (CS) Detection and Assessment

- **Stage I – Advance detection and assessment based on forecasts:** based on the estimated parameters of chemical strikes and accidents, accounting for prevailing meteorological conditions. Data on probable chemical strikes from military districts, as well as information from the hydrometeorological service or aeroclimatic atlases, are used. The results are necessary for planning CD and RSCHS measures.
- **Stage II – Detection and assessment based on forecasts after strikes or accidents:** based on data from higher command authorities of RSCHS, military command, RCN (Radiation and Chemical Observation) posts, RCR (Radiation, Chemical, and Biological Reconnaissance) groups, hydrometeorological stations, facility duty officers, and real meteorological data. The results are required for making decisions on population protection and refining reconnaissance tasks.
- **Stage III – Detection and assessment based on reconnaissance data:** based on information regarding TS (HCS) concentrations at specific terrain points at a given time. The data are essential for conducting rescue and other urgent operations.

Key Tasks of Chemical Reconnaissance (CR):

- Detecting environmental contamination by TS and HCS, issuing warning signals.
- Determining the radiation dose rate, type, and concentration of TS/HCS.
- Monitoring the dynamics (decrease/increase) of substance concentrations.
- Sampling water, food, soil, and vegetation, and delivering them to institutions of the Observation and Laboratory Control Network (OLCN).
- Marking the boundaries of contaminated areas.
- Determining the direction of movement of contaminated air clouds.
- Finding bypass routes or directions to cross contaminated zones.
- Chemical monitoring of personnel, formations, and the population.
- Meteorological observation.

Table 3.1 – Chemical Reconnaissance and Monitoring Equipment

#	Name of Equipment	Unit	Allowance Rate	Recipient
1	Automatic military gas detector of GSA-3 type (or its modifications) or Kolion gas detector	set	1 to 10	Each transport reconnaissance team, each CBR reconnaissance group, each railway division, each categorized facility.
2.	Mini-express-laboratory of Pchelka type (VPHR)	set	1 to 10	Each RCN post, each transport reconnaissance team, each CBR reconnaissance group, each railway division.
3.	Universal gas monitoring device of UPGK type with a set of indicator tubes (or its modifications)	set	1–2	Each chemical scout of all formations, first aid detachment, CBR observation post, sanitary/special treatment point, decontamination team, protective shelter, food and water analysis laboratory.
4.	Meteorological kit of MK-3 type (or its modifications)	set	1–2	Each chemical scout, first aid detachment, CBR observation post, sanitary/special treatment point, railway division, each ZZPU (backup protected control point), and protective shelter.
5.	Portable warning sign kit of KZO-1 type	set	2	All communication and firefighting formations.
6.	Sampling kit of KPO-1M type	set	1–2	Each chemical scout, first aid detachment, CBR observation post, sanitary/special treatment point, railway division, each ZZPU.

3. Equipment and Materials: Chemical Reconnaissance and Control Instruments

Ion Mobility Spectrometers **SIP**



HazMatID (portable identifier): Designed for rapid (within seconds) identification of unknown liquids, powders, and solids without preliminary sample preparation. Weight: 23 lbs

Purpose

Responder RCI (portable spectrometer): Designed to detect solids, liquids, WMDs, and toxic industrial chemicals (including energetic materials). The database contains approximately 16,500 spectra. Analyzes substances through plastic and glass, works with aqueous solutions and mixtures (using Fourier-transform infrared spectroscopy).



Field Chemical Laboratories **(PHL-54-M, MPHL)**



Purpose

Detection of sarin, soman, VX, mustard gas, nitrogen mustard, BZ, hydrocyanic acid, arsenic-containing agents, pesticides, alkaloids, and heavy metal salts in water, loose food supplies, forage, terrain, and objects.

Specifications

Weight – 7.5 kg; operating temperatures from 0 to 40 °C;
detection time for TS in water – 0.4–1.2 h, in loose materials – 0.11–0.15 h.

Semi-Automatic Gas Detector Purpose

PGO-11



Periodic monitoring of air, terrain, equipment, and clothing for contamination by TS, toxic chemicals, and rocket fuel components (RFC) using indicator tubes (IT).

Specifications: Preparation and warm-up time – 10 minutes.

Indicator Tubes (IT-S2, IT-G1, Purpose

IT-2T)



Express determination of toxic gases and vapors in the air at special-purpose facilities and industrial plants.

Operating Principle: Based on the color change of the indicator mass upon contact with the analyzed substance. The length of the discolored layer or the color intensity indicates the substance concentration..

Here below come the devices that are to be available at the respective units subject to Order by EMERCOM of the RF of 23/12/2005 #999.

Automatic Military Gas Detector GSA-3



Purpose

Automatic continuous detection of sarin, soman, V-gases, lewisite, chlorine, and ammonia vapors with light and sound alarms.

Specifications: Weight – 0.9 kg; continuous operation time – 24 h; response time for organophosphorus agent vapors – 5 s. The ionization chamber operates using a ^{238}Pu ionization source. Included in the chemical observer vest kit.

Gas Detector Kolion



Purpose

Measurement of the total concentration of organic and inorganic substances (hydrocarbons, alcohols, ammonia, hydrogen sulfide, etc.) using the photoionization method.

Specifications

Explosion-proof execution (marking ExibIIBT4), equipped with visual and audible alarms for exceeding set thresholds.

Mini-Express-Laboratory

Pchelka-R



Purpose

Autonomous express monitoring of air pollution (12 components), water (6 components), soil, and agricultural products without requiring power supply.

Application

Situation assessment during accidents, workplace certification, monitoring of toxic chemical emissions.

Military Chemical Reconnaissance Device (VPHR)



Purpose

Detection of sarin, soman, mustard gas, phosgene, diphosgene, hydrocyanic acid, cyanogen chloride, VX, and BZ in the air, terrain, and equipment.

Operating Principle

Pumping air through indicator tubes using a manual piston pump. A heating element is used at low temperatures, and a protective cap nozzle is used when inspecting objects.

Universal Gas Monitoring Device UPGK (UPGK- LIMB)

Purpose

Operates in gas analyzer, leak detector (with measuring unit BI), and gas detector (with sampling unit BP and indicator tubes) modes.

Specifications

Measurement error not exceeding 25%; warm-up time – no more than 10 min.



Meteorological Kit MK-3

Purpose

Observation of wind speed/direction, air, and soil temperature.

Composition

Hand anemometer, sling psychrometer, pennant, compass, rhumb indicators, stopwatch, flashlight, folding pole, carrying bag. Total weight – 3 kg; deployment time – 8 min.



Portable Warning Sign Kit KZO-1

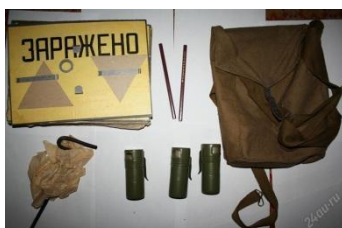
Purpose

Marking the boundaries of areas contaminated with radioactive materials and TS, as well as bypass directions.

Composition: 10 yellow signs with the inscription CONTAMINATED, 10 aluminum stakes, 5 flashlights (operating time up to 48 h), paper triangles for notes, pencils, a pin, a bag, and a cover.

Visibility

Daytime – up to 200 m, nighttime – up to 100 m.



Sampling Kit KPO-1M

Purpose



Sampling soil, air, and vegetation contaminated with radioactive materials, toxic chemicals, and biological agents at 10 points on the terrain for delivery to laboratories.

Specifications

Weight – 4.5 kg; preparation time – 2 min.

UG-2 and GANK-4 gas analyzers are used to measure hazardous chemical substances (HCS) indoors and in the field. The operating principle of the UG-2 gas analyzer (Figure 3.1) is based on drawing air containing harmful gases (vapors) through an indicator tube using an air sampling device (linear-colorimetric sampling method).

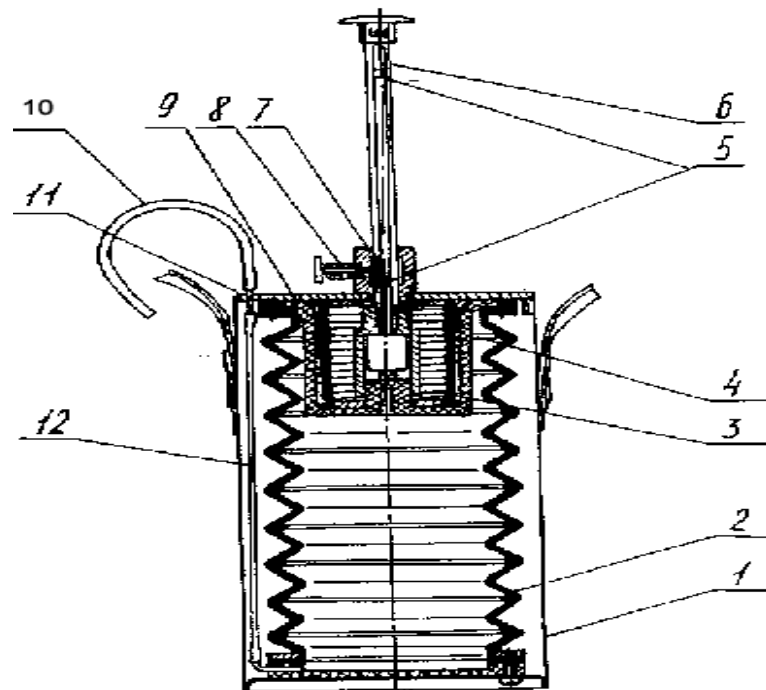


Рис. 12. Газоанализатор УГ-2

1 – корпус; 2 – сильфон; 3 – пружина; 4 – кольцо распорное;
5 – канавка с двумя углублениями; 6 – шток; 7 – втулка;
8 – фиксатор; 9 – плата; 10 – трубка резиновая; 11 – штуцер;
12 – трубка резиновая.

Figure 3.1 – UG-2 Gas Analyzer Construction: 1 – housing, 2 – bellows, 3 – spring, 4 – spacer ring, 5 – groove with two recesses, 6 – rod, 7 – bushing, 8 – retainer, 9 – plate, 10 – rubber tube, 11 – fitting, 12 – rubber tube.

The formation of a colored column in the indicator tube occurs as a result of a reaction between the analyzed gas (vapor) and the indicator tube filler reagent. This results in the formation of a colored product different from the original.

The length of the colored column of indicator powder in the tube is proportional to the concentration of the analyzed gas in the air and is measured on a scale calibrated in mg/m³. The colors of the indicator powders after drawing the analyzed air, the impurities captured during analysis by a special absorption tube, and the interfering impurities are specified in Table 3.2.

Table 3.2 – Colors of Indicator Powders After Drawing the Analyzed Air

Analyzed Gas, Vapors	Color of Indicator Powder After Analysis
Sulfur dioxide	White
Carbon monoxide	Brown (ring)
Hydrogen sulfide	Brown
Chlorine	Red
Ammonia	Blue
Gasoline	Light brown
Petroleum hydrocarbons	Light brown

On the cylindrical surface of the rod, there are 4 longitudinal grooves 5 with 2 recesses for fixing two positions of the rod using retainer 8. The distance between the recesses on the grooves is selected in such a way that when the rod moves from one recess to another, the bellows draws in a specified volume of analyzed air.

The GANK-4 gas analyzer is used for both continuous and instantaneous monitoring of harmful substance content in the air. The general view of the gas analyzer with a chemical cassette and a filter is presented in Figure 3.2.

The operation of the gas analyzer is carried out in automatic mode. The pump feeds the analyzed air through the inlet fitting of the gas analyzer to the sensor or the chemical cassette tape. During concentration measurements, the analyzed air enters through the inlet fitting to the sensor or chemical cassette.

Within a time of no more than 20 s (when measuring with a sensor) or no more than 30 s (when measuring with a chemical cassette), the signal enters the computing unit, which converts it and displays it on the indicator as the current concentration value, C_{cur} , and average concentration, C_{avg} , in mg/m³.

After displaying the C_{avg} concentration value, measurements are paused. To resume measurements with this averaging time, press the START button four times. In doing so, the C_{cur} and C_{avg} values are reset automatically.

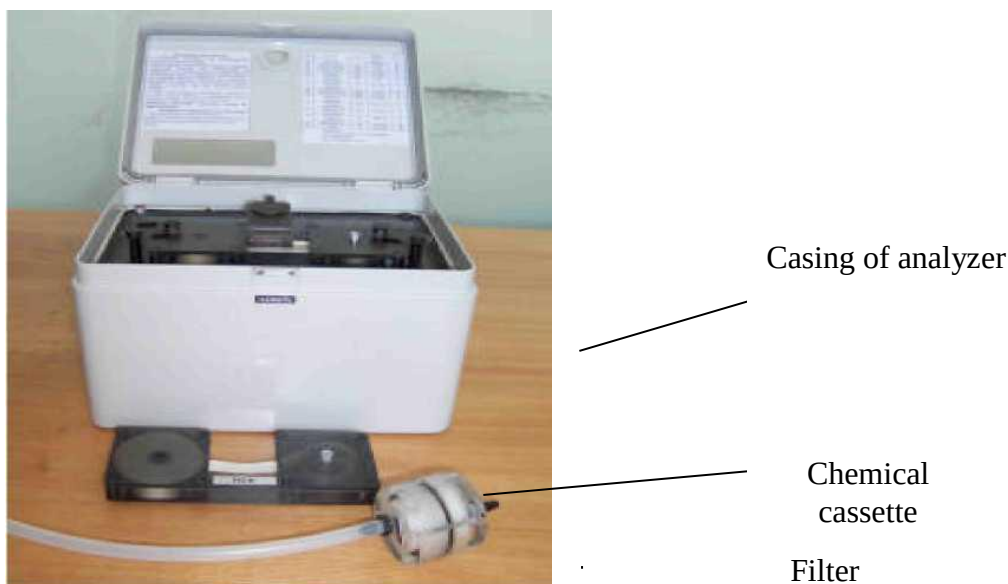


Figure 3.2 – General View of GANK-4 Gas Analyzer

The value of the average concentration during continuous measurement mode is determined by the formula:

$$C_{avg} = \frac{\sum_{i=1}^n C_{cur_i}}{n} \quad (3.1)$$

where n is the number of readings taken.

4. Safety Instructions

1. Before starting work, the instructor must check the students' understanding of the specifics and sequence of the experimental part of the work.
2. Proceed to measure the concentration of harmful substances in the air of the working area only after becoming familiar with the device, principle of operation, and knowledge verification by the instructor.
3. Before pouring powder into the indicator tube, compact the cotton plug thoroughly first.
4. When compressing the bellows with the rod, firmly hold the gas analyzer body to avoid mechanical injury.
5. When operating the GANK-4 gas analyzer, strictly follow the instructions indicated on the device.
6. When conducting measurements, handle the instruments with care, avoiding sharp jolts, and do not place them near powered electrical appliances and equipment.

5. Methodology and Procedure for Performing the Work

Task 1. Assess air quality using the UG-2 gas analyzer

1.1 Pour indicator powder, opened immediately before use, into a glass tube (closed on one side with absorbent cotton) up to the edge at the open end of the tube.

By tapping on the tube wall, compaction of the powder column is achieved, after which an identical plug of absorbent cotton is placed on top of the column. Poor compaction of the tube contents leads to an increase in the length of the colored column and blurring of its boundaries. The length of the compacted powder column in the tube should be 68–70 mm.

1.2 Preparation of the gas analyzer for operation. Before conducting analyses, check the tightness of the air sampling device. Prepare indicator tubes and filter cartridges from undamaged ampoules; when moving the gas analyzer from one room to another (with a different temperature), it is necessary to allow the indicator tubes to reach the ambient air temperature before starting the analysis.

1.3 Compress the bellows with the rod to the upper hole at a volume of 200 mm and fix this position with the retainer. Insert the tube with indicator powder into the end of the rubber tube. Hold the other end of the tube over the ammonia solution. Release the rod and record the time for it to fully rise. Measure the length of the colored powder layer using previously prepared measuring scales.

1.4 Measure concentrations of harmful substances (as assigned by the instructor) at various distances from the emission source. Complete Tables 3.3 and 3.5.

1.5 Plot graphs showing the concentration of harmful substances as a function of distance from the source.

1.6 Based on the research results and according to the task variant, determine the emission rate of the harmful substance, G , mg/h, using the formula:

$$G = \frac{C \cdot V \cdot 3600}{t}, \quad (3.2)$$

where C is substance concentration, mg/m³;

V – room volume, m³;

t – piston stroke time, s.

1.7 Record the calculation results in Tables 3.3 and 3.5.

Table 3.3 – Measurement Results (UG-2)

Distance from Source	Piston Stroke Time	Concentrations of Harmful Substances	Harmful Substance Emission Rate, G, mg/h
10 cm			
30 cm			
50 cm			

Task 2. Measure the concentration of harmful substances in the air using the GANK-4 gas analyzer

2.1 Install the chemical cassette for the substance being monitored.

2.2 Turn on the device using the POWER switch.

2.3 Set the substance code and object number using the CODE and START buttons.

2.4 Press the START button to begin measurements. Record the measurement results in Tables 3.4 and 3.5.

Table 3.4 – Measurement Results (GANK-4)

Current Value, C _{cur} , mg/m ³					Average Concentration Value, C _{avg} , mg/m ³
1	2	3	4	5	

6. Report Content and Structure

1. Title page
2. Objective of the work
3. Brief outline of theoretical material containing answers to the questions
4. Research results
5. Conclusions

Table 3.5 – Summary Table of Measurement Results

Substance being detected	Air Sample Volume, ml	Indicator Color		Concentration, mg/m ³			Hazard Class of the Substance
		Before	After	by UG-2	by GANK-4	MA C (PD K)	

Review Questions

1. What are the tasks of chemical reconnaissance?
2. What structures and forces are involved in conducting chemical reconnaissance?
3. Describe the operating principles of chemical reconnaissance instruments: physicochemical, thermochemical, colorimetric, chromatographic.

4. Characterize the stages of detecting and assessing the chemical situation.
5. What types of chemical classifications do you know?
6. What types of situations can form during accidents at chemically hazardous facilities?
7. What types of chemicals can be used as agents of weapons of mass destruction? What are the characteristics of the formation of a chemical contamination site during their use?
8. What factors can the chemical situation depend on?

Practical Class 5.4.3.

Topic: Personnel Action Methods under Conditions of Radioactive, Chemical, and Biological Contamination

1. Warning signals for radioactive, chemical, and biological contamination and their dissemination by various means.
2. Operating the DP-5V radiation reconnaissance instrument.
3. Operating the VPHR chemical reconnaissance instrument.

1. Theoretical Part

1.1. Warning Signals for Radioactive, Chemical, and Biological Contamination and Their Dissemination by Various Means

In the Russian military, unified and standing warning signals are used for radioactive contamination – Radiation Danger (Радиационная опасность), for chemical and bacteriological (biological) contamination – Chemical Alarm (Химическая тревога).

Warning signals are transmitted via all communication channels and duplicated using various acoustic and visual (light) signals.

