Theme: "Weapons of mass destruction (WMDs)"

Weapons of mass destruction (WMDs) are weapons that are capable of causing widespread destruction and devastation, particularly through the use of nuclear, biological, or chemical agents. WMDs include nuclear weapons, biological weapons, and chemical weapons.

Nuclear weapons are weapons that use nuclear reactions to release a large amount of energy in the form of an explosion. They are extremely powerful and can cause widespread destruction and loss of life.

Biological weapons are living organisms or their toxins that are used to cause illness or death in people, animals, or plants. These weapons can be highly contagious and difficult to control.

Chemical weapons are substances that are designed to cause injury or death through their toxic effects. They can be delivered through various means, including as gas, liquid, or solid.

The use, possession, and proliferation of WMDs are strictly regulated by international law. Many countries have signed international treaties and agreements that prohibit the development, production, and use of WMDs. Despite these efforts, there remain concerns about the potential use of WMDs by state and non-state actors.

There are several types of weapons of mass destruction (WMDs), including:

1. **Nuclear weapons:** These are weapons that use nuclear reactions to release a large amount of energy in the form of an explosion. They can cause widespread destruction and death.
2. **Chemical weapons**: These are weapons that use chemicals to cause death or injury. Examples include mustard gas, sarin, and VX.
3. **Biological weapons:** These are weapons that use living organisms or their byproducts to cause death or injury. Examples include anthrax, plague, and smallpox.
4. **Radiological weapons:** These are weapons that use radioactive materials to cause death or injury. An example would be a "dirty bomb," which is a conventional explosive device that is designed to spread radioactive material over a wide area.

Nuclear weapons are explosive weapons of mass destruction based on the use of internal nuclear energy. They consist of nuclear munitions, means of delivering them to the target (carriers), and control systems. Nuclear munitions (warheads of missiles and torpedoes, nuclear bombs, artillery shells, mines, etc.) are the most powerful weapons of mass destruction. Their actions are based on the use of internal nuclear energy released during the chain reactions of heavy nuclei of certain isotopes of uranium and plutonium, or during thermonuclear reactions of light nuclei of hydrogen isotopes (deuterium, tritium).

The power of nuclear weapons is commonly measured in terms of TNT equivalent, which is the amount of conventional explosive (TNT) that releases the same amount of

energy as a given nuclear weapon. The TNT equivalent is expressed in tons, kilotons, and megatons. According to their power, nuclear weapons are conventionally divided into: ultra-small (with a power of up to 1 kt);

The damaging factors of a nuclear explosion are the shock wave, light radiation, penetrating radiation, radioactive contamination, and electromagnetic pulse.

The distribution of energy between the damaging factors of a nuclear explosion depends on the type of explosion and the conditions in which it occurs. In an atmospheric explosion, approximately 50% of the explosion's energy is converted into a shock wave, 30-40% into light radiation, up to 5% into penetrating radiation and electromagnetic pulse, and up to 15% into radioactive contamination.

The effects of nuclear explosion on people and objects do not occur simultaneously and vary in duration, nature, and extent of damage.

The shock wave of a nuclear explosion is a region of sharp compression of the medium, which in the form of a spherical layer is distributed in all directions from the place of the explosion with supersonic speed. Depending on the medium of propagation, the shock wave in the air, in water or in the ground is distinguished

The shock wave can cause traumatic injuries, contusions, or death to unprotected people and animals, and the damage can be direct or indirect.

Direct damage by a shock wave occurs as a result of exposure to excessive pressure and high-speed air pressure. Due to the small size of the human body, a shock wave almost instantly engulfs a person and exposes him to severe compression. The compression process continues with decreasing intensity throughout the entire period of the compression phase, i.e. for several seconds. The instantaneous increase in pressure at the moment of the shock wave arrival is perceived by a living organism as a sharp blow. At the same time, the velocity pressure creates a significant frontal pressure, which can lead to the body movement in space.