Conditions Determining the Need to Issue Signals	Means of delivering signals				
	Technical Means		Acoustic/Visual		
	Radio	Telephone	Voice	Flares	Siren, Vehicle Horn
In case of an immediate threat or detection of radioactive contamination	Digital group	Radiation Danger	Commands	White light flares	Long intermittent siren (horn) blasts of 10–15 sec
In case of an immediate threat or detection of chemical and bacteriological contamination	Digital group	Chemical Alarm	Commands	SHT-40	Short intermittent siren (horn) blasts of 3–5 sec

Upon detecting radioactive contamination, the observer reports to the company (battery) commander and, upon their command, issues the Radiation Danger signal by voice, a series of white light flares, and striking a rail/bell (rynda). In platoons, observers duplicate the signal by voice, drivers use vehicle horns, and platoon (section) commanders issue the corresponding commands.

Upon detecting chemical contamination, the observer immediately gives the Chemical Alarm signal and only then reports to the company (battery) commander.

At the Radiation Danger or Chemical Alarm signal, personnel switch their personal protective equipment into the combat position, and if in the immediate vicinity of a shelter, enter the shelter.

Actions of Personnel Upon Warning Signals for Radioactive, Chemical, and Biological Contamination

In a combat situation, the observer conducts surveillance of the radiation and chemical situation in the designated sector, at established times, and during every enemy artillery barrage and air strike, switches on the radiation and chemical reconnaissance instruments, and monitors their readings.

Upon detecting an exposure dose rate of 0.5 R/h or more, the senior observer of the observation post (observer) reports to the commander who deployed the post and, upon their instruction, issues the Radiation Danger signal.

Upon detecting chemical contamination or signs of biological contamination, the senior observer (observer) immediately issues the Chemical Alarm signal and reports to the commander who deployed the post.

Warning personnel about enemy aircraft, the immediate threat or onset of the enemy's use of nuclear weapons, as well as CBR contamination, is carried out using unified and standing signals.

Warning Signals, Dissemination Procedures, and Actions of Personnel

Warning Signal	Signal Dissemination			Personnel Actions
	Via Communications / Voice	Via Technical Means	Via Improvised Means Available	
1. Notification of missile or air danger				
Air Raid Alarm	Attention! Air Raid Alarm! Air Raid Alarm!	Siren: continuous blast	Frequent strikes on a rail/bell or continuous vehicle horn for 0.5–1 min	Immediately enter a shelter, trench, slit trench, or any available cover.
2. Immediate threat or detection of radioactive contamination				
Radiation Danger	Attention! Radiation Danger!	Siren: series of short blasts	Infrequent strikes on a rail/bell or intermittent vehicle horn blasts	In open terrain, without stopping the execution of the assigned task,

Warning Signal	Signal Dissemination			Personnel Actions
	Via Communications / Voice	Via Technical Means	Via Improved Means Available	
	Radiation Danger!			immediately put on respirators (gas masks) and skin protection. In enclosed vehicles, shelters, and premises not equipped with filtered ventilation – gas masks (respirators) only. Radioactive contamination areas are crossed in vehicles at maximum speeds and increased distances. Drivers put on respirators (gas masks) during a short stop.
3. Warning of the threat or detection of chemical (biological) contamination				
Chemical Alarm	Attention! Chemical Alarm! Chemical Alarm!	40 mm reactive signal flare SHT-40. Siren: series of short blasts	Infrequent strikes on a rail/bell or intermittent vehicle horn blasts	In open terrain, without stopping the execution of the assigned task, immediately put on gas mask and skin protection. In enclosed vehicles, shelters, and premises not equipped with filtered ventilation – gas masks only. Drivers put on gas masks during a short stop.

2. Operation of Radiation and Chemical Reconnaissance and Control Instruments

2.1. Operation of the DP-5V Radiation Reconnaissance Instrument

The DP-5V portable dose rate meter is designed to measure the exposure dose rate of gamma radiation over radioactively contaminated terrain (objects), as well as to detect beta radiation.

Main Technical Data

- Measurement range:** From 0.05 mR/h to 200 R/h, divided into six sub-ranges.
- Basic measurement error:** No more than $\pm 30\%$.
- Reading stabilization time:** Does not exceed 45 s.
- Audio indication:** When headphones are connected, the device provides an audio signal on all sub-ranges except the first.
- Power supply:** From three KB-1 type cells. Using a voltage divider, an external DC power source with a voltage of 12 V or 24 V can be used.
- Instrument weight:** 3.2 kg.

Sub-ranges of the DP-5V Device

Sub-range	Switch Position	Scale	Measurement Limits
1	200	0...200	5...200 R/h
2	X 1000	0...5	500...5000 mR/h
3	X 100	0...5	50...500 mR/h
4	X 10	0...5	5...50 mR/h
5	X 1	0...5	0,5...5 mR/h
6	X 0.1	0...5	0,05...0.5 mR/h

Device Construction and Operating Principle

The instrument consists of a measuring console and a detection unit (probe) connected to the console via a flexible cable.

Inside the sealed detection unit, a beta radiation check source and a circuit board with Geiger-Müller counters and other elements are housed.

The unit has a rotating screen that can be fixed in positions **B** (Б), **G** (Г), and **C** (К). In position **G** (Г), the window in the detection unit body is closed. In this case, only gamma radiation is registered. In position **B** (Б), the window opens, allowing the registration of beta radiation as well. In position **C** (К), the check radiation source is set opposite the window.

For working with the detection unit, the set includes a telescopic extension rod, the length of which can be varied from 45 cm to 75 cm.

The operating principle of the DP-5V instrument is as follows:

Geiger-Müller counters SI-3BG and SBM-20, under the action of beta particles or gamma quanta, generate electrical pulses that enter the input of the amplifier-normalizer. The amplifier-normalizer with discharge circuits amplifies and normalizes the Geiger-Müller counter pulses in amplitude and duration, while the integrating circuit averages the pulse current. The averaged current, proportional to the exposure dose rate, is recorded by a microammeter.

Headphones are connected to the instrument when audio indication is required.

Preparing the Instrument for Operation

1. Perform a visual inspection of the instrument.
2. Set the switch knob to position **▲** (mode check).
3. Check the serviceability of the instrument on all sub-ranges: to do this, set the screen to position **C** (К) and connect the headphones.

Serviceability is monitored by clicks in the headphones and by the position of the microammeter needle. On the 5th and 6th sub-ranges, the needle should go off the scale; on the 4th sub-range, it should show a value within ± 30 of that specified in the device logbook under Verification of

Calibration During Periodic Maintenance (determined during the last calibration); on the 3rd and 2nd sub-ranges, the needle may not deflect due to insufficient activity of the check source.

4. Press the **RESET** (СБРОС) button; the needle should return to the zero mark of the scale.
5. Rotate the screen to position **G** (Γ) and set the switch knob to position **▲**. The device is ready for operation.

Procedure for Operating the Instrument

a) Measurements on Terrain

1. Place the detection unit (the screen of the unit must be set to position G [Γ]) in the lower compartment of the carrying case.
2. Position the device at a height of ~ 1 m from the ground surface.
3. Perform measurements starting from the 1st sub-range.
4. On sub-range 1, readings are read from the 0...200 microammeter scale. On the remaining sub-ranges, readings are read from the 0...5 microammeter scale and multiplied by the multiplier of the corresponding sub-range.

b) Measuring the Degree of Radioactive Contamination of Various Objects

1. Prepare the instrument for operation.
2. Measure the gamma radiation dose rate, P_{meas} , on the surface of the object being inspected. The detection unit is positioned at a distance of 1–1.5 cm from the inspected surface; if necessary, an extension rod can be attached to the detection unit.
3. Measure the background gamma radiation, P_{bg} . Measurements are taken at a distance of 15–20 m from the inspected object at a height corresponding to the first measurement; the screen of the detection unit must be set to position G (Γ).

Uneven contamination of the object, as well as differences in the accepted average shielding factor (by type of equipment), can reduce the reliability of contamination monitoring results.

It should be noted that monitoring radioactive contamination of an object at a radioactively contaminated airfield is carried out only if the external gamma source does not exceed the safe contamination level of the object by more than three times.

When determining the surface contamination of vehicle bodies, packing crate walls, and walls or partitions of other objects transparent to gamma radiation, it is sometimes necessary to know which specific surface is contaminated.

If the screen of the detection unit is set to position B (Б) and the reading is noticeably higher than when set to position G (Γ), the radioactive products are located directly on the inspected surface (i.e., the surface is contaminated). If both readings are identical, there are no radioactive substances on the inspected surface; in this case, inspect the opposite side of the object in the same order.

Measurements with the detection unit screen open (B) should also be performed when checking for body surface contamination on personnel. If the readings in positions G and B are identical, the radioactive substances are inside the body.

2.2. Operation of the VPHR Chemical Reconnaissance Instrument

The Military Chemical Reconnaissance Device (VPHR) is designed to detect sarin, soman, mustard gas, phosgene, diphosgene, hydrocyanic acid, cyanogen chloride in the air, on terrain, and on military equipment, as well as VX vapors in the air.

Kit Composition

Carrying case with lid, shoulder strap and waist strap, pump, pump nozzle, protective caps (8 pcs.), PDF-1 anti-smoke filters (10 pcs.), chemical heater with a pin, heater cartridges (10 pcs.), flashlight, shovel, indicator tubes IT-51 (10 pcs.), IT-45 (10 pcs.), IT-36 (10 pcs.), VPHR handling instruction cards (2 pcs.), certificate, technical description, and operating instructions.

To detect chemical agents (CWAs), the device uses indicator tubes:

- **IT-44** (red ring and red dot) – for detecting organophosphorus agents (GA, GB, GD, VX);
- **IT-45** (three green rings) – for detecting phosgene, diphosgene, hydrocyanic acid, cyanogen chloride;
- **IT-36** (one yellow ring) – for detecting mustard gas.

Technical Specifications

- **Device sensitivity:** Determined by the sensitivity of the indicator tubes (IT).
- **Detection time in air:** Depends on ambient temperature, taking approximately 5 min at temperatures above +5 °C and about 6–7 min at temperatures below +5 °C.
- **Pump displacement:** Delivers 1.8–2 liters of air at 50–60 strokes/min.
- **Weight of the set:** 2.3 kg.

Operating Principle

The principle of operation consists of drawing analyzed air through pre-prepared indicator tubes using a hand pump.

Ten indicator tubes (IT) with identical markings are stored in a paper cassette. The front side of the cassette features a colorimetric standard, brief operational instructions for the indicator tube, manufacturing date, and shelf life.

Signs of Persistent Chemical Agent Use:

- Presence of oily drops, spots, splashes, puddles, or streaks on ground, snow, vegetation, equipment, gear, and items;
- Discoloration or wilting of vegetation.

Operating the VPHR

1. Check the presence and condition of all items included in the set; verify that they are securely attached.
2. Remove the polyethylene cover from the anti-smoke filters.
3. Check pump operation and flashlight functionality (if needed).
4. At temperatures below 15 °C, activate the chemical heater.

If CWA presence in the air is suspected, put on a gas mask and test the air using indicator tubes. Test first using tubes with a red ring and dot, then tubes with three green rings, and lastly, tubes with a yellow ring.

The heater of the device should be used:

- To thaw ampoules inside indicator tubes;
- To heat IT-44 (for organophosphorus agents) at temperatures below 5 °C;
- To heat IT-36 (for mustard gas) at temperatures below 15 °C.

CWA Detection in Air

Detection using indicator tubes involves comparing the time during which the color persists in the control and test tubes. If the color persists longer in the test tube than in the control tube, a chemical agent is present in the air.

CWA Detection in Smoke

When detecting CWAs inside a smoke cloud, the pump nozzle with an anti-smoke filter must be used, as smoke obscures the color change of the indicator tube filler caused by the toxic agent.

CWA Detection in Soil and Loose Materials

Prepare the device for operation, remove the shovel from the case, take a soil or loose material sample at the most contaminated spot, pour it into the pump funnel until full, cover the funnel with an anti-smoke filter, and secure the filter.

Further detection is conducted in the same order as testing CWAs on various surfaces.

Protective caps and anti-smoke filters are discarded after detection.

3. Practical Tasks

- **Task 1.** Describe personnel actions upon receiving various warning signals (by variant).
- **Task 2.** Prepare the DP-5V instrument for operation and check its functionality.
- **Task 3.** Perform measurements on terrain.
- **Task 4.** Conduct measurements of radioactive contamination on various objects.
- **Task 5.** Perform CWA detection in air.
- **Task 6.** Perform CWA detection in soil and loose materials.

4. Review and Competency Assessment Questions

1. Purpose, specifications, and kit composition of the DP-5V dose rate meter.
2. Operating procedure for the DP-5V.
3. Purpose, specifications, and kit composition of the VPHR chemical reconnaissance device.
4. Operating procedure for the VPHR.

5. Recommended Literature

1. *Radiation, Chemical, and Biological Protection: Textbook*. I. Lepeshinsky, V. Kutepov – Moscow: INFRA-M, 2021, pp. 65–85.
2. *Radiation, Chemical, and Biological Protection: Textbook*. Yu. B. Bayramukov, M. F. Anakin, V. S. Yanovich [et al.]; ed. by Yu. B. Torgavanov. – Krasnoyarsk: Siberian Federal University, 2015, pp. 111–127.

Practical Class 5.5.1

Topic: Work with Graphic Documents

1. Tactical conventional symbols, their classification, and the procedure for plotting them on a map.
2. Determination of geographic and rectangular coordinates.
3. Identification of distances to targets and plotting them on a map.

Theoretical Part

1.1. Tactical Conventional Symbols

Tactical conventional symbols are used to indicate the location of troops, command posts, the nature of troop actions, and other elements of the combat situation on maps and other graphical documents. By purpose and geometric properties, they are subdivided into scaled, non-scaled, and combined symbols.

- **Scaled conventional symbols** are used to indicate the location of troops, the scope of their actions, firing positions of artillery subunits (units), positional areas of missile troops, lines for various purposes, trenches, areas and sectors of artillery fire, nuclear strikes, and other objects that can be displayed to the map scale due to their dimensions (occupied area, length).
- **Non-scaled conventional symbols** are used to indicate the location of targets and objects (single tanks, IFVs, guns, observation posts and stations, artillery and mortar platoons and batteries at firing positions, etc.) that cannot be expressed to the map scale.
- **Combined conventional symbols** represent a combination of scaled and non-scaled symbols; for example, the conventional symbol anti-tank reserve firing line is plotted on a map: to scale for the frontal extent of the line, and non-scaled for the type of anti-tank weapons.

The location of targets and objects plotted on a map with non-scaled conventional symbols usually corresponds to the center of the symbol figure, and for command posts, to the lower end of the flagstaff.

Color Coding Standards

The position, tasks, and actions of **friendly** motorized rifle, tank, airborne, and aviation subunits (units), their command posts, and rear subunits (units) are plotted in **red**;

Missile, missile-technical, artillery, anti-aircraft, engineering, chemical, radio-technical subunits and units, communications, electronic warfare, road and railway troops, and other special troops, their command posts, rear subunits (units), engineering structures, obstacles, etc. – in **black**;

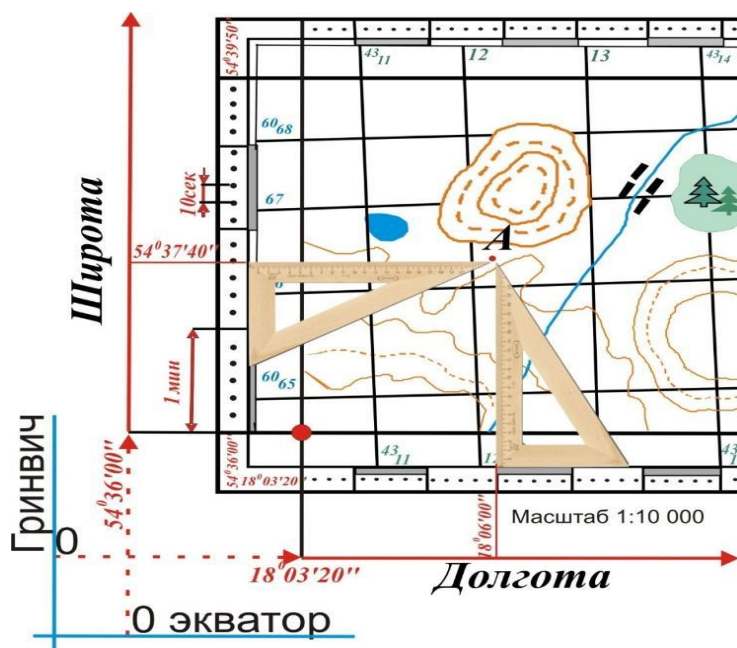
Data on the **enemy** are plotted using the same conventional symbols as friendly troops, but in **blue**.

Numbering, designations of subunits (units), and explanatory inscriptions relating to friendly troops are written in **black**, and those relating to enemy troops in **blue**.

a) Determination of Geographic Coordinates of a Point on a Map

To determine latitude: using a set square (triangle), drop a perpendicular from point A onto the minute frame line of latitude and read the corresponding degrees, minutes, and seconds on the right or left latitude scale.

To determine longitude: using a set square, drop a perpendicular from point A onto the minute frame line of longitude and read the corresponding degrees, minutes, and seconds on the top or bottom longitude scale.



b) Determination of Rectangular Coordinates of a Point on a Map

The rectangular coordinates of a point (X, Y) on a map are determined within a grid square of the kilometer grid as follows:

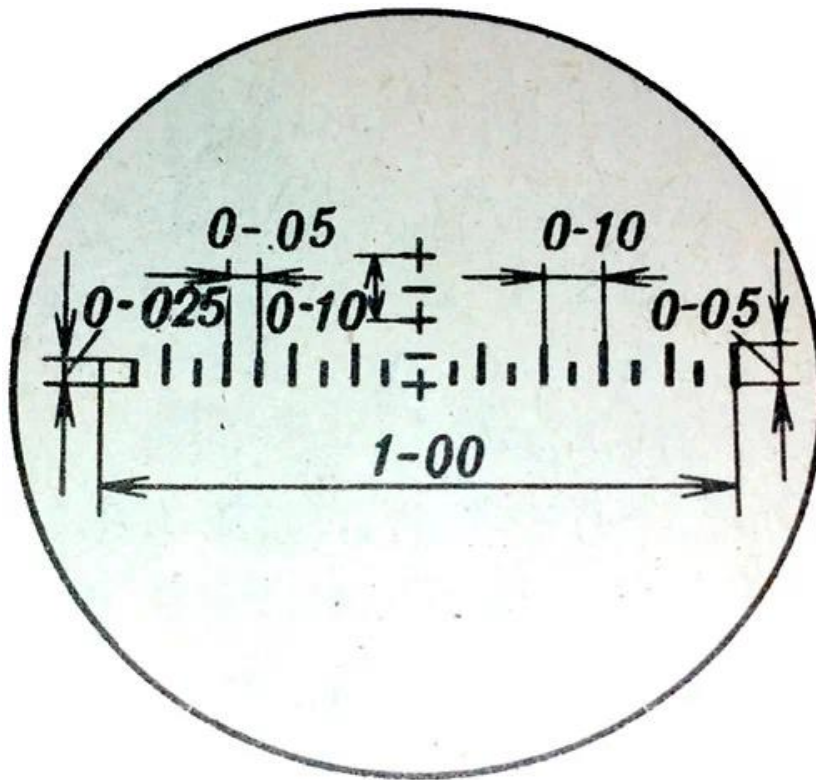
1. Using a set square, drop perpendiculars from point A onto the X and Y lines of the kilometer grid.
2. Read the values:

$$XA = X_0 + \Delta X; YA = Y_0 + \Delta Y$$

Example: The coordinates of point A are:

- $XA = 6065 \text{ km} + 0.55 \text{ km} = 6065.55 \text{ km};$
- $YA = 4311 \text{ km} + 0.535 \text{ km} = 4311.535 \text{ km}$ (the coordinate is reduced).

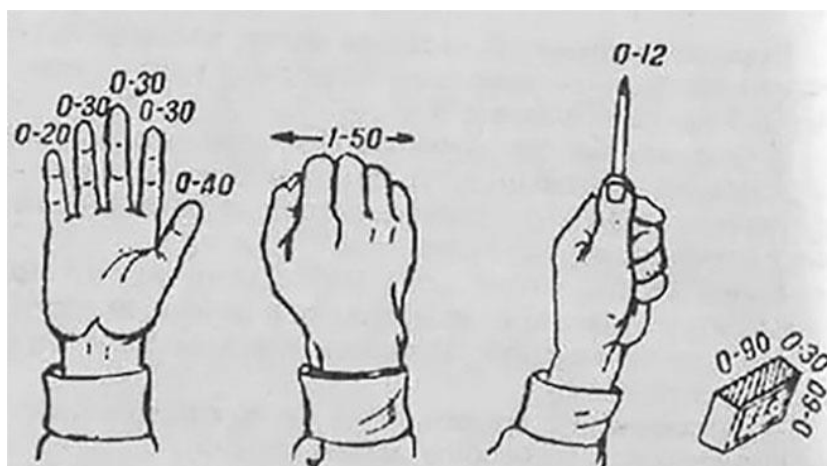
Point A is located in Zone 4, as indicated by the first digit of the reduced Y coordinate.



The angular size of an object in mils can be determined using field binoculars or another observation device. The field of view of binoculars contains a reticle scale, which features mutually perpendicular goniometric scales. The value of one large division of the scale corresponds to 10 mils (0-10), and a small division corresponds to 5 mils (0-05)

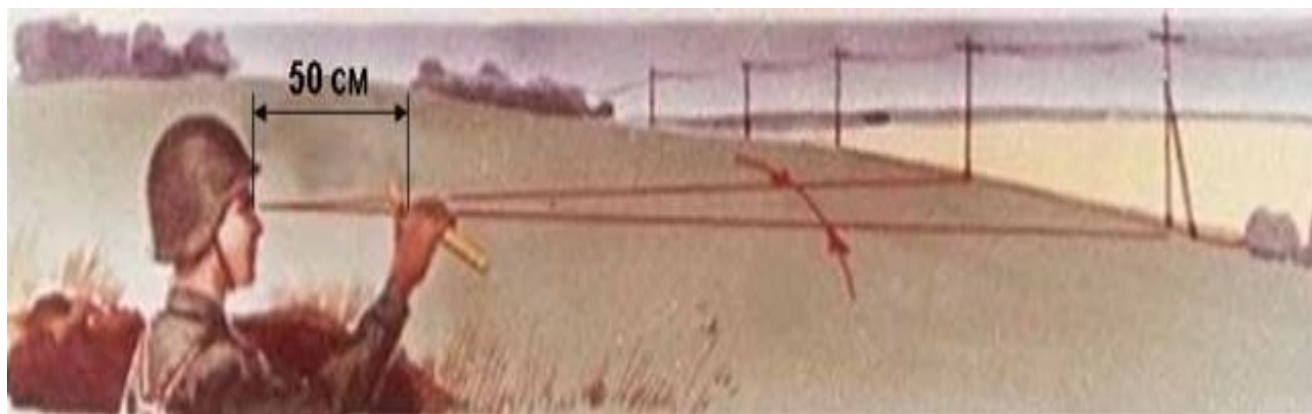
In case there are no observation devices available, angular sizes can be measured using improvised objects (pencil, matchbox, ruler, as well as fingers and palm). To do this, remember their values in mils. At an arm's length (approximately 50 cm) from the observer's eye, the angular sizes of these items are:

- Pencil: 0-10
- Match (thickness): 0-3.5
- Thumb: 0-40
- Index finger: 0-30
- Middle and ring fingers together: 0-35
- Little finger: 0-25
- Matchbox:
 - Length: 0-90
 - Width: 0-60
 - Height: 0-30



Determining distances based on the linear dimensions of objects is performed as follows. Using a ruler positioned at a distance of 50 cm from the eye, measure the height (width) of the observed object in millimeters. Then, divide the actual height (width) of the object in centimeters by the value measured on the ruler in millimeters, multiply the result by the constant number 5, and obtain the target distance in meters:

$$D = \frac{\text{Высота предмета (см)}}{\text{Визмеренная (мм)}} \cdot 5$$



Determining distances based on the angular size of objects yields accurate results only if the linear dimensions of the target are known and the angular measurements are performed carefully.

Name of Object (Local Feature)	Dimensions (Averaged) in meters DOCX		
	Height	Length (without gun)	Width
Tank	2.4	7.6	3.5
IFV (Infantry Fighting Vehicle)	2.6	6.8	3
APC (Armored Personnel Carrier)	2.1	6.7	3
Telegraph pole	6	—	—
Wire obstacle posts	1.5	—	—
Kilometer posts	2	—	—
High-voltage power line pylons	25	—	—
High-voltage line masts	10	—	—

4. Examples of Problem Solving

Problem 1. Determine the distance to an enemy ATGM (anti-tank guided missile) position located at a line of telegraph poles.

Solution: The distance between the poles is 50 m. It is covered by large divisions of the horizontal reticle scale (20 mils or 0-20). Distance to the ATGM:

$$D = \frac{B \times 1000}{Y} = \frac{50 \times 1000}{20} = 2500 \text{ m}$$

where B is the distance between the poles, and Y is the angle in mils subtended by the target.

Problem 2. Determine the distance to the telegraph line.

Solution: The distance between telegraph poles equal to 50 m covers a 10 mm segment on the ruler. Consequently, the distance to the telegraph line is equal to:

3. Classroom Practical Tasks

Task 1. Plotting tactical symbols on a map (overlay) and determining geographic and linear coordinates of objects on the map.

Task 2. Determining distances using angular sizes.

Task 3. Determining distances using linear sizes.

4. Tasks and Questions for Competency Development and Assessment

1. What is the step-by-step algorithm for determining geographic coordinates?
2. What is the step-by-step algorithm for determining linear coordinates?
3. What does the mils formula determine?

Recommended Literature

1. *Military Topography: Study Guide*. L. S. Shuldeshov. — Moscow: KNORUS, 2019, 164 p.

Practical Class 5.6.1

Topic: Terminal States. Clinical Death. Principles and Methods of Resuscitation

Aim

Practice cardiopulmonary resuscitation skills with the ability to monitor execution quality using a mannequin trainer.

Video Resource Links

1. [Course Lectures: First Aid Provision](#)
2. [10 Common Errors in First Aid](#)
3. [Basic Cardiopulmonary Resuscitation](#)
4. [Asthma: First Aid for Asthma Attacks](#)
5. [Seizures and Epilepsy First Aid](#)
6. [Stroke: First Aid for Stroke](#)
7. [Heart Attack First Aid](#)

Theoretical Part

Terminal states are pathological conditions based on progressing tissue hypoxia (primarily affecting the brain), acidosis, and intoxication caused by metabolic breakdown products.

Acidosis (from *Lat. acidus – sour*) is a shift in the body's acid-base balance toward increased acidity (decreased pH).

The most critical factor is the decline of central nervous system functions. Progressing hypoxia and subsequent anoxia in brain cells (primarily the cerebral cortex) lead to a transition from oxidative metabolism to glycolytic metabolism. This results in impaired ATP synthesis and ion gradient disruption, free radical formation, and increased cell membrane permeability. These metabolic disturbances cause destructive changes in cells, manifesting as hydropic degeneration. These changes are reversible and do not pose life-threatening conditions if normal oxygen supply to tissues is restored. However, with continued anoxia, they progress to irreversible degenerative changes accompanied by protein hydrolysis and subsequent autolysis.

Anoxia is the complete or partial (hypoxia) absence of oxygen supply to brain tissues for a duration exceeding the survival time of neurons. Brain tissues can survive without oxygen supply for 4–5 minutes; after this period, brain tissue damage begins to occur. The subcortical region and spinal cord can function slightly longer under glycolytic metabolism. The longer the duration of anoxia, the greater the level of tissue damage. For instance, after 15 minutes without oxygen, approximately 95% of brain tissue dies.

Autolysis (of *Greek origin, literally meaning self-digestion*) is the property of biological structures to undergo hydrolytic breakdown via their own enzymes and phagocytes.

The severity and duration of terminal states depend on the severity and speed of hypoxia and anoxia development.

Conditions Classified as Terminal States:

- Severe shock (Grade IV shock);
- Out-of-bounds / profound coma;
- Collapse;
- Pre-agonal state;
- Terminal pause;
- Agony (agonal state);
- Clinical death.

Stages of Terminal States:

1. **Preagonal state:** Characterized by respiratory distress, rapid pulse, pale skin, and confusion.
2. **Terminal / Agonal pause:** Does not always occur. Clinically manifests as respiratory arrest and transient periods of asystole lasting from 1–2 to 10–15 seconds. During the agonal state, severe skin pallor and irregular respiration are observed; the pulse is undetectable, and the pupils are dilated. Pre-agonal and agonal states can last from several minutes to several hours (sometimes extremely brief and difficult to monitor).
3. **Clinical death:** Respiration is absent, pulse is undetectable, skin is pale, and pupils are dilated and unresponsive to light.

The preagonal state is characterized by respiratory disorders, frequent pulse, pale skin, and confused consciousness.

The terminal or agonal pause does not always occur. Clinically, it manifests as respiratory arrest and transient periods of asystole lasting from 1-2 to 10-15 seconds. In the agonal state, marked pallor of the skin is observed, and breathing is arrhythmic. The pulse is not palpable (determined). The pupils are dilated. The preagonal and agonal states can last from several minutes to several hours (sometimes they can be very brief, so it is not always possible to track them).

Clinical death: breathing is absent, the pulse is not determined, the skin is pale; the pupils are dilated and do not react to light.

Severe shock, beyond-limit coma, and collapse can transition into a state of clinical death or other terminal states, whereas shock, coma, or collapse do not necessarily have to precede the preagonal state, terminal pause, agony, and clinical death. During the terminal period, severe pathophysiological (pathofunctional) disorders occur in all tissues and organs. Sometimes the terminal period is so prolonged and severe that an irreversible state develops in the cerebral cortex,

when resuscitation measures become meaningless and resuscitation of a person is impossible even after several seconds of clinical death.

Signs of Biological Death

Biological death follows clinical death when irreversible processes have occurred in the body and providing aid is futile:

1. Clouding and drying of the cornea;
2. Presence of the cat's eye sign (pupil deforms and resembles a cat's pupil when the eyeball is squeezed);
3. Cooling of the body (starting with the extremities) and appearance of livor mortis (blue-violet spots on the skin);
4. Rigor mortis, occurring 2–4 hours after death.

Resuscitation is a complex of measures aimed at restoring the lost vital functions of the body: respiration, blood circulation and consciousness; it is effective only in case of sudden death and has no prospects for gradually fading patients with long-term debilitating and incurable diseases. Resuscitation should be performed as quickly as possible so that irreversible brain death does not occur (3-5 minutes). An indication for resuscitation is the presence of pre-diagonal, atonal conditions or clinical death in the patient. Resuscitation measures are not provided to patients with life-threatening injuries, terminal incurable diseases, or cancer patients with metastases. Intensive care consists of several stages and includes several important rules. Moreover, their observance, as well as the sequence of stages, is mandatory, as their effectiveness depends on it. In case of cardiac arrest and loss of consciousness, resuscitation measures should be initiated immediately. According to the recommendations of the Institute of General Resuscitation of the Russian Academy of Medical Sciences, the rules for resuscitation approved by the American Heart Association and the European Resuscitation Council, only qualified specialists can practice precordial impact. If cardiac activity has not recovered, it is immediately necessary to start indirect heart massage and artificial ventilation. In adults, cardiopulmonary resuscitation is performed in a 30:2 ratio. That is, after 30 chest compressions (pressures), 2 ventilators should be taken. At the same time, it is necessary that the respiratory tract (mouth and nose) be free for air passage. Otherwise, they must be sanitized – cleaned of foreign bodies, liquids, etc.

As for children in the first 5 years of life, cardiopulmonary resuscitation is carried out in a ratio of 5:1, and precordial strokes are not performed. Resuscitation measures cannot be stopped for more than 30 seconds. It is during this time that tracheal intubation should be performed or a defibrillator should be prepared for discharge. Resuscitation measures should be carried out before signs of

cardiac activity and independent breathing appear. Otherwise, if these measures are ineffective for at least 30 minutes, resuscitation is stopped. The continuity of cardiopulmonary resuscitation and other resuscitation measures lies in the fact that, in case of successful recovery, intensive treatment of the main disorders of the body must begin, with constant support (if necessary) of blood circulation and respiration.

Primary ABC Resuscitation Complex (Pre-Hospital Stage)

- **A – Airway:** Ensuring airway patency.
- **B – Breathing:** Artificial respiration.
- **C – Circulation:** Restoring blood circulation.

(Authored by Peter Safar, American professor and founder of modern resuscitation science).

Primary CPR Algorithm

1. **Airway Restoration:** Achieved by tilting the head back, lifting the lower jaw forward, opening the mouth, and clearing foreign material from the oral cavity.
 2. **Artificial Respiration:** Conducted by blowing exhaled air into the victim's lungs (exhalation occurs passively). Restoring spontaneous breathing quickly restores other functions, as the respiratory center acts as the brain's pacemaker.
 3. **Circulation Restoration:** Conducted via external (closed) chest compressions.
- Every 2–3 minutes, evaluate resuscitation effectiveness for a few seconds: check the carotid pulse, pupil condition, and return of spontaneous breathing.
- If pulse and breathing return, monitor parameters until emergency medical services arrive.
 - If cardiac activity returns without breathing, continue artificial ventilation.
 - If both breathing and pulse are absent, continue CPR until emergency personnel arrive.

Signs of Resuscitation Effectiveness

1. Appearance of sinus cardiac rhythm;
2. Restoration of circulation with blood pressure registered at no less than 70 mmHg;
3. Pupil constriction and light reflex recovery;
4. Normalization of skin color;
5. Resuscitation of spontaneous breathing.

Signs of Recovery

6. Reduction of cyanosis and pallor;
7. Appearance of spontaneous breaths;

8. Constriction of previously dilated pupils;
9. Presence of carotid and femoral arterial pulses independent of chest compressions.

Common Errors During Artificial Ventilation:

1. Head not fully extended back (air enters the esophagus and stomach);
2. Failure to pinch nostrils during mouth-to-mouth ventilation;
3. Failure to open the mouth during mouth-to-nose ventilation;
4. Unsynchronized breathing rhythm with chest compressions;
5. Premature termination of artificial ventilation.

Common Errors During Chest Compressions:

1. Performing compressions on a soft or springy surface;
2. Applying pressure off-center from the sternum;
3. Insufficient or excessive compression force;
4. Prolonged interruptions in compressions (5 seconds).

Practical Training Equipment

CPR skill training with performance monitoring is conducted using an interactive adult male mannequin simulator integrated with the Reanim-1.01 software and hardware interface complex. (Figure 1.1)



Figure 1.1 – Interactive adult male CPR simulator integrated with the Reanim-1.01 interface system

Practical CPR Techniques on the Simulator

1. **Ensuring Correct Head Position**
 - Place one hand on the forehead.
 - Place the other hand under the neck and clasp it with fingers.
 - Tilt the head backward until the tilt angle reaches 15° – 20° . (Figure 1.2)

When executed correctly, the green Correct Position light indicator illuminates on the control panel.

Warning: Excessive force during head extension can damage the simulator mechanism (corresponding to a cervical spine fracture in a real human).



Figure 1.2 – Ensuring correct head position

2. Loosening the Waist Belt

Unbuckle the simulator's waist belt. Upon execution, the green light indicator on the control panel illuminates. (Figure 1.3).



Figure 1.3 – Loosening the waist belt

3. External Chest Compressions

- Locate the xiphoid process at the bottom of the sternum by touch.
- Position hands approximately 3–4 cm (two finger widths) above the tip of the xiphoid process. Align the heel of the lower hand with the axis of the sternum.
- Place the heel of the second hand on top at a 90° angle, keeping fingers extended.
- Keep elbows straight, positioning arms vertically at a 90° angle to the anterior chest wall.
- Compress to a depth of 3–5 cm with an applied force of 25±2 kg/s.
- Perform compressions at a rate of 80 compressions/min (at least two compressions per second).



Figure 1.5 – External chest compressions

Note! When performing chest compressions, it is necessary to maintain the correct frequency and rhythm of compressions.

When this procedure is performed correctly, the green Hand Position light indicator illuminates on the light indication panel of the remote electrical controller.

If insufficient pressure is applied to the sternum of the robotic trainer, the light signals are not activated. If the hands are positioned incorrectly on the sternum or shift during a compression stroke, the red Hand Position light indicator flashes on the light indication panel of the remote electrical controller.

If the force applied during compression to the sternum exceeds 32 kg/s (sternal displacement inward toward the spine by more than 5 cm), two red Rib Fracture light indicators activate and start flashing on the light indication panel of the remote electrical controller.

4. Artificial Ventilation (Mouth-to-Mouth).

- Fix the mannequin's head in the correct position.
- Place a hygienic sanitary face napkin over the facial part of the robotic trainer's head (Figure 1.5).
- Pinch the nose using the thumb and index finger of one hand (Figure 1.6).
- Take a deep breath, press your mouth against the forehead of the robotic trainer, and ensure a complete seal (Figure 1.7).



Figure 1.5 – Position of the hygienic single-use sanitary face napkin



Figure 1.6 – Hand position during artificial ventilation



Figure 1.7 – Performing artificial ventilation

- Exhale forcefully into the victim's mouth. The volume of air delivered to the victim in a single breath must be no less than 400–500 cm³.
 - When this procedure is performed correctly, the green Normal Air Volume light indicator illuminates on the light indication panel of the remote electrical controller.
- 5. Checking for pulse presence and pupil condition of the victim (Figure 1.8).**

Using the Change Mode buttons on the electrical controller, select the Pulse mode. The green light indicator for the corresponding mode of the robotic trainer will illuminate, and an audible signal will sound. To activate the selected mode, press the Enter button.



Figure 1.8 – Checking for pulse

- On the light indication panel of the remote electrical controller, the Pulse Presence light indicator illuminates.
- Locate the carotid pulse on the anterior surface of the neck using finger pads.

Equipment and Materials

Interactive multifunctional robotic trainer of an adult male victim integrated with the Reanim-1.01 interface software and hardware complex; set of sanitary napkins for artificial ventilation.

Safety Instructions

When doing the laboratory work, safety requirements for laboratory presence must be observed. Students who have completed the safety briefing for work in the laboratories of the Emergency Protection Department are admitted to work.