People and animals can be indirectly injured by falling debris from destroyed buildings and structures, or by flying glass, slag, stones, wood, and other objects at high speeds. For example, with an overpressure of 35 kPa in the shock wave front, the density of flying debris reaches 3,500 pieces per square meter, with an average speed of 50 m/s.

The nature and extent of damage to unprotected people and animals depend on the power and type of explosion, distance, weather conditions, as well as on the location (in a building, in an open area) and position (lying, sitting, standing) of the person.

The impact of the air shock wave on unprotected people is characterized by mild, moderate, severe, and extremely severe injuries.

Guaranteed protection of people from the shock wave is provided by sheltering them in shelters. In the absence of shelters, anti-radiation shelters, underground workings, natural shelters, and terrain are used.

Weak destruction. Window and door frames and light partitions are destroyed, the roof is partially destroyed, and cracks may appear in the walls of the upper floors. The basements and lower floors are completely preserved. The building is safe to enter and can be used after minor repairs.

Medium destruction is characterized by the destruction of roofs and built-in elements such as internal partitions and windows, as well as the appearance of cracks in the walls,

the collapse of individual sections of the attic floors and walls of the upper floors. The basements are preserved. After clearing and repairing, some of the lower-floor rooms can be used. Major repairs are necessary to restore the buildings.

Severe destruction is characterized by the destruction of load-bearing structures and floors of the upper floors, the formation of cracks in the walls, and the deformation of the floors of the lower floors. The use of the premises becomes impossible, and repair and restoration are often impractical.

Complete destruction. All the main elements of the building, including the load-bearing structures, are destroyed. The building cannot be used. In cases of severe and complete destruction, the basement may remain intact and can be partially used after the rubble is cleared.

Light radiation. By its nature, the light radiation of a nuclear explosion is a combination of visible light and ultraviolet and infrared rays that are similar in spectrum. The source of light radiation is the glowing region of the explosion, which consists of highly heated substances from the nuclear weapon, air, and ground (in the case of a ground explosion). The temperature of the glowing region is comparable to the surface temperature of the sun for a period of time (maximum of 8,000-10,000°C and minimum of 1,800°C). The size of the glowing area and its temperature change rapidly over time. The duration of the light emission depends on the power and type of the explosion and can last up to tens of seconds.

The light radiation of a nuclear explosion causes burns to exposed areas of the body, temporary blindness, or retinal burns upon direct exposure. Secondary burns may occur from the flames of burning buildings, structures, vegetation, or flaming or smoldering clothing.

Protection against light radiation is simpler than protection against other damaging factors. Light radiation propagates in a straight line. Any opaque barrier, any object that creates a shadow, can serve as protection against it. By using pits, ditches, mounds, embankments, walls between windows, various types of equipment, tree crowns, etc., as shelters, it is possible to significantly reduce or even avoid burns from light radiation. Shelters and anti-radiation shelters provide complete protection.

Penetrating radiation. This is one of the damaging factors of nuclear weapons, which is a gamma radiation and a neutron flux emitted into the environment from the nuclear explosion zone. In addition to gamma radiation and a neutron flux, ionizing radiation is emitted in the form of alpha and beta particles, which have a short mean free path and are therefore not considered to have a significant impact on people and materials. The duration of penetrating radiation does not exceed 10-15 seconds after the explosion.

The main parameters that characterize ionizing radiation are the dose and radiation dose rate, the flux and particle flux density. As they propagate through the environment, gamma radiation and neutrons ionize its atoms and change the physical structure of substances. During ionization, atoms and molecules in living tissue cells are disrupted due to the breaking of chemical bonds and the decay of life-sustaining processes.

Exposure to penetrating radiation can cause radiation sickness in humans and animals. The severity of the disease depends on the radiation dose, the time during which the dose is received, the area of the body exposed, and the overall health of the individual. Exposure

to radiation doses of up to 50 to 80 R (0.013 to 0.02 Ci/kg) in the first four days does not cause damage or loss of function in humans, except for some changes in the blood. An exposure dose of 200-300 R, received over a short period of time (up to four days), can cause moderate radiation damage in humans, but the same dose received over several months does not cause disease. A healthy human body is able to partially produce new cells to replace those damaged by radiation during this time.