Tasks

- **Task 1.** Study cardiopulmonary resuscitation techniques using the interactive multifunctional robotic trainer of an adult male victim. Practice individual CPR techniques in training/demonstration mode:
 1. Single-rescuer resuscitation mode (2:15)
 2. Two-rescuer resuscitation mode (1:5)
 3. Resuscitation mode (2:30) recommended by the European Resuscitation Council (ERC)
 4. Resuscitation mode (30:2) recommended by the European Resuscitation Council (ERC)

5. EXPERT resuscitation mode, allowing CPR performance without visualization of actions, followed by a summary report on the completed exercise

Task 2. Complete Table 1.1.

Table 1.1 – Resuscitation Measures

Indications for Use (Symptom Complex)	Contraindications for Use (Symptom Complex)
n..	
1.	
2.	

Task 3. Complete Table 1.2.

Table 1.2 – Causes of Circulatory Arrest

Cardiac Causes	Non-Cardiac Causes
1.	
2.	
3.	

Task 4. Complete Table 1.3.

Table 1.3 – Monitoring the Effectiveness of Resuscitation Measures

Effectiveness of Resuscitation Measures			
Signs of Resuscitation Effectiveness	Signs of Recovery	Main Errors During Artificial Ventilation	Main Errors During External Chest Compressions
1.			
2.			
3.			
4.			
5.			

Task 5. Solve situational scenarios

1. At a bus stop, a man standing nearby turned pale and fell. He is unconscious; his skin is pale with a grayish tint; pupils are dilated and unresponsive to light.

Select the correct steps and arrange them in order of priority:

- Call for an ambulance;
- Verify the absence of a carotid pulse and pupil response to light;
- Call bystanders for help;
- Determine signs of breathing using cotton fibers or a small mirror;
- Deliver a precordial thump;
- Begin cardiopulmonary resuscitation;
- Attempt to ascertain what the man is complaining of;

- Question bystanders in detail about what preceded the loss of consciousness;
 - Turn the victim onto his stomach;
 - Apply cold to the head (a plastic bag with snow or water);
 - Hold cotton wool soaked in liquid ammonia near his nose.
- 2. The victim is motionless and unresponsive to verbal calls. Visible breathing is absent. Radial and carotid pulses are undetectable.**
- Determine the victim's emergency condition.
 - Formulate a first aid algorithm.
- 3. During a power line collapse, a victim was struck by electric current. Unconscious. Carotid pulse is rapid and weak. Fingers of the right hand are covered with a black eschar. Wooded area. Air temperature +10°C.**
- Determine the victim's emergency condition.
 - Formulate a first aid algorithm.
- 4. While swimming in a river, a teenager suffered a leg cramp and began to drown; no one was nearby. By the time help arrived and he was pulled from the water, he was unconscious, not breathing, and had no detectable pulse.**
- Determine the victim's emergency condition.
 - Develop a first aid algorithm.

Report Contents

The report must include:

- Aim of the work
- Brief summary of theoretical material, containing answers to questions and completed tasks
- Conclusions

Review Questions

1. What is the algorithm of actions for rescuers in the event of clinical death?
2. Name the primary indications and contraindications for resuscitation.
3. In which cases is resuscitation terminated?
4. Describe the procedure for performing external chest compressions.
5. Describe the technique for performing mouth-to-mouth and mouth-to-nose artificial ventilation.
6. What are the signs of resuscitation effectiveness?
7. Name the main errors committed during artificial ventilation.
8. Name the cardiac and non-cardiac causes of circulatory arrest.

9. What are the signs of recovery during resuscitation measures?

Aim

Practicing first aid techniques for contusions, sprains, dislocations, and fractures.

Video Material Links

1. <https://youtu.be/nvQRfJkkDHE> – Emergency First Aid Training Course – Training for Non-Medical Personnel
2. https://youtu.be/SpNUCA3_0T8 – Lecture Course: Providing First Medical Aid
3. <https://youtu.be/4yRDWJUTOEg> – All Types of Bandages in Medicine (Educational Guide)
4. <https://youtu.be/Vm5VPkmg3fl> – Lower Limb Immobilization Technique Using the Dieterichs Splint

Theoretical Part

Injury (Trauma) – Damage caused by a sudden, simultaneous exposure to an external factor (mechanical, thermal, chemical, etc.) leading to a violation of anatomical tissue integrity and physiological functions.

Classification of Injuries:

- **By origin:** Industrial, domestic, sports, transport, military, and peacetime disaster-related.
- **By severity:**
 - **Mild:** Without loss of working capacity;
 - **Moderate:** With temporary loss of working capacity, outpatient treatment;
 - **Severe:** Hospital treatment, hospitalization required.
- **By nature and localization:**
 - **Closed injuries:** Without disruption of skin integrity (contusions, ligament sprains, internal organ ruptures, bone damage);
 - **Open injuries:** With disruption of skin integrity (fractures, wounds);
 - Injuries of the head, abdominal cavity, lower limbs, upper limbs, spine, etc.

Multiple injuries – Polytrauma.

- **Combined injuries** – Resulting from the impact of damaging factors of different natures (e.g., a burn combined with a fracture).
- **Contusion (Bruise)** – Damage to soft tissues accompanied by blood vessel rupture and tissue hemorrhage in the absence of skin damage.
- By nature, contusions can be **superficial** or **deep**. Ruptures of muscles or tendons may occur due to an impact or fall, causing blood to flow into soft tissues. In cases of deep tissue bleeding, the affected body part becomes firm to the touch.

Signs of a Contusion:

- Swelling at the injury site;
- Bruising (ecchymosis);
- Pain;
- Impaired function, complete or partial inability to move the injured limb.

Signs of Head Contusion and Concussion:

- Short-term memory loss;
- Headache;
- Nausea;
- Vomiting;
- General weakness.

First aid for such victims consists of the most urgent transportation to a medical facility and provision of physician care. The victim must be laid horizontally on their back on a stretcher and board.

First Aid for Contusions:

First aid aims to stop hemorrhage into soft tissues. Therefore, first elevate the injured arm or leg, place rolled clothing under it, apply a pressure bandage to the contusion site, and place an ice pack (cold) on it (a hypothermic pack is available in vehicle first aid kits). Cooling the injured site relieves pain and swelling. If ice is unavailable, a cold compress can be applied: soak a cloth in cold water, wring it out, apply it to the contusion, and replace it when it warms up. Apply an ice pack to the injured limb for no more than 10 minutes once per hour. Rest must be provided to the injured body part using a splint or sling. During the first 24 hours post-injury: **no heat, only cold!**

Sprain – A complex of soft tissue injuries without anatomical disruption.

Joint Ligament Rupture – Partial or complete rupture, hemorrhage from blood vessels into tissue or the joint cavity.

Symptoms of Sprains and Ruptures:

- Pain;
- Swelling in the joint area with normal joint contours;
- Partial loss of function.

First aid for sprains and ruptures: Pressure bandage, cold application during the first 24 hours following injury, and rest for the affected body part.

Dislocation – Persistent, abnormal displacement of bones from their joint position.

Causes of Traumatic Dislocation:

- Falling onto extended or bent limbs;
- A strong jerk;
- Throwing heavy weight or a sharp turn.

Bone displacement from its normal position in a joint may be accompanied by vessel and nerve rupture. In most cases, a dislocation is combined with a fracture, so the victim should be handled as carefully as possible.

Symptoms of Traumatic Dislocation:

- The injury is extremely painful; the victim feels severe pain in the affected joint area;
- Bruising;
- Pronounced joint deformity;
- Swelling (edema) around the joint;
- Unnatural limb position and complete loss of function.

First Aid for Dislocation:

First aid begins with placing the victim in a position where the affected body part has support, which alleviates pain. Usually, victims select the position themselves and support the injured arm (if an arm is involved).

In cases of hip, elbow, or shoulder joint dislocations, carefully place a pillow or rolled clothing underneath and perform immobilization in the position in which the victim is found. Under no circumstances should you attempt to reduce (realign) the joint; even a physician will not perform this at the scene due to the risk of severe complications, such as rupture of the joint capsule, ligaments, blood vessels, and nerves.

In cases of finger dislocation, place something soft underneath and apply a loose bandage without pressure; otherwise, nerves and blood vessels may be damaged. Urgent hospitalization to a trauma care facility is required.

Fracture – Complete disruption of bone integrity accompanied by soft tissue damage. Of the 200 bones constituting the human skeleton, 20 are broken most frequently, including the wrist bones (falling onto an outstretched palm produces a typical radius fracture), ankles, lower leg bones, and femoral neck (in elderly individuals). Sternal fractures occur much less frequently and only under very strong direct impact. Bones are a fairly strong tissue, but their strength decreases with age, making them more brittle. In children, due to the elasticity of the periosteum, fractures more

commonly occur as greenstick fractures.

The ultimate tensile strength of bone tissue differs noticeably between young and elderly individuals. For example, fracturing a rib requires applying 85–90 kg/cm² in a young person versus 40 kg/cm² in an elderly person. Ultimate strength is defined as the stress at which body integrity is disrupted.

Types of Fractures by Nature: Closed and Open (including gunshot fractures).

Types of Long Bone Fractures:

Transverse, oblique, longitudinal, spiral (torsional), cruciate, Y-shaped, wedge-shaped, and comminuted (Figure 3.1).

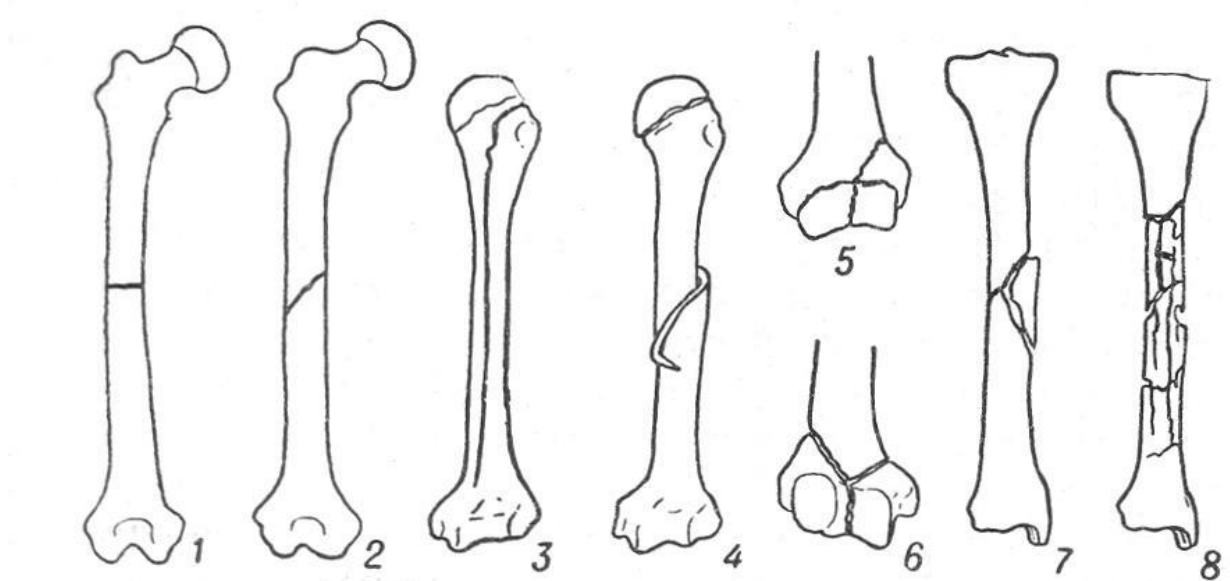


Figure 3.1 – Long Bone Fractures

1 – transverse; 2 – oblique; 3 – longitudinal; 4 – spiral; 5 – cruciate; 6 – Y-shaped; 7 – wedge-shaped; 8 – comminuted

The type of fracture depends on the injury mechanism. A transverse femoral fracture occurs during direct impact, such as from a car bumper in a traffic accident. Falling from a height onto extended legs can cause an impacted fracture, where one bone fragment is driven into another. Falling onto the buttocks can cause a spinal compression fracture; diving into shallow water can result in a compression fracture of one or more vertebrae, flattening them.

Spiral fractures are characteristic of sports injuries where athletes use fixed footwear (skiers, speed skaters). Gunshot wounds are often highly comminuted. Avulsion fractures occur during strong muscle contractions, pulling off a bone fragment. Falling from a height onto the buttocks or legs typically results in pelvic bone fractures (e.g., falling from a window during a fire).

Symptoms of a Fracture

- Swelling (edema);
- Bruising;
- Severe pain up to loss of consciousness; traumatic shock is possible;
- Tenderness upon palpation, deformity, pathological mobility along the bone length;
- Complete loss of function;
- Immobility of the injured limb;
- Nausea and vomiting.

Providing first aid for a fracture requires extreme caution due to potential complications. If there is no threat of danger at the accident scene, aid should be provided directly on site.

First Aid Algorithm for Fractures

- Stop any bleeding;
- Apply an aseptic dressing (in cases of open fractures);
- Immobilize the injured body part (impart rest and immobility) to alleviate pain, allow carrying and transporting the victim, and prevent traumatic shock;
- Administer a painkiller (if possible);
- Position the victim appropriately (in the least painful posture for the given fracture type);
- Hospitalize the victim in an appropriately specialized medical facility.

Immobilize (create rest and motionlessness) for an injured body part to reduce pain and prevent dangerous complications such as infection and shock. Immobilization is essential for fractures because it prevents bone fragment displacement, bleeding, and subsequent complications (Figure 3.2).

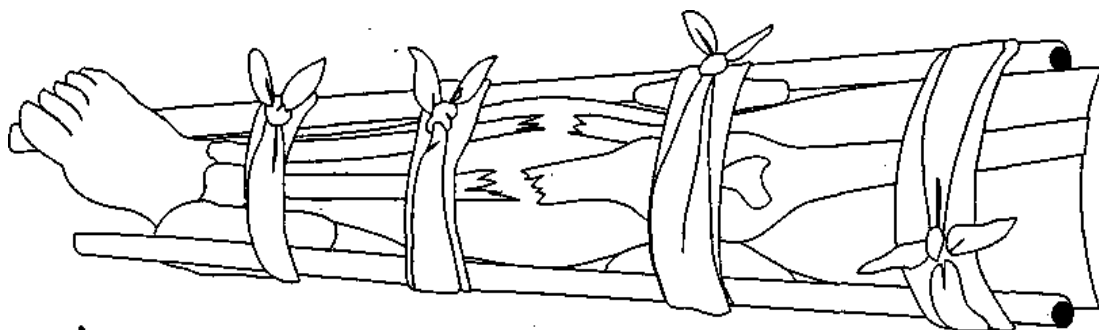


Figure 3.2 – Lower Limb Immobilization Technique Using Improvised Means

There are two types of immobilization: **transport** and **therapeutic**.

During first aid, transport immobilization is carried out using standard equipment (splints) or

improvised materials used in their place (boards, sticks, an umbrella, tightly rolled newspapers or magazines, and any other items depending on the situation).

Auto-splinting can also be applied: bandaging an arm to the body, securing an elbow-flexed arm with the lapel of a jacket, or bandaging one leg to the other. The victim should be placed in a position that is least painful for the specific injury (muscle contraction is eliminated, and lymph movement slows down, which not only reduces pain but also prevents the spread of infection).

Basic Rules of Transport Immobilization

- Perform immobilization as early as possible;
- Splints are applied over clothing and footwear;
- Before splint application, limbs are placed in a gentle/sparing position;
- When any part of a limb is damaged, the two adjacent joints must be immobilized (for a femur fracture – 3 joints: hip, knee, and ankle);
- Before applying a splint, shape/model it to match the contour and position of the limb segments (if the limb is exposed, apply the splint over a cotton-gauze dressing);
- Improvised items for upper limbs most commonly include belts, shirt or jacket hems, or triangular bandage slings. A lower limb can be bandaged to the other leg using a belt, strap, or strip of fabric.

Always remember the principle of gentle care: **do not cause additional suffering or injury.**

In head injuries (skull or face), the goal of immobilization is to eliminate jolts and prevent additional contusions during carrying and transportation. At the same time, potential vomiting should be anticipated; therefore, rigid fixation of the head is undesirable. A convenient method in this case is placing a thick, soft pillow/bedding with a central depression under the head to ensure immobility.

In spinal injuries, sagging of the stretcher must not be allowed; place the victim on a rigid board (a tabletop, door leaf, plywood, or plank can be used).

In cervical spine injuries, fit the victim with a cervical splint collar. If no collar is available, wrap the neck with a thick layer of cotton wool and bandage tightly with a soft roller bandage.

Damage to lower leg or thigh bones is accompanied by damage to other tissues, including blood vessels and nerves. This causes severe pain and can lead to dangerous complications like traumatic shock. Handle the victim with extreme caution to avoid causing further damage and suffering.

If nothing suitable for splinting is available, roll a cushion out of clothing or paper (newspapers, magazines), place it along the healthy leg, and move it toward the broken leg (which must not be

moved). Without removing footwear, slide a strip of fabric under the ankles, gently press the healthy leg against the injured one, and tightly cross and tie the ends of the bandage into a knot. If this increases the victim's pain, stop tightening immediately and tie it as is. Protect the victim from hypothermia by placing clothing under the head and torso (if no blanket is available) and refrain from giving food or drink, as anesthesia may be required for subsequent hospital treatment. A cravat bandage folded into a strip can be used as a fastener.

Hand and finger fractures are common. Despite being painful, these injuries are generally not considered severe; however, profuse bleeding may occur, posing a risk of irreversible loss of limb function. Signs of hand fractures include severe pain, bruising, loss of function, and swelling. Have the victim sit down, and for closed fractures, apply a supporting sling bandage gently without pressing on the injured part of the hand/arm. Support the arm with a triangular sling. If a single finger is broken, fashion a splint from a wooden stick (e.g., an ice cream stick), a teaspoon, or another small object. Wrap it and secure it with adhesive tape. If two fingers are injured, place soft padding between them and bandage them together.

In wrist or forearm fractures, folded newspapers, magazines, or other improvised materials can be placed under the victim's arm from fingertips to elbow. Secure it in several places using bandages or a sling. The victim supports the injured arm while the rescuer prepares a triangular sling and secures the arm by tying its ends around the neck. The forearm bones (radius and ulna) can be fractured by a direct strong blow. Because there is no large muscle mass surrounding these bones, these fractures are usually open.

The most common fracture site is the wrist joint. It typically occurs in elderly women who fall onto an outstretched hand. In young people, such a fall may fracture the small carpals. Fractures here are rarely displaced but are frequently accompanied by ligament damage. Distinguishing a wrist fracture from a sprain can be difficult, especially if the scaphoid bone is involved.

First Aid for Wrist Fractures:

1. Seat the victim. Gently place the arm across the chest. Treat the wound if necessary.
2. Gently wrap the hand/arm in a soft, cool cloth.
3. Place the arm in a triangular sling. If necessary, bandage the limb to the chest using a wide roller bandage over the sling near the elbow. Tie the knot in front on the uninjured side.
4. Transport the victim to a medical facility in a seated position.

For elbow joint injuries, do not attempt to straighten the victim's arm; they will naturally support it in a comfortable position. Seat the victim and place soft padding under the arm (a pillow, blanket, or folded clothing on their lap). This support relieves pain. Perform immobilization using an improvised splint.

Elbow joint fractures are quite typical and usually result from falls. Radial head fractures are characterized by immobility in the elbow joint. In children, humeral fractures are most common and usually involve displacement.

The ends of a broken bone can shift and damage nearby blood vessels and nerves. Continuously monitor blood circulation and the radial pulse at the wrist.

Symptoms: Pain that worsens with movement; localized tenderness at the fracture site; potential swelling and bruising; immobility in the elbow joint if the radial head is fractured.

What to do with an injured elbow that CAN bend:

- Treatment is similar to shoulder joint fracture care;
- Check the radial pulse at the wrist every ten minutes. If absent, gently extend the elbow until the pulse returns, and hold the arm in that position;
- Do not forcibly bend or extend the arm at the elbow joint.

What to do with an elbow that CANNOT bend:

- Lay the victim down and place the injured limb across the chest;
- Place soft padding between the injured limb and body, ensuring the bandage does not cause displacement of bone fragments;
- Bandage the injured limb to the chest: first at the wrist and hip, then above and below the elbow joint.

The humerus can be broken by direct axial impact, but it is more typical—especially among elderly individuals—for the surgical neck of the humerus to break during a fall. This is an impacted fracture. The victim may tolerate the pain and even move around for a while without seeking immediate medical assistance.

Symptoms: Pain that worsens with movement; tenderness at the fracture site; rapid swelling; bruising that develops more slowly.

First Aid:

1. Seat the victim. Gently place the injured arm across the chest in the most comfortable position. Ask the victim to support the arm if possible.
2. Support the arm with a triangular sling and secure the limb to the chest; place soft padding between the arm and chest, applying a wide bandage over the sling.
3. Transport the victim to a medical facility.

A clavicle fracture is characterized by pain at the injury site that worsens with movement, attempts to relax muscles to relieve pain, and the victim supporting the arm at the elbow while tilting their head toward the injured side.

First Aid for Clavicle Fracture:

1. Application of a triangular sling to support the arm or a Desault bandage (Figure 3.3).

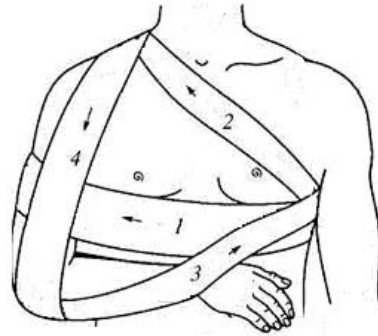


Figure 3.3 – Desault Bandage

2. Clavicle immobilization can also be performed using cotton-gauze rings.

Rib fractures are dangerous due to internal damage threatening severe bleeding and respiratory distress. Signs of rib fractures include severe chest pain and shallow, labored/gasping breaths. Help the victim assume a comfortable semi-sitting position with the torso tilted toward the injured side. An inverted chair can serve as a support. The ribs can be fixed with a tight circular bandage around the chest applied during exhalation (Figure 3.4). Continuously check pulse and breathing while awaiting medical personnel.

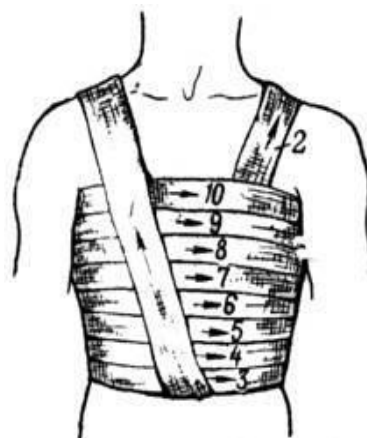


Figure 3.4 – Fixing Bandage for Low Chest Rib Fractures

Spinal fracture is an extremely severe injury, and incorrectly administered first aid can cause the patient's death. The greatest danger of a spinal fracture lies in potential damage (compression, rupture) to the spinal cord. It is highly sensitive, and if damaged, loss of muscle strength or

sensation in regions below the injury level may occur. Temporary damage occurs when the spinal cord or peripheral nerves are pinched by displaced vertebrae or bone fragments; permanent damage develops when the spinal cord is partially or completely traumatized.

One should always check for spinal injury if a significant force was applied to the neck or back, particularly when the victim complains of discomfort and pain during movement. Knowing the mechanism of injury is crucial. If the victim or witnesses report that the body jerked sharply forward or backward during the impact, treatment must proceed as for a fractured spine.

Symptoms of isolated spinal injury: pain in the neck and back at the level of the vertebra. This injury may be masked by other, more painful injuries; tenderness upon light palpation of the spine.

Symptoms of spinal cord damage: loss of control over limbs; limb movements are weak or absent; abnormal sensations—such as a burning feeling or ringing in the ears. The victim complains that their limbs feel heavy or numb; difficulty breathing.

Probable causes of spinal injury: falls from height; diving into a shallow body of water; sudden braking of a vehicle; heavy object falling on the back.

First and foremost, the patient must be kept at rest by placing them on a flat, firm surface. It is strictly contraindicated to sit the patient up or stand them on their feet. Transportation of such patients must be executed with extreme caution. The least dangerous mode of transportation is with the victim lying prone (on their stomach) with pillows placed under the shoulders and head. Transport in a supine position (on the back) is also permissible. In this case, the patient must be placed on a flat wooden board, shield, etc. Transferring the patient onto the stretcher should be performed simultaneously by 3–4 people, maintaining the torso at a single, continuous level throughout.

Pelvic bone fracture—this type of fracture occurs in 75% of road traffic accident victims, during falls onto the buttocks from a height, compression in structural collapses or rubble, falls on icy roads when trying to maintain balance with sudden movements, etc. In 30% of cases, pelvic fractures are combined with damage to internal organs. This type of fracture is extremely dangerous, with potential for massive internal hemorrhage and internal organ damage. If it is necessary to carry the person, it should be done by 2, or preferably 3 rescuers to prevent displacement of fragments and complications (bleeding, painful shock, rupture of internal

organs). Place the victim on their back with a bolster/roller under the knees (Figure 3.5).

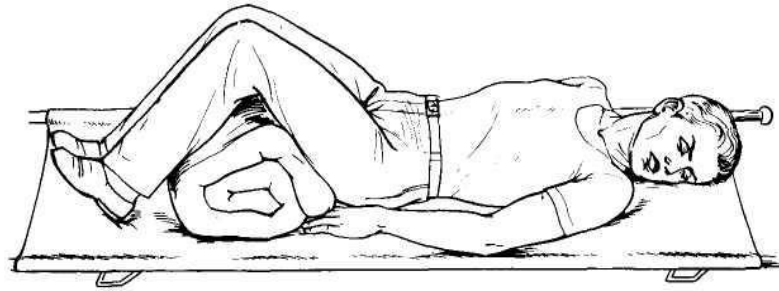


Figure 3.5 – Positioning of a victim with a pelvic fracture

Signs of pelvic fractures: severe pain in the pelvic region, bruising (ecchymosis) in the perineum, the frog-leg position (where the victim lies on their back with legs semi-flexed at the knees and abducted), and the heels-stuck symptom – the victim cannot lift their leg, unable to raise the heel off the floor. Due to the threat of shock, the victim must be handled with extreme gentleness and transported to a trauma hospital as quickly as possible.

Knee joint – a large joint connecting the tibia and femur. The knee can flex, extend, and slightly rotate when flexed. The knee joint is supported by strong muscles and ligaments, and protected anteriorly by a bone – the patella, or kneecap.

The knee joint can be damaged by direct impact, severe twisting, or dislocation.

Symptoms of knee joint damage: pain radiating from the injury site into the joint; if a flexed knee becomes locked, sharp pain occurs when attempting to extend the leg; rapid development of swelling in the knee joint.

First aid:

- Help the victim lie down, supporting the entire leg and knee.
- Wrap the joint with a soft cloth and then gently bandage it.
- Hospitalize the victim on a stretcher.
- Do not attempt to forcibly straighten the knee. Displaced cartilage or intra-articular bleeding will not allow painless extension.
- Do not give the victim food or drink. Pain management/anesthesia may be required later.
- Do not allow the victim to walk.

Lower leg injury. Fracturing the strong tibia requires a heavy impact (e.g., against a car bumper). The thinner fibula can be fractured by twisting movements that lead to ankle sprains. Because the weight-bearing tibia remains intact, the victim may be able to walk and remain unaware of the fracture.

Symptoms of lower leg injury:

- Localized pain;
- Recent direct blow or foot sprain/twisting;
- Open wound;
- Inability to walk.

First aid:

1. *Help the victim lie down and carefully stabilize and support the injured leg. Clean/treat the wound gently if necessary.*
2. *Straighten the leg using traction, gently pulling the leg along the axis of the tibia.*
3. *Call emergency services.*
4. *If transport is delayed, bandage the injured limb to the uninjured one, using it as a splint:*
 - Gently align the healthy limb along the injured one;
 - While supporting the leg at the ankle, carefully pass bandages under the knees and ankles. Position them above and below the fracture, as well as at the knees and ankles;
 - Insert padding between the knees and ankles, as well as between the calves;
 - Apply bandages around the ankles and knees, then above and below the fracture. Tie securely, avoiding sudden movements.

Victim transportation. If evacuating the victim on a stretcher, place additional padding (e.g., rolled blankets) along each limb from the upper thigh to the foot. Secure the thigh and knee with a wide bandage, binding above and below the fracture. Apply a figure-of-eight bandage over the feet and ankles.

Foot fractures. Fractures involving a large number of small bones are caused by crushing. These are best treated in a hospital setting.

Observed signs: pain during walking; tightness/strain during movement; bruising and swelling.

First aid:

1. Elevate and support the foot to minimize swelling.
2. Apply an ice pack or cold compress.
3. Transport the victim to a hospital, maintaining the foot in an elevated position.

Skull and brain injuries. The greatest danger in head contusions is brain damage, which can occur even without fractures to the cranial bones. Types of brain injury include concussion, contusion, and compression. Concussion involves brain edema and swelling; contusion and compression involve partial destruction of brain tissue.

Brain injury is characterized by general cerebral symptoms – dizziness, headache, nausea and vomiting, slowed pulse (the severity of which depends on the degree and extent of damage) – and cardinal symptoms: loss of consciousness (ranging from several minutes to 24 hours or more) and

retrograde amnesia (the victim cannot recall events preceding the injury). Brain contusions and compressions manifest focal neurological signs – impairment of speech, sensation, limb movement, facial expressions, etc.

Severe trauma may involve cranial bone fractures. Brain damage in these cases can be substantial, caused not only by the primary impact but also by bone fragments and extravasated blood (hematoma compression). Open fractures of the cranial vault carry high risk. Clear cerebrospinal fluid or diluted blood may leak from the ears or nose. This is a critical warning sign and indicates a pathway for microbial infection.

A skull fracture should be suspected in any victim who sustains a head injury followed by loss of consciousness lasting more than three minutes. In certain injuries (e.g., comminuted bone fractures), loss of consciousness may not occur.

First aid: Since it is difficult to determine the extent of brain injury immediately after trauma, all patients presenting with symptoms of concussion, contusion, or compression must be transferred to a hospital immediately. First aid consists of providing complete rest in a horizontal position. Valerian tincture (15–20 drops) or Zelenin drops may be administered to calm the patient. Apply an ice pack or a cold-water cloth to the head. If the victim is unconscious, clear mucus and vomitus from the oral cavity. Initiate artificial respiration if respiratory or cardiac function is impaired.

In open vault fractures, particular attention must be paid to protecting the wound from infection. Apply an aseptic dressing.

Continuous monitoring of the patient is mandatory during transport, as recurrent vomiting – and subsequent aspiration and asphyxia – may occur. Transport victims lying down, ensuring head immobility using cotton-gauze pads or transport splints. Unconscious victims are sometimes secured to the stretcher to prevent movement during transport.

Severe facial fractures. These injuries can be severe, involving damage to the eyes, nose, upper teeth, and oral cavity. Swelling and bruising develop rapidly, and bleeding from the nose and mouth is common. The main hazard is that bleeding, swelling, and tissue displacement can obstruct the airway.

First aid:

1. Clear and, if necessary, purge the airway;
2. Place the victim in a comfortable position.

Victim transportation. If the victim must be carried on a stretcher, position them so airway compromise is avoided; in the absence of other injuries, lay them prone (face down) on the stretcher with the head extending past the canvas and the forehead supported by a bandage loop passed through the stretcher handles.

Zygomatic and nasal fractures. These are the most common facial fractures, typically resulting

from physical altercations. Post-fracture swelling complicates care and can obstruct airflow.

First aid:

1. Apply a cold compress to reduce swelling.
2. Control nasal bleeding if present.
3. Transport the victim to a medical facility.

Mandibular (lower jaw) injury. Jaw fractures result from direct force, such as a heavy impact to the jaw. However, an impact to one area of the face can cause a fracture in another. A blow to the chin can fracture both mandibular rami or cause jaw dislocation. Dislocation can also occasionally occur during yawning.

Observed signs: dull pain worsening with jaw movement and swallowing; malocclusion (misalignment of teeth edges) and salivation; swelling, tenderness, and bruising; wounds or ecchymosis in the oral cavity.

If the victim is severely injured, manage as with severe facial trauma.

First aid:

1. For conscious victims without severe concurrent injuries, seat them upright with the head tilted forward to allow free drainage of blood and mucus;
2. Ask the victim to support their jaw using a cotton-gauze pad;
3. Transport the victim to a medical facility while maintaining jaw support.

Tasks

Task 1

Study the theoretical section on the topic, consolidate basic knowledge and skills of rendering first aid for various types of body injuries and trauma using the electrified training stand for familiarization with the concept of traumatism and first aid measures for injuries. The training stand provides two operating modes: Training and Control (Figure 3.6).

In the Training mode, using a wireless control element for testing and training, any of the injuries displayed on the human body can be selected. The selected option is highlighted with LED backlighting and accompanied by a detailed voice explanation from a Virtual Teacher describing the injury and first aid measures. The volume of the Virtual Teacher is adjusted via a separate control unit.

In the Control mode, the instructor is enabled to test and consolidate the acquired knowledge, with correct answers displayed on the bottom panel. An incorrect answer is marked with red LED backlighting.

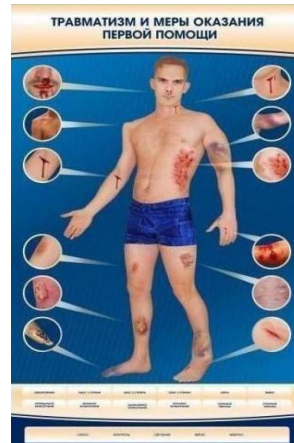


Figure 3.6 – Electrified training stand for familiarization with the concept of traumatism and first aid measures for injuries

Task 2. Solve the situational problems:

1. A 65-year-old woman slipped and fell on a metro station platform and was unable to stand up on her own. Upon examination at the scene, she complains of minor pain in the upper third of the right thigh and in the region of the right hip joint. External rotation of the right lower leg and foot is present; attempts to lift the right leg are unsuccessful.
 - Identify the emergency condition of the victim.
 - Formulate the first aid algorithm.
2. During icy conditions while crossing the street, a woman fell on an outstretched arm. Sharp pain arose in the shoulder joint. Movement in the joint is impossible, the contour of the joint has changed, and the limb is fixed in an unnatural position.
 - Identify the emergency condition of the victim.
 - Formulate the first aid algorithm.
3. A boy fell off a swing and could not stand on his leg. Swelling, hemorrhage, pain, and a slight deformity of the lower leg are noted in the middle third of the right calf.
 - Identify the emergency condition of the victim.
 - Formulate the first aid algorithm.
4. During severe icy conditions, a driver lost control of a car and crashed into a fence. From the sharp impact, he sustained a shoulder injury – bleeding is observed, and a bone fragment is

protruding through the skin. The mandible is displaced to the right, the mouth is open, teeth do not occlude, and speech is impossible.

- Identify the emergency condition of the victim.
 - Formulate the first aid algorithm.
5. During a hike, a tourist's legs were crushed by a fallen tree. He has been in this state for over 2 hours but remains conscious.
- *Select the correct answers and arrange them in order of priority:*
1. Lift the tree and free the legs;
 2. Do not lift the tree or disturb the victim until rescue services arrive, even if waiting takes 24 hours;
 3. Remove shoes and place bottles or flasks with hot water (heated over a campfire) around the legs below the obstruction;
 4. Place bottles and flasks filled with ice-cold spring water around the legs;
 5. Tightly bandage the legs up to the site of injury;
 6. Offer abundant warm liquid to drink (e.g., tea from a thermos);
 7. Exclude any fluid intake;
 8. Administer 2–3 Analgin tablets if there is no allergic reaction;
 9. Apply protective tourniquets to the thighs above the compression site;
 10. Continuously rub and massage the legs until the victim is freed;
 11. Apply improvised splints from the armpits to the heels;
 12. Apply improvised splints from the inguinal fold to the heels;
 13. Tightly bandage up to the inguinal folds;
 14. Carry or transport the victim only on a stretcher, even if they feel satisfactory.

Review Questions:

1. What is an injury (trauma)?
2. How are injuries classified by nature and localization?
3. What are the main signs of contusions?
4. First aid algorithm for contusions.
5. Causes and symptoms of traumatic dislocation.
6. Name the major joints of the human body.
7. Types of long bone fractures.
8. Symptoms of bone fractures.
9. First aid algorithm for bone fractures.

10. Basic rules of transport immobilization.
11. Symptoms of spinal injury.
12. Symptoms of spinal cord damage.

Practical Class 5.6.3

Topic: Bleeding. First Aid for External and Internal Bleeding

Aim

Practicing first aid techniques for external and internal hemorrhage.

Video Material Links

1. <https://youtu.be/nvQRfJkkDHE> – Emergency First Aid Training Course – Training for Non-Medical Personnel
2. https://youtu.be/SpNUCA3_0T8 – Lecture Course: Providing First Medical Aid
3. <https://youtu.be/ESORMgWifTs> – 10 Errors in First Aid Delivery
4. <https://youtu.be/k77mNr-lkEM> – Tourniquet Application

Theoretical Part

Bleeding is the most dangerous complication of wounds that directly threatens life. **Bleeding (hemorrhage)** is the escape of blood from the vascular bed through a defect in the vessel wall into the external environment, hollow organs, body cavities, and tissues.

Blood accounts for approximately 7–8% of body mass, or 5.2 kg in a person weighing 65 kg. During bleeding, a 10% blood loss is tolerable, a 30% loss is dangerous, and a 50% blood loss is fatal.

Small blood losses up to 500 mL in adults do not cause significant changes in the body. In infants under 1 year of age, a blood loss of 250–300 mL causes hemorrhagic shock and death. In newborns, a loss of 25–50 mL of blood leads to death.

Significant bleeding exceeding 500 mL, 1 L, or 1.5 L – especially in severe combined trauma – can lead to death or cause acute blood loss (acute anemia), which is characterized by: thirst, dizziness, pain, tinnitus, weakness, and dark spots before the eyes. On examination: pale skin and mucous membranes, cyanotic tint to the lower limbs and ears; skin is cold and covered in a cold, clammy sweat; reduced blood pressure; thread-like, poorly palpable pulse; rapid, shallow breathing; clouding of consciousness or unconsciousness; convulsions; involuntary urination and defecation; coma.

Blood clotting for any mild bleeding begins within three minutes and stops completely within eight minutes.

Classification of Bleedings

- a) **By origin:** traumatic and non-traumatic;
- b) **By mechanism:** from vessel rupture or wall erosion;
- c) **By type of bleeding vessel:** arterial, venous, capillary, parenchymal;

- d) **By site of blood extravasation:** external and internal;
- e) **By time of onset:** primary and secondary;
- f) **By severity:** fulminant (from the heart and aorta); massive (from large arteries and veins); acute (from medium-diameter vessels).

If the escape of blood from vessels results primarily from damage to them, it is referred to as **traumatic bleeding**. Bleeding can also occur when a vessel is eroded by a pathological focus (tuberculous, cancerous, ulcerous) – **non-traumatic bleeding**.

Traumatic bleeding is one of the primary signs of any wound. An impact, incision, or puncture disrupts the vascular walls, causing blood to flow out.

Blood possesses an important protective property – coagulability. Due to the ability of blood to clot, spontaneous arrest of any small, mainly capillary bleeding occurs. A clot of coagulated blood plugs the opening formed in the vessel during injury. In some cases, bleeding stops as a result of vessel compression.

In cases of insufficient coagulability, manifested by prolonged, delayed clotting, bleeding tendency occurs. Individuals suffering from this condition can lose a significant amount of blood from small vessel bleeding or minor wounds, which can even result in death.

During bleeding, the primary danger relates to acute circulatory insufficiency in tissues and blood loss, which, by causing inadequate oxygen supply to organs, impairs their function – primarily affecting the brain, heart, and lungs.

Depending on the nature of the damaged vessels, a distinction is made between arterial, venous, capillary, and parenchymal bleeding (Figure 2.1).

Arterial bleeding is the most dangerous type, in which a significant volume of blood can pour out of the body in a short time. It occurs upon damage to large blood vessels (carotid, femoral, radial arteries). **Signs:** blood spurts from the wound in a pulsing stream, is bright red (scarlet) in color, and does not stop spontaneously. Requires temporary arrest (emergency aid), with definitive care provided in a hospital.



Figure 2.1 – Types of Bleeding
(Arterial – Venous – Capillary)

Venous bleeding occurs upon damage to more or less large venous vessels. **Signs:** blood flows steadily/evenly and is dark red in color (depleted of oxygen).

Capillary bleeding occurs upon damage to small vessels of the skin, subcutaneous tissue, and muscles. **Signs:** the entire surface bleeds uniformly, blood is bright red, and it stops spontaneously.

Parenchymal bleeding occurs upon damage to internal organs: liver, spleen, kidneys, lungs. **Signs:** mixed bleeding, flowing abundantly and continuously from small arteries, veins, and capillaries across the entire surface. It is difficult to stop due to the unique structure of organs and the inability of their vessels to contract. It is always life-threatening and requires surgical intervention.

Hypothermia, overheating, starvation, and psycho-emotional stress aggravate bleeding.

Subjective and Objective Signs of Bleeding

Subjective signs refer to sensations experienced by the victim (subject) during bleeding. They depend on the decrease in brain oxygen content (dizziness, flickering and darkening before the eyes, ringing in the ears and head). Thirst, nausea, and sometimes vomiting arise; general weakness increases.

Objective signs are identified using sense organs, instruments, and apparatuses. They include the typical appearance of the victim (pale skin and mucous membranes, cold sweat, pinched facial features, sunken eyes); falling blood pressure; rapid pulse (compensatory tachycardia) of weak filling and tension (sometimes thread-like, i.e., barely palpable); rapid breathing. Subsequently,

the victim loses consciousness. Death occurs as a result of paralysis of the respiratory center and cardiac arrest stemming from severe hypoxia.

Types of Bleeding Control: Spontaneous, Temporary, and Definitive Control

Spontaneous (i.e., without external intervention) arrest of bleeding is possible with damage to capillaries, small arteries, and veins. During bleeding, the activity of the blood clotting system increases, forming a clot that plugs the defect in the vessel wall. Other adaptive mechanisms also activate. Clots form in larger vessels as well, but high arterial pressure in vessels closer to the heart forces them out of the wound before they can strengthen and settle.

Temporary arrest of bleeding is performed at the moment of its onset as self-help or mutual aid for a short period to buy time and prepare for its definitive arrest.

Definitive arrest of bleeding is performed in a medical facility during the provision of qualified medical care. Its methods and means differ significantly from those used at the scene of the accident.

Controlling Capillary, Venous, and Arterial Bleeding

In **capillary bleeding**, blood loss is relatively small. Such bleeding can be stopped quickly by applying clean gauze over the bleeding area. A layer of cotton wool is placed on top of the gauze, and the wound is bandaged. If neither gauze nor a roller bandage is available, the bleeding site can be bound with a clean handkerchief. Fuzzy/fleecy fabric must not be applied directly to the wound, as its fibers carry a large number of bacteria that cause wound infection. For the same reason, raw cotton wool must not be applied directly to an open wound.

A dangerous aspect of **venous bleeding**, alongside significant blood loss volume, is that in vein injuries – especially involving neck veins – air can be sucked into the vessels through the wounded areas. Air entering a vessel can then reach the heart. In such cases, a fatal condition arises – air embolism. Venous bleeding is best stopped with a pressure bandage. Clean gauze is applied to the bleeding area, topped with an unrolled bandage roll or multi-layered folded gauze, or, as a last resort, a folded clean handkerchief. Means applied in this manner act as a compressive factor that presses the open ends of damaged vessels.

When such a compressive item is bound to the wound with a bandage, the vessel lumens are compressed, and bleeding ceases. If the rescuer does not have a pressure bandage at hand and the victim is bleeding heavily from a damaged vein, the bleeding site should immediately be pressed with fingers. For venous bleeding in an upper limb, simply elevating the arm is sufficient in some cases. In both cases, a pressure bandage must subsequently be applied to the wound. The most convenient option for these purposes is a pocket pressure dressing or an emergency bandage (individual dressing packet) sold in pharmacies.

Arterial bleeding is the most dangerous of all types, as total exsanguination of the victim can occur rapidly. In bleeding from the carotid, femoral, or axillary arteries, the victim can die within three or even two and a half minutes. Arterial bleeding, much like venous bleeding, can be successfully stopped using a pressure bandage.

In bleeding from a major artery, blood flow to the wounded area must be stopped immediately by compressing the artery with a finger above the wound site. This prevents blood inflow to the damaged arterial section. However, this measure is only temporary. Digital arterial compression is maintained until a pressure bandage is prepared and applied. In femoral artery bleeding, a pressure bandage alone is sometimes insufficient. In such cases, a loop, tourniquet, or improvised tourniquet must be applied. If the rescuer lacks a standard loop or tourniquet, a cravat, handkerchief, tie, or suspenders can be used instead. The tourniquet or loop is applied to the limb immediately above the bleeding site. A pocket dressing (individual dressing packet) is very convenient for these purposes, acting simultaneously as a covering and pressure dressing.

The application site of the tourniquet or loop is covered with a layer of gauze to avoid damaging the skin and nerves. An applied tourniquet completely halts blood flow to the limb, but if left on the limb for a long duration, tissue necrosis may occur. Therefore, tourniquets are used to stop bleeding only in exceptional cases, specifically on the upper arm and thigh (in cases of partial limb traumatic amputation or surgical amputations).

When a loop or tourniquet is applied, the victim must strictly be delivered to a medical facility within two hours for specialized surgical treatment. Upper limb bleeding can be stopped using a bandage roll placed in the cubital fossa or axilla, with simultaneous tightening of the limb using a tourniquet. Lower limb bleeding is managed similarly by inserting a wedge into the popliteal fossa. However, this method of controlling hemorrhage is used only rarely. In bleeding from the main neck artery – the carotid – the wound must be compressed immediately with fingers or a fist; thereafter, the wound is packed with a large amount of clean gauze. This method of stopping bleeding is called wound packing (tamponade). After bandaging the bleeding vessels, the victim should be given non-alcoholic beverages to drink and delivered to a medical facility as quickly as possible.

Methods of Bleeding Control

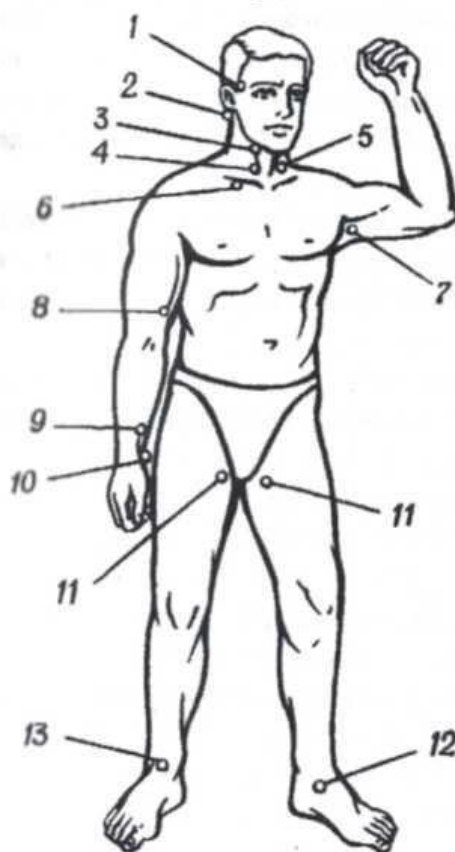
1. **Pressure Bandage and Limb Elevation.** A pressure bandage is applied for minor venous and capillary bleeding: a sterile wipe, a roll of bandage, and a thick layer of cotton wool are placed over the wound, followed by tight bandaging. Following this, elevating the injured limb is advisable.

2. **Maximum Joint Flexion.** In the absence of limb fractures, temporary bleeding control can be achieved by maximum flexion of the limb at the joint:

- **Bleeding from a hand or forearm wound:** place a gauze or cotton roll into the elbow joint, flex the arm, and fix the forearm to the upper arm;
- **Bleeding from the brachial artery:** place a roll into the axilla, flex the arm at the elbow, and fix the upper arm to the torso;
- **Bleeding in the axilla or infraclavicular fossa:** pull the arms (flexed at the elbows) maximally backward and tie the elbows behind the back with a cravat;
- **Bleeding from lower leg and foot vessels:** place a roll into the popliteal fossa, flex the leg at the knee joint, and fix the lower leg to the thigh;
- **Bleeding from a thigh wound:** place a roll into the groin region, flex the leg at the knee and hip joints, and fix it securely to the torso.

3. **Digital Arterial Compression.** The fastest and most accessible method of temporary bleeding control is digital compression of the artery above its damage site. Compression is applied where arteries pass close to or over a bone (Figure 2.2).

4.



1. temporal;
2. occipital;
3. mandibular;
4. right common carotid;
5. left common carotid;
6. subclavian;
7. underarm;
8. shoulder;
9. axilla;
10. elbow;
11. femoral;
12. posterior tibial;
13. artery of the back of the foot.

Figure 2.2 – Points of Digital Arterial Compression

- **Scalp bleeding:** compress the temporal artery 1–2 cm anterior to the auricle;

- **Facial wound bleeding:** compress the facial (submandibular) artery with one finger at a point between the chin and the angle of the mandible, closer to the angle;
 - **Head or upper neck wound bleeding:** compress the common carotid artery against the cervical vertebrae on the anterior surface of the neck lateral to the larynx. Then apply a pressure bandage over a dense roll made of a bandage, wipes, or cotton wool;
 - **Shoulder joint, upper third of upper arm, or axilla bleeding:** compress the subclavian artery against the 1st rib in the supraclavicular fossa;
 - **Middle and lower third of upper arm bleeding:** compress the axillary artery against the humeral head by resting one finger on the upper surface of the shoulder joint and compressing the artery with the remaining fingers;
 - **Lower third of upper arm or forearm bleeding:** compress the brachial artery against the humerus along the medial side of the upper arm lateral to the biceps muscle;
 - **Hand injury:** compress the radial artery against the underlying bone in the wrist area where the pulse is palpated;
 - **Middle and lower third of thigh injury:** compress the femoral artery against the pubic bone in the groin region by applying pressure with a fist;
 - **Lower leg and foot injury:** compress the popliteal artery in the popliteal fossa by placing thumbs on the anterior surface of the knee joint and pressing the artery against the bone with the remaining fingers in the fossa. On the foot, the dorsalis pedis artery can be compressed.
- After performing digital arterial compression, a tourniquet or twist-tourniquet must be applied rapidly.

4. Tourniquet Application. When major limb arteries are damaged, applying a tourniquet is the primary method of temporary bleeding control. Tourniquets can be: standard Esmarch rubber tourniquets, twist-tourniquets, or improvised tourniquets made from available materials (belt, strap, rope, twisted handkerchief, strip of cloth, etc.).

Rules for Applying a Tourniquet (Twist-Tourniquet)

1. Applied **only** upon damage to major vessels – arteries (not veins).
2. Applied to the thigh, lower leg, upper arm, or forearm above the bleeding site, close to the wound.
3. Elevate the limb before application.
4. Apply the tourniquet over a bandage lining (wrap the limb or apply over clothing) to avoid skin damage between turns.

5. Apply starting in the middle, wrapping around the limb in a stretched state (2nd turn looser than 1st, 3rd looser than 2nd, each subsequent turn looser than the previous).
6. Apply with sufficient force to stop arterial bleeding, until the pulse disappears. Secure the tourniquet using its chain and hook or tie it in a knot.
7. Attach a note to the application site indicating the date and time (hour and minute) of application, tucking it under a turn of the tourniquet so it remains clearly visible. In winter, a tourniquet is applied for up to 0.5 hours with wrapping/insulation. In summer, up to 1 hour.
8. When the time limit expires, perform digital arterial compression, slowly loosen the tourniquet under pulse control for 5–10 minutes, and then reapply it slightly higher than the previous site.
9. The tourniquet must not constrict the limb excessively, as severe compression leads to paresis, paralysis (nerve trunk compression), and gangrene (necrosis).

Errors in Tourniquet Application:

- Application without indications;
- Application directly onto bare skin;
- Excessive tissue compression (over-tightened);
- Weak tension;
- Poor fixation of tourniquet ends (may untie or loosen);
- Omission of application time.

Definitive Bleeding Control

Definitive bleeding control is conducted in a medical facility. The following methods exist:

1. **Physical Method:** Based on the application of low or high temperatures:
 - Low temperatures cause vasospasm (constriction);
 - High temperatures cause protein coagulation and thrombus formation;
 - Ice packs or swabs soaked in hot saline solution are applied during bone bleeding;
 - Ultra-high frequency current or extreme cold (cryo) is used.
2. **Mechanical Method:**
 - Vessel ligation using ligatures (silk, linen, nylon threads; catgut);
 - Suturing, tamponade/packing (for nasopharyngeal bleeding);
 - Replacing a damaged vessel segment with a prosthesis (synthetic or other materials);
 - Vessel torsion (twisting).
3. **Chemical Method:** Based on the use of vasoconstrictive and procoagulant agents:

- Vasoconstrictors include: epinephrine (adrenaline), ergot extract; astringent and cauterizing solutions of silver nitrate, hydrogen peroxide;
 - Procoagulants: calcium chloride, calcium gluconate, menadione (Vikasol), etc.
4. **Biological Method:** Drip transfusion of small doses of preserved blood (100–200 mL), plasma, or therapeutic serum (40–50 mL) subcutaneously. Fibrinogen administration.
 5. **Ultrasound Method:** Conventional ultrasound helps detect internal bleeding sites, while high-intensity focused ultrasound (HIFU) is used to repair damaged vessels. It can heat tissue rapidly (up to 70°C per second) at a target site and weld them, eliminating the need for a scalpel.
 6. **Autotransfusion:** In massive hemorrhage, to ensure blood supply to the brain, heart, and lungs, autotransfusion can be performed. For this, limb wrapping/tight bandaging is performed from toes/fingers to the limb bases using rubber bandages. Limbs are elevated, the head is lowered, and a weight is placed on the abdomen.

Other External Bleedings

First aid must be rendered not only for wound bleeding but also for other external bleedings, some of which are also traumatic in nature.

Epistaxis (Nosebleed)

Occurs upon impact to the nose, hard blowing or sneezing, severe skull trauma, or during certain diseases (e.g., influenza).

The victim is placed supine with a slightly elevated head; cold compresses or ice are applied to the bridge of the nose, neck, and cardiac region. The victim compresses the nasal alae with fingers. Nose blowing and flushing the nose with water are forbidden during nosebleeds. Blood draining into the nasopharynx must be spit out by the victim.

Post-Extraction Dental Bleeding

Placing a small gauze pad over the extracted tooth site, which the patient then clamps with their teeth, is sufficient.

Otorrhagia (Ear Bleeding)

Observed in wounds of the external auditory canal and skull fractures. Clean gauze is placed over the injured ear, followed by bandaging. The victim lies on their uninjured side (ear) with a slightly elevated head. Ear flushing is forbidden.

Pulmonary Bleeding (Hemoptysis/Hemoptysis)

Occurs from severe chest impacts, rib fractures, or tuberculosis when a disease focus erodes a pulmonary vessel.

The victim coughs up bright red, frothy blood; breathing is labored. Place the victim in a semi-sitting position, placing a bolster under the back for support. Apply a cold compress to the bare

chest. Talking and movement are strictly prohibited.

Gastrointestinal Bleeding

Esophageal bleeding occurs upon injury or rupture of esophageal varices associated with certain liver diseases. Gastric bleeding occurs in gastric ulcers or tumors eroding stomach wall vessels, as well as gastric trauma. Vomiting is observed; vomitus consists of dark red or clotted blood (coffee-ground). Place the victim in a semi-sitting position with knees flexed. Place a cold compress on the abdominal area. Complete rest is required. Do not give food or drink. Both types of bleeding require immediate surgical intervention.

Internal Bleedings

Intra-Abdominal Bleeding

Occurs upon abdominal impact. Liver and spleen ruptures are observed in most cases. In females, intra-abdominal bleeding occurs in ectopic pregnancy. Characterized by severe abdominal pain. The victim enters shock or loses consciousness. Place the victim in a semi-sitting position with knees flexed, and apply a cold compress to the abdomen. Do not give food or drink. Immediate transport to a medical facility must be arranged.

Intra-Pleural Bleeding (Hemothorax)

Occurs upon impact or chest injury. Blood accumulates in the pleural cavity and compresses the lung on the affected side, hampering normal respiration. The victim breathes with difficulty and may suffocate in significant hemorrhage. Place the victim in a semi-sitting position with flexed lower limbs, and apply a cold compress to the chest. Immediate transport to a medical facility must be arranged.

Acute Anemia from Blood Loss

Acute anemia is observed when the body loses a significant volume of blood. Blood loss up to 1.5 liters poses a major threat to the victim's life. In acute anemia, the victim complains of weakness; paleness, sunken eyes, and a weak, rapid pulse are noted; the patient looks haggard and apathetic, with cold sweat on the forehead. Shock can develop as a result of blood loss. The victim may faint and lose consciousness.

Consequences of Blood Loss for the Organism

As a result of reduced blood volume in the circulatory system, body organs suffer from inadequate oxygen supply. This affects brain function and general metabolism most severely. Despite several adaptive defense mechanisms, the brain and hormonal system cannot balance the pathological changes occurring in the body. If appropriate assistance is not rendered at this stage, death occurs from paralysis of the respiratory and circulatory centers in the medulla oblongata caused by oxygen deficiency.

First Aid for Hemorrhage

A patient who has lost a significant amount of blood can be saved, but immediate first aid measures must be taken. First and foremost, bleeding must be stopped if spontaneous cessation has not occurred due to loss of vascular tone (observed in severe blood losses). Even if bleeding has stopped, a pressure bandage should still be applied to the wound.

Next, unbutton the victim's clothing. If consciousness is preserved and there are no gastrointestinal injuries, offer tea to drink. Giving black coffee in such cases is not recommended. Then place the victim supine with a slightly lowered head, elevating or suspending the arms and legs.

This position promotes cerebral blood filling, maintaining brain function. Following this, the victim must urgently be transported to a medical facility.

Equipment and Materials

Multifunctional training complex Reanimator for training and rendering first aid at the scene of an accident; information stand on rules for transporting victims; three-element magnetic marker board for consolidating first aid knowledge; multifunctional interactive training stand on first aid delivery methods; electrified training stand on methods of bleeding control.

Tasks

Task 1

Study the theoretical section of the laboratory work. Using the electrified training stand Bleeding Control in various modes:

Training mode: Touch the tip of the pointer to the Training sensor. Then, using the pointer, select one of the arteries or tourniquet application sites. The selected item is marked with LED backlighting and accompanied by a detailed voice description from a Virtual Teacher, who narrates about the injury where first aid is provided by stopping bleeding from that specific artery. The volume of the Virtual Teacher is adjusted via a separate control unit.

Control mode: Touch the tip of the pointer to the Control sensor. Any of the injuries displayed on the human body will light up in random order. Using the pointer, select the artery that should be compressed to stop the bleeding.

In case of a correct answer – the CORRECT LED lights up. In case of an incorrect answer – the INCORRECT LED lights up.

Task 2. Complete Table 2.1. Signs of Bleeding

Table 2

Signs of Bleeding

Signs		Subjective Signs	Objective Signs
Loss of consciousness			
Cold sweat			
Skin defect			
General weakness			
Nausea, vomiting			
Pinched facial features			
Dizziness			
Thirst			
Sunken eyes			
Paleness of skin and mucous membranes			
Pulse	Rapid		
	Weak, thread-like		
	Slow (infrequent)		
Ringing in ears and head			
Flickering and darkening before the eyes			
Dryness of mucous membranes			
Blood Pressure	Unchanged		
	Elevated		
	Low, rapidly dropping		

Task 3. Solve the situational problems

1. An industrial worker fell off scaffolding and sustained an open fracture of the right upper arm with damage to the brachial artery. The victim is pale with cold sweat. Skin integrity is disrupted, and a pulsing stream of bright red (scarlet) blood is spurting from the wound.

- Identify the emergency condition of the victim.
- Formulate the first aid algorithm.

2. A neighbor from the stairwell landing approached you, stating that her 18-year-old intoxicated son slit the veins on his left forearm with a razor. A wound measuring 5.5 * cm is present at the boundary of the middle third of the left forearm, with profuse bleeding; the stream of blood is non-pulsing and dark in color.

- Identify the emergency condition of the victim.
- Formulate the first aid algorithm.

3. In a park, a young man received a knife wound to the chest. There is an incised wound under the right clavicle, from which frothy blood is flowing. You have a vial of alcohol solution of iodine, a non-sterile bandage, and a non-sterile plastic bag.

- Identify the emergency condition of the victim.

- Formulate the first aid algorithm.
- 4. Upon falling from a height, a man lost consciousness. Bleeding from the nose, ears, and oral cavity is observed; a sharp bone fragment protrudes through the skin of the right thigh, accompanied by bleeding.
- Identify the emergency condition of the victim.
- Formulate the first aid algorithm.
- 5. A pedestrian was struck by a truck right before your eyes. He is unconscious, lying on his back. His face is covered in blood, his right leg is unnaturally twisted, and a puddle of blood is spreading around it. Breathing is noisy, with a characteristic whistling sound on inspiration.

Select the correct answers and arrange them in order of priority:

1. Apply an improvised splint to the right leg;
2. Wipe blood from the face and place a pillow under the head;
3. Turn the victim onto his stomach;
4. Clear the oral cavity of mucus and blood;
5. Verify the presence of a carotid artery pulse;
6. Apply a sterile dressing to the bleeding wound;
7. Drag the victim off the roadway to a safe place;
8. Call an ambulance;
9. Leave the victim in place and wait for the ambulance to arrive;
10. Apply tourniquets to stop bleeding.

Review Questions:

1. Classification of bleeding.
2. Subjective and objective signs of bleeding.
3. Spontaneous control of bleeding.
4. Temporary control of bleeding.
5. Definitive control of bleeding.
6. Venous bleeding control.
7. Capillary bleeding control.
8. Arterial bleeding control.
9. First aid for pulmonary bleeding.
10. First aid for gastrointestinal bleeding.
11. Consequences of blood loss for the organism. First aid.

**MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN
FEDERATION
FEDERAL STATE AUTONOMOUS EDUCATIONAL INSTITUTION
OF HIGHER EDUCATION
NORTH-CAUCASUS FEDERAL UNIVERSITY**

**Methodological Guidelines
for Students' Independent Work in
LIFE SAFETY
for all specialties and fields of study**

Stavropol 2026

Introduction

When studying the Life Safety discipline, the curriculum provides for classroom sessions (lectures and practicals), as well as independent work (IW) to study basic and supplementary literature, and present reports.

The main forms of student independent work (SIW) and its control in this course are:

1. Independent study of material on the topics of the discipline (in accordance with the syllabus).
2. Preparation for the examination.

These methodological guidelines present recommendations for organizing independent work in these areas.

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General Characteristics of Student Independent Work in Studying the Discipline Life Safety

When studying the course, the following types of independent work are provided:

1. Independent study of material on the topics of the discipline (in accordance with the syllabus);
2. Preparation for the examination.

Independent study of theoretical material combines oral and written student work and is organized with the aim of developing student skills in searching for information on specific topics, working with textual information, highlighting the main semantic content of the text and the ability to present its brief summary in writing, as well as formulating a theoretical answer to the question under consideration.

This type of work contributes to the formation of the following competency:

- **UC-8.** Capable of creating safe living conditions in daily life and professional activities for the preservation of the natural environment and ensuring sustainable social development, including under the threat and occurrence of emergency situations and military conflicts.

Competency Achievement Indicators:

- **AI-1 UC-8.** Familiar with the general characteristics of ensuring safety and sustainable development in various spheres of life; classification of military-character emergency situations; principles and methods of organizing population protection from hazards arising in peacetime and during the conduct of military operations.
- **AI-2 UC-8.** Evaluates the probability of potential hazards in wartime, daily life, and professional activities and takes measures for their prevention.
- **AI-3 UC-8.** Applies basic protection methods under the threat and occurrence of emergency situations and military conflicts in daily life and professional activities.

Schedule Plan for Independent Work (Full-Time Education)

Competency Codes	Student Activity	Final Product of Independent Work	Assessment Tools and Technologies	Hours		
				SIW	Contact with the Teacher	Total
Semesters 1, 7						
AI-1 UC-8 AI-2 UC-8 AI-3 UC-8	Independent study of material on discipline topics	Summary notes	Oral questioning, interview	24	4	28
AI-1 UC-8 AI-2 UC-8 AI-3 UC-8	Preparation for the exam	Electronic testing	Test	24	2	26
Total for Semesters 1, 7				48	6	54
Total				48	6	54

Schedule Plan for Independent Work (Full & Part and Part-Time Education)

Competency Codes	Student Activity	Final Product of Independent Work	Assessment Tools and Technologies	Hours		
				Contact with the Teacher	Contact with the Teacher	Total
Semesters 1, 7						
AI-1 UC-8 AI-2 UC-8 AI-3 UC-8	Independent study of material on discipline topics	Summary notes	Oral questioning, interview	42	4	46
AI-1 UC-8 AI-2 UC-8 AI-3 UC-8	Preparation for the exam	Electronic testing	Test	48	4	52
Total for Semesters 1, 7				90	8	98
Total				90	8	98

Methodological Recommendations for Studying Theoretical Material

When studying the discipline Life Safety, the curriculum provides for classroom sessions (lectures, practicals), as well as student independent work (SIW) on studying primary and supplementary literature. The main forms of SIW work and control in this course are:

- Independent study of main and additional material on the topics presented in the discipline's syllabus. The report for this control form is submitted as written summary notes. This activity combines written and oral forms of student performance; it reveals analytical skills and the ability to identify the semantic cores of a text;

Knowledge assessment via interview

Knowledge testing of lecture and practical material is conducted in the form of an interview. It is assumed that individual questions of the discipline topics are studied by students independently. Knowledge of these questions is checked by the presence of summary notes and an interview. Below are the interview questions on the topics of the Life Safety course.

This evaluation event is held during practical classes based on materials and knowledge obtained in lectures, as well as through the study of basic and supplementary literature. To prepare for this evaluation event, the student needs to prepare oral answers to the interview questions or make summary notes in a notebook. During preparation, the student has the right to use lecture materials, basic and additional literature, as well as Internet resources.

When checking the assignment, the following are evaluated:

- Correctness of answers;
- Clear knowledge of terminology;
- Ability to competently, clearly, and consistently present the material;
- Use of additional literature during preparation;
- Ability to analyze theoretical material and compare it with practice;
- Knowledge of statistical data regarding the studied processes and phenomena;
- Ability to provide specific examples.

In the process of independent study of individual questions within the discipline topics, working with literature listed at the end of the methodological guidelines is recommended.

Module 1. Theoretical Foundations of Life Safety (UC-8)

Basic Concepts, Terms, and Definitions in the Field of Life Safety

- Definition, structure, and objectives of life safety.
- Characteristics of hazards.
- Characteristics of threats.
- Spheres and principles of ensuring state security.
- Economic, information, and food security.

General Classification of Emergency Situations

- Concepts, definitions, stages of development, and classification of emergency situations.
- Main types of emergencies and their brief characteristics.
- Sources of emergency situations. Stages of emergency development.
- Classification of emergencies by origin.
- Main types of emergency situations.

Natural Emergency Situations, Classification, and Protection Against Them

- Classification of natural emergencies.
- Rules of behavior in the event of a threat of a natural emergency.

Safety in Technological Emergency Situations

- General characteristics of technological emergency situations.
- Transport and its hazards. Fires and explosions at economic facilities.
- General characteristics of hazardous chemical substances.
- General characteristics of radioactive substances.
- Classification of technological emergencies by departmental affiliation.
- Accidents and disasters on railway transport.
- Causes of fires at industrial facilities. Causes of explosions. Fire prevention measures.
- Assessment of the chemical situation. Baseline data for chemical situation assessment.
- General accidents at nuclear power plants. Characteristics of the mandatory evacuation zone.
- Categorization of nuclear power plant events according to the IAEA scale.

Module 2. Ensuring National Security of the Russian Federation (UC-8)

Theoretical Foundations of the Institution of National Security (NS) of the RF

- Ensuring the national security of the RF.
- Potential threats to the national security of the RF.
- Military Doctrine of the RF.

- Conducting military registration and organizing the reservation of citizens in the reserves of the Armed Forces within organizations.

Theoretical Foundations of the Institution of National Security (NS) of the RF

- National spheres of Russia's state security. Subjective-objective relations in the field of life safety.
- The national security system in the structure of Russian state authorities.
- Federal laws of the Russian Federation and their purpose.

Military-Political Training. Geopolitical Position of the Russian Federation

- Modern trends and characteristics of international relations development. Russia's place and role in a multipolar world.
- Key directions of political, socio-economic, and military-technical development of the Russian Federation.
- Military policy of the RF at the present stage.
- International military conflicts involving Russia: global, regional (local) wars. Hybrid wars, color revolutions.
- Features of conducting information and psychological warfare.
- Special military operations of the RF (SMO).

Geopolitical Position of the Russian Federation

- Modern trends in the development of international relations.
- Foreign policy of the Russian Federation at the present stage.
- Causes and objectives of the special military operation in Ukraine.

Module 3. Ensuring the Safety of Population and Territories in Wartime (UC-8)

Civil Defense

- Purpose of civil defense and its main tasks.
- Characteristics of civil defense in modern conditions and assigned tasks.
- Organizational foundations, leadership, and management of civil defense.
- Organization of civil defense at an economic facility and its main tasks, taking into account the field of study.

Organization of Civil Defense

- Components of evacuee luggage.
- Types of civil defense property supplied to schools during emergencies.
- Types of protective structures and their purpose.
- Individual decontamination kits.

Preparation of Data to Determine the Usage Order of Civil Defense Protective Structures for

Sheltering Facility Workers and Their Families from Emergency Situations

- Key indicators of quick-erect shelters of various capacities and designs.
- Development of a plan for bringing a shelter into readiness to receive occupants.
- Sample plan for bringing a shelter into readiness to receive occupants.
- Calculation for bringing civil defense protective structures into readiness.

Module 4. Countering Threats of Extremism and Terrorism (UC-8)

Legal and Organizational Foundations for Ensuring Anti-Terrorist Security of the RF

- Modern terrorism, its characteristics, and features.
- Types of terrorist acts and methods of their execution.
- Organization of anti-terrorist measures to ensure safe behavior in educational institutions.
- The concept of terrorism in the RF Law On Countering Terrorism.
- Types and forms of terrorism.
- Rules of conduct when taken hostage.
- Causes generating terrorism in Russia.
- Rules of conduct and algorithm of actions during a threat of a terrorist act in an educational organization.
- Criminogenic hazards.
- Rules of conduct and actions of the population in extreme social situations.

Public Danger of Terrorism and Extremism

- Organized crime.
- Blackmail, fraud, extortion, theft, robbery.
- Vehicle assault.
- Defense against armed assault.

Module 5. Fundamentals of Military Training (UC-8)

Goals, Tasks, Directions, and Forms of Military-Political Work in the Armed Forces of the RF

- Fundamentals of military-political work in the AF RF: goals, tasks, directions, and forms of military-political work.
- Military education and upbringing.
- Military courtesy: genesis and modernity.
- Military discipline.
- Responsibility of service members and its types.
- Principle of single command (unity of command). Superiors and subordinates. Seniors and juniors.

- Orders and instructions. Procedure for giving and executing an order.
- Military ranks. Military rituals and holidays.

Fundamentals of Military-Political Work in the AF RF: Goals, Tasks, Directions, and Forms of Military-Political Work

- Military education and upbringing.
- Military courtesy: genesis and modernity.
- Military discipline.
- Responsibility of service members and its types.
- Principle of single command. Superiors and subordinates. Seniors and juniors.
- Orders and instructions. Procedure for giving and executing an order.
- Military ranks. Military rituals and holidays.

Fundamentals of Small Arms Firing

- Stripping and assembly of small arms.
- Loading the Kalashnikov assault rifle magazine.
- Purpose, components, combat characteristics, and order of assembly (stripping) of the AK-74 and PM pistol.
- Purpose, combat characteristics, and hardware components of hand grenades.
- Assembly (stripping) of the AK-74 and PM pistol.
- Preparing them for combat application.
- Firing positions for small arms, safety requirements.
- Construction of a single trench for firing an assault rifle.
- Safety requirements when handling small arms and conducting marksmanship training sessions.
- Techniques and rules of firing small arms.
- Purpose, combat characteristics, hardware components, and application of small arms and hand grenades.
- Loading small arms magazines. Preparing hand grenades for combat application.
- Firing positions for small arms, safety requirements.

Fundamentals of Small Arms Firing. Techniques and Rules of Small Arms Firing

- Assuming the kneeling firing position.
- Assuming the standing firing position.
- Safety requirements.

Construction of a Single Trench for Firing an Assault Rifle

- Nature of field engineering equipment for artillery unit firing positions.

- Fortification equipment for covered firing positions.
- Construction of trenches for firing an assault rifle. Camouflage.

Tactical and Technical Characteristics (TTC) of the Main Types and Samples of Armament and Equipment of the AF RF

- Armed Forces of the Russian Federation: branches, service arms, system, structure, personnel. Tasks and functions in peacetime and wartime.
- Combat designation of AF RF units. Structure of ground forces units.
- TTC of main samples of armament and equipment of ground forces units of the AF RF.
- Organization of the Armed Forces of a potential adversary of the RF: military strategy, armament, combat equipment.
- Organization, armament, and combat equipment of army units of a potential adversary.

Fundamentals of Combined Arms Combat of AF RF Units

- Essence of modern combined arms combat: characteristics and types.
- Methods of conducting modern combined arms combat. Forces and means of armed struggle.
- Characteristics of combat application of new technologies and technical equipment (EW, UAVs).

Tactical and Technical Characteristics (TTC) of the Main Types and Samples of Armament and Equipment of the AF RF

- Armed forces. Service arm.

Tactical and Technical Characteristics (TTC) of the Main Types and Samples of Armament and Equipment of the AF RF

- Combat, defense, offense, maneuver, encirclement/flanking.

Radiation, Chemical, and Biological Protection of the AF and Population of the RF

- Personal protective equipment for service members and the procedure for its use. Fitting and technical check of personal protective equipment.
- Nuclear, chemical, biological, and incendiary weapons. Nuclear weapons.
- Damage factors of a nuclear explosion and their impact on the human body, equipment, machinery, and fortification structures. Delivery and application systems.
- Chemical weapons. Chemical agents (CWAs), their purpose, classification, and impact on the human body. Combat injury conditions, delivery means, signs of CWA application, their persistence on terrain.
- Biological weapons. Main types and damaging effects. Means and external signs of application.
- Incendiary weapons. Damaging effects of incendiary weapons on personnel, armament, and military equipment.

Radiation Reconnaissance Instruments

- Radiation reconnaissance.
- Means of radiation reconnaissance and monitoring.
- Types of dosimetric instrument classifications.
- Ionization chamber. Gas-discharge counter. Scintillation detector. Radiothermoluminescent detectors. Chemical detectors.

Chemical Reconnaissance Instruments

- Assessment of the chemical situation. Means of chemical reconnaissance and monitoring.
- Colors of indicator powders after drawing sample air through them.

Action Procedures for Personnel in Conditions of Radioactive, Chemical, and Biological Contamination

- Warning signals of radioactive, chemical, and biological contamination and their transmission by various means.
- Actions of personnel upon warning signals of radioactive, chemical, and biological contamination.
- Military chemical reconnaissance device (VPKHR).

Fundamentals of Military Topography. Fundamentals of Cartography and Its Application in Combat Conditions

- Terrain as an element of the combat situation. Measurements and orientation on terrain without a map, movement by azimuths.
- Methods of measuring distances and orientation on terrain without a map. Topographic maps.
- Geometric essence, classification, and purpose of topographic maps. Map reading, preparing it for work.
- Determining geographic and rectangular coordinates of objects and target designation using a map. Determining object coordinates.
- Responsibility of service members for the preservation of maps in a combat situation.

Working with Graphical Documents

- Determining rectangular coordinates of a point on a map. Determining distance by angular size.
- Determining distances by linear dimensions.

Rendering First Aid to Victims in Peacetime and Wartime Emergency Situations

- Principles of rendering first aid.
- Classification of wounds. Rules for wound treatment and dressing application.
- Rendering first aid for burns. Rendering first aid for drowning.
- Rendering first aid for heatstroke.
- Rendering first aid in cases of unconsciousness, respiratory arrest, and cardiac arrest.

Terminal States. Clinical Death. Principles and Methods of Resuscitation

- Terminal states. Clinical death. Resuscitation.
- Primary cardiopulmonary resuscitation algorithm. Signs of resuscitation measures effectiveness.

Injuries. Rendering First Aid for Injuries

- Trauma, contusion, sprain, dislocation, fracture. First aid.

Bleeding. First Aid for External and Internal Bleeding

- Classification of bleeding. Types of bleeding control. Tourniquet application. First aid for bleeding.

Criteria for Assessing Competencies in Performing Test Tasks

The grade **excellent** is given to a student who has completed 88-100% of all proposed test tasks of various types, independently and consistently navigates the test tasks.\

The grade **good** is given to a student if they have correctly completed 87-72% of the proposed test tasks, and navigates the test tasks.

The grade **satisfactory** is given to a student if they have correctly completed 71-53% of the proposed test tasks, and fragmentarily navigates the tasks.

The grade **unsatisfactory** is given to a student if they have completed less than 52% of the proposed test tasks, and poorly navigates the tasks.

Methodological materials defining the procedures for assessing knowledge, skills, abilities and (or) experience of activity characterizing the stages of competency development

The procedure for conducting this assessment event includes: an interview. The tasks proposed to the student allow testing the UC-8 competency.

The features of basic level tasks are that the student is able to explain and apply terms and concepts of the course in the proposed context; analyze and classify information presented schematically; correlate textual information with course knowledge.

The features of advanced level tasks are that the student possessing information at an advanced level can disclose theoretical provisions on specific examples, solve problematic tasks using theoretical knowledge; independently find information necessary to formulate their own judgments; critically perceive information received from textual sources, argue their own position, confirming it with adequate examples from the course of the discipline, related academic disciplines, and their own life experience.

To prepare for this assessment event, it is necessary to familiarize oneself with the recommended literature, Internet resources, and periodicals available in the reading room of the NCFU Scientific Library. The approximate time allotted for preparing for each topic is given in the discipline's working program. When preparing for the answer, the student is granted the right to use a calculator, reference materials, and regulatory documents.

When checking the assignment, the following are evaluated: sequence and rationality of execution, developed thinking (flexibility, rationality, originality), formation of the ability to solve problems, formation of applied skills (ability to solve practical problems, apply new technologies to solve applied problems, etc.), ability to clearly and argumentatively state one's thoughts, literacy in the execution of problem solutions, formation of self-control and self-evaluation skills (self-criticism, ability to work on mistakes, realism in assessing one's abilities).

Test Questions in LIFE SAFETY Discipline

#	Question Content with Correct Answer	Competency
Test Tasks		
1.	An accident not associated with the release of highly toxic substances or with their minor leakage is...: +: a local accident -: a municipal accident -: a facility-level accident -: a regional accident	UC-8
2.	Life safety studies: -: safety in the domestic sphere -: safety in the urban sphere -: safety in the production sphere +: safety in all of the listed spheres	UC-8
3.	If during a flood water catches you in a field, then you: -: will stay in place and wait for help -: will try to run away from the oncoming flow at an angle of 45° to it -: will try to run away from the oncoming flow at an angle of 90° to it +: will head out to an elevated place	UC-8
4.	The howling of sirens and intermittent honks of enterprises indicate the signal: +: Attention all! -: Air raid! -: Air raid over -: Radiation hazard!	UC-8
5.	An integral indicator of life safety is: -: protection from the impact of hazardous and harmful factors of the production environment -: protection from all types of hazards +: life expectancy -: observance of industrial sanitation	UC-8
6.	Sources of technological hazards are elements of: -: the biosphere -: the hydrosphere -: elementary particle decay +: the technosphere	UC-8
7.	Primary fire extinguishing agents include: -: internal fire hydrants, fire extinguishers, sand, blankets, coarse woolen blankets, shovels and scoops, axes and gaffs, asbestos covers -: water, sand, inert gases, foam -: air-mechanical foam, table salt, sodium chloride +: chemical, foam, gas, carbon dioxide fire extinguishers, sand	UC-8
8.	Natural emergency situations include: -: storms, hurricanes, falling aircraft with nuclear power plants on board, release of highly toxic substances into the atmosphere -: ice jams on rivers, landslides, mudflows, glacier movement, ship collisions at sea +: earthquakes, volcanic eruptions, floods, mudflows, landslides, hurricanes, tornadoes, storms, natural fires -: tsunamis, vortexes, explosions in residential buildings, aviation disasters, snow avalanches	UC-8

9.	Dangerous natural disasters, phenomena, or processes of an extraordinary nature leading to the disruption of the daily routine of life of significant groups of people, human casualties, destruction and annihilation of material values are called emergency situations of ... origin: -: geological -: cosmic -: natural +: social	UC-8
10.	The outer shell of the Earth is ...: +: the biosphere -: the hydrosphere -: the atmosphere -: the lithosphere	UC-8
11.	The goal of life safety is ...: -: to form a person's consciousness and responsibility regarding personal safety and the safety of others +: the protection of man from hazards at work and beyond -: to teach a person to provide self-help and mutual aid -: to teach how to promptly eliminate the consequences of emergencies	UC-8
12.	Safety is ...: +: a state of activity in which the manifestation of danger is excluded with a certain probability -: a multifaceted process of human creation of conditions for their existence and development -: a complex biological process that occurs in the human body and allows maintaining health and working capacity -: a central concept of life safety that unites phenomena, processes, and objects capable of causing harm to human health under certain conditions	UC-8
13.	Technological hazards include: -: flooding +: large-scale industrial accidents -: air pollution -: natural cataclysms	UC-8
14.	Hazards according to the time of exposure of negative consequences can be: -: mixed +: impulsive -: technological -: ecological	UC-8
15.	How many axioms are there in the science of life safety in total: -: 10 -: 5 +: 7 -: 4	UC-8
16.	A hurricane belongs to hazards in: -: the lithosphere +: the atmosphere -: the biosphere -: the hydrosphere	UC-8
17.	Working conditions, their classification. Organization of a special assessment of working conditions. Severity and intensity of labor. Name the phenomenon for which penetrating radiation is an important damaging factor:	UC-8

	-: volcanic eruption -: accident of an icebreaker operating on petroleum product fuel -: accident of a nuclear-powered ship in which the power unit remained undamaged +: an accident at a nuclear power plant accompanied by the destruction of the power unit	
18.	An event of a technological nature with tragic consequences leading to loss of life is called: -: an accident (neschastny sluchay) +: a catastrophe -: an extreme situation -: an emergency situation	UC-8
19.	Physical, chemical, biological, and social hazards are called ... of hazards: -: subjects -: objects +: types -: sources	UC-8
20.	Factors leading under certain conditions to traumatic injuries or sharp disorders of human health are called: -: intensive +: harmful -: dangerous -: risky	UC-8
21.	A potential hazard is called the possibility of exposure to human ... factors: +: adverse or incompatible with life -: production -: personal -: social	UC-8
22.	The main way to achieve safety is: -: elimination of hazards in the man - habitat system -: elimination of potential hazards in the man - production environment system +: increasing public awareness -: prevention of violations	UC-8
23.	Risk can be: -: industrial, agricultural, natural +: social, industrial, natural -: legal, ethnic, reconnaissance -: national, military, domestic	UC-8
24.	The technosphere characterizes: -: natural disasters +: the work of the production and industrial complex -: the work of medical and educational institutions -: the work of cultural and educational institutions	UC-8
25.	The natural sphere characterizes: -: transport work -: communication services work +: natural weather phenomena -: the work of the production and industrial complex	UC-8
26.	A threat is ...: +: a danger at the stage of transition from possibility to actuality, an expressed intention or demonstration of readiness of some subjects to cause damage to others -: a possible danger of failure of undertaken actions, or the actions themselves	UC-8

	associated with such a danger -: a state of protection of an individual, society, state from external and internal dangers and threats -: an unexpressed intention of some subjects to cause damage to others	
27.	How many approaches are distinguished in defining risk: -: 9 +: 4 -: 2 -: 5	UC-8
28.	The negative impact of emergency events on groups of people is called ... risk: +: social -: individual -: ecological -: technological	UC-8
29.	Food security is ...: +: the ability of domestic producers to provide the country's population with food in terms of volume and caloric content corresponding to minimum medical standards -: protection of food warehouses by the civilian population -: protection of food warehouses during emergencies -: the ability of the country's population to consume the food basket	UC-8
30.	How many cardinal directions are on a compass: -: 1 -: 2 -: 3 +: 4	UC-8
31.	Safety is ...: +: a state of protection of the individual, society, state from external and internal dangers and threats -: a multifaceted process of human creation of conditions for their existence and development -: a complex biological process that occurs in the human body and allows maintaining health and working capacity -: a central concept of life safety that unites phenomena, processes, and objects capable of causing harm to human health under certain conditions	UC-8
32.	The approach to defining risk relies on statistics, calculation of hours, probable safety analysis, and forecasting possible hazards; it is called: -: sociological +: engineering -: model -: expert	UC-8
33.	The approach to defining risk determined on the basis of a survey of experienced specialists is called: -: sociological -: engineering -: model +: expert	UC-8
34.	According to origin, hazards are: +: anthropogenic -: impulsive -: cumulative -: mixed	UC-8

35.	Environmental security is ...: -: a set of measures to protect the interests of the country and society in the social sphere -: a state of protection of the information environment of society, ensuring its formation and development in the interests of citizens, organizations, and the state +: ensuring a sustainable and optimal balance over long periods of time between natural and anthropogenic ecosystems, the technosphere, and the population -: creation of conditions for the normal development of society, protection of cultural heritage, historical traditions, and norms of public life	UC-8
36.	Security determined by the state of protection of the quantitative and ethnic composition of the country's population from external and internal threats is called: -: social +: demographic -: economic -: information	UC-8
37.	An emergency situation is ...: +: a state in which, as a result of the occurrence of an emergency source in a certain territory, the living conditions of people are disrupted, a threat to their life and health arises, and damage is caused to the property of the population, the national economy, and the natural environment -: a state in which, as a result of the occurrence of a certain danger, damage is caused to the property of the population and the national economy -: a state in which, as a result of the occurrence of an emergency source at a facility, a certain territory, or water area, accidents and catastrophes occur that disrupt the living conditions of people and cause damage to the property of the population and the natural environment -: a state in which, as a result of the occurrence of a certain danger, damage is caused to the natural environment	UC-8
38.	: What is the scale of which of the following emergencies is the largest: -: municipal +: interregional -: intermunicipal -: local	UC-8
39.	An emergency whose damaging factors do not extend beyond the territory of a single constituent entity of the RF is called: +: a regional emergency -: a municipal emergency -: an intermunicipal emergency -: local	UC-8
40.	According to the speed of propagation, emergencies are classified as: +: explosive -: transboundary -: sudden -: global	UC-8
41.	A suddenly arisen disaster caused by the forces of nature or human activity, accompanied by the death and mass injury of people is ...: -: natural disasters -: ecological catastrophe -: an accident +: a catastrophe	UC-8

42.	An accident is ...: -: an extraordinary event of particularly large scale caused by anthropogenic factors +: a suddenly arising stop of work or violation of the production process in transport and various industrial facilities due to design, technological, production, operational reasons or accidental external influences -: natural phenomena of geographical, geological, hydrological, atmospheric, biospheric and other origins -: an extraordinary event of particularly large scale caused by natural factors	UC-8
43.	Natural emergency situations are subdivided into the following types: -: geological, biological, cosmic, and natural fires +: geological, meteorological, hydrological, cosmic, and natural fires -: geological, meteorological, geophysical, and building collapse -: meteorological, cosmic, geophysical	UC-8
44.	A high water level (flash flood) leads to: -: poisoning of pastures -: dam failure -: loss of livestock +: pollution of soil waters	UC-8
45.	If a hurricane or tornado catches you at home, you need to: -: move to the leeward side -: take cover away from windows and mirrors -: go down to the basement and close it well behind you +: all of the above	UC-8
46.	If you are in a house and a hurricane, storm, or tornado suddenly begins, what must be done: -: open the window +: move away from windows, stay at home, hide in a safe place -: gather belongings and go outside -: hide in a closet	UC-8
47.	A hazardous chemical substance (HCS) is ...: +: a hazardous chemical substance used in industry and agriculture, an emergency release of which can lead to environmental pollution and injury to people -: the penetration of hazardous substances through the respiratory tract and skin into the human body -: a radiant energy flux -: the dispersion of harmful substances in the atmosphere	UC-8
48.	Is the following statement true: technological emergency situations are those associated with the activity of a person operating mechanisms, machines, structures, technical devices: -: sometimes -: episodically +: true -: false	UC-8
49.	A device where a controlled uranium nuclear fission reaction is carried out, as a result of which the kinetic energy of the resulting fission products is converted into heat, is ...: +: a nuclear reactor -: a generator -: a turbine -: an engine	UC-8

50.	The main type of regulatory legal acts on environmental protection is ... +: the system of state standards in the field of nature conservation (SSPC) -: a set of legislative and subordinate acts in the field of nature conservation -: a system of state standards in the field of labor safety in nature -: a system of state standards in the field of safety in natural emergency situations	UC-8
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4. Criteria for Assessing Competencies in Performing Test Tasks

The grade excellent is given to a student who has completed 88-100% of all proposed test tasks of various types, independently and consistently navigates the test tasks.

The grade good is given to a student if they have correctly completed 87-72% of the proposed test tasks, and navigates the test tasks.

The grade satisfactory is given to a student if they have correctly completed 71-53% of the proposed test tasks, and fragmentarily navigates the tasks.

The grade unsatisfactory is given to a student if they have completed less than 52% of the proposed test tasks, and poorly navigates the tasks.

5. Methodological materials determining the procedures for assessing knowledge, skills, abilities and (or) experience of activity characterizing the stages of competency development

The procedure for conducting the exam is carried out in accordance with the Regulations on the Conduct of Current Progress Monitoring and Intermediate Certification of Students under Higher Education Educational Programs at NCFU – bachelor’s degree programs, specialist’s degree programs, master’s degree programs – at NCFU, and the Regulations on the Conduct of Current Progress Monitoring and Intermediate Certification of Students under Higher Education Educational Programs – postgraduate programs, residency programs – at NCFU.

The examination ticket includes 4 questions. Two of them are for determining the basic level and two are of the advanced level.

No more than 45 minutes are allotted for preparation using the ticket.

When preparing for the answer, the student is granted the right to use a calculator, reference materials, and regulatory documents.

When checking the practical assignment, the following are evaluated: sequence and rationality of execution, developed thinking (flexibility, rationality, originality), formation of the ability to solve problems, formation of applied skills (ability to solve practical problems, apply new technologies to solve applied problems, etc.), ability to clearly and argumentatively state one’s thoughts, literacy in the execution of problem solutions, and formation of self-control and self-evaluation skills (self-criticism, ability to work on mistakes, realism in assessing one’s abilities).

Recommended Literature

Main Literature

1. Mikhailidi, A.M. Life Safety in the Workplace: textbook / A. M. Mikhailidi. - Life Safety in the Workplace, Entire copyright term. - Electronic data (1 file). - Moscow: IP Ar Media, 2021. - 135 p. - electronic. - The book is located in the premium version of the IPR BOOKS EBS. - ISBN 978-5-4497-0805-2, unlimited copies.
2. Sokolov, A.T. Life Safety: textbook / A.T. Sokolov. - Life Safety, 2021-12-05. - Electronic data (1 file). - Moscow, Saratov: Internet University of Information Technologies (INTUIT), IP Ar Media, 2020. - 191 p. - electronic. - The book is located in the premium version of the IPR BOOKS EBS. - ISBN 978-5-4497-0304-0, unlimited copies.
3. Life Safety Electronic Resource / Kholodov O.M., Duts V.I., Kublanov A.M., Kulikova T.A., Shumansky I.I.: textbook. - Voronezh: VGIFK, 2020. - 206 p. - ISBN 978-5-905-654-68-8, unlimited copies.

Additional Literature

1. Alekseev, V.S. Life Safety. Electronic Resource: Textbook for Secondary Vocational Education / V.S. Alekseev, O.I. Zhidkova, I.V. Tkachenko. - Life Safety, 2020-08-30. - Saratov: Nauchnaya Kniga, 2019. - 159 p. - The book is located in the premium version of the IPR BOOKS EBS. - ISBN 978-5-9758-1890-4 (unlimited copies).
2. Life Safety Electronic Resource: textbook. - Kemerovo: Kuzbass State Technical University named after T.F. Gorbachev, 2020. - 214 p. - The book is located in the premium version of the IPR BOOKS EBS - ISBN 978-5-00137-179-3 (unlimited copies).
3. Krivoshein, D.A. Life Safety Electronic Resource / Krivoshein D.A., Dmitrenko V.P., Gorkova N.V.: textbook. - Saint Petersburg: Lan, 2019. - 340 p. - Recommended by the Editorial and Publishing Council of the Moscow Aviation Institute (National Research University) as a textbook. - The book is located in the basic version of the IPRbooks EBS. - ISBN 978-5-8114-3376-6 (unlimited copies).
4. Sazonova, A.M. Life Safety Electronic Resource / Sazonova A.M., Kharlamova A.V., Shilova E.A. - Saint Petersburg: PGUPS, 2019. - 50 p. - The book is located in the basic version of the IPRbooks EBS. - ISBN 978-5-7641-1387-6 (unlimited copies).

8.2. Educational and Methodological Materials

1. Makarova E.V., Abakumets E.I. Life Safety (workshop) for students of all fields of study and specialties - 104 p. (manuscript) (electronic version)

2. Abdulina, E.R. Life Safety Electronic Resource: workshop / comp. E.R. Abdulina. - Stavropol: North-Caucasus Federal University, 2016. - 156 p. - The book is located in the basic version of the IPRbooks EBS. (electronic version)
3. Methodological guidelines for students' independent work for all fields of study and specialties. Comp. Makarova E.V., Abakumets E.I. - 35 p. (manuscript)

Internet Resources

1. Ministry of Internal Affairs of the RF // Access mode <http://www.mvd.ru>
2. Ministry of Emergency Situations of Russia // Access mode <http://www.emercom.gov.ru>
3. Ministry of Health of the RF // Access mode <http://www.minzdrav-rf.ru>
4. Ministry of Defense of the RF // Access mode <http://www.mil.ru>
5. Ministry of Science and Higher Education of the RF // Access mode <https://minobrnauki.gov.ru>
6. Information and methodological publication for teachers of Life Safety / EMERCOM of Russia // Access mode <http://www.school-obz.org/topics/bzd/bzd.html>
7. Internet Educational Resources – Life Safety // Access mode <http://www.alleng.ru/edu/saf.htm>
8. Safety. Education. Human. Information portal of Basics of Life Safety and Life Safety: All of Life Safety // Access mode <http://www.bezopasnost.edu66.ru>