Penetrating radiation can cause reversible and irreversible changes in materials, elements of radio, electrical, and other equipment. In outer space, these damages can be observed at distances of tens and hundreds of kilometers from the center of explosions of megaton weapons.

The electromagnetic pulse of a nuclear explosion is a short-term electric and magnetic field (EMP).

EMP does not have a direct effect on humans. The receivers of EMP energy are bodies that conduct electricity, such as all aerial and underground communication lines, control lines, alarms, power lines, metal masts and supports, aerial and underground antenna devices, above-ground and underground pipelines, metal roofs, and other metal structures. During the explosion, an electric current pulse occurs for a fraction of a second, and a potential difference relative to the ground is generated. These voltages can cause cable insulation to fail, damage to the input elements of equipment connected to antennas, overhead lines, and underground lines (such as communication transformers, spark gaps, fuses, and semiconductor devices), and the burning of fuses included in the lines to protect the equipment.

Radioactive contamination occurs as a result of the fallout of radioactive substances (RS) from the cloud of a nuclear explosion. The main sources of radioactivity in nuclear explosions are: fission products of the substances that make up the nuclear fuel (200 radioactive isotopes, 36 chemical elements); induced activity, which occurs as a result of the impact of the neutron flux of a nuclear explosion on certain chemical elements in the soil (sodium, silicon, etc.); and a portion of the nuclear fuel that does not participate in the fission reaction and is released as tiny particles in the explosion products. The radiation of radioactive substances consists of three types of rays: alpha, beta, and gamma. Gamma rays have the greatest penetrating power (they travel several hundred meters in the air), beta particles have a lesser penetrating power (several meters), and alpha particles have a negligible penetrating power (several centimeters). Therefore, gamma and beta radiation pose the greatest danger to humans in areas with radioactive contamination.

Radioactive contamination has a number of features that distinguish it from other effects of a nuclear explosion. These include: a large area of contamination, which can cover thousands or even tens of thousands of square kilometers; a long duration of the effects, which can last for days, weeks, or even months; and the difficulty of detecting radioactive substances, which have no color, odor, or other external characteristics.

Areas of radioactive contamination are formed in the area of the nuclear explosion and along the path of the radioactive cloud. The greatest contamination of the area will be caused by surface and underground (produced at shallow depths), surface and underwater nuclear explosions. RV contamination may also occur as a result of the enemy's use of radiological weapons.

In a ground-based (underground) nuclear explosion, the fireball touches the surface of the earth. The surrounding environment is severely heated, and a significant portion of the soil and rock is vaporized and captured by the fireball. Radioactive substances settle on the molten soil particles. As a result, a powerful cloud is formed, consisting of a vast number of radioactive and non-radioactive molten particles, ranging in size from a few microns to a few millimeters. 5 Within 7-10 minutes, the radioactive cloud rises and reaches its maximum height, stabilizes, and takes on a characteristic mushroom-shaped form.

Under the influence of air currents, it moves at a certain speed and in a certain direction. Most of the radioactive fallout, which causes severe contamination of the area, falls from the cloud within 10-20 hours after the nuclear explosion.

When radioactive fallout falls from the cloud of a nuclear explosion, it contaminates the surface of the earth, the air, water sources, and property.

Chemical weapons. Their action is based on the toxic properties of chemical substances. The main components of chemical weapons are chemical warfare agents (CWA) or herbicides and their application tools, including carriers, devices, and control systems used to deliver chemical munitions to targets. They can be used by the enemy to defeat troops and civilians, contaminate the environment (water area), equipment, and supplies. Chemical weapons have a wide range of effects, both in terms of the nature and severity of the damage, as well as the duration of their effects.

Another type of chemical weapon is binary chemical weapons. Unlike existing unitary chemical munitions, binary munitions are equipped with two or more non-toxic chemical components that are placed in separate containers. During the flight of shells, bombs, and missiles to their targets, these components are mixed together. As a result of the reaction, highly toxic and lethal substances are produced. By varying the components of binary mixtures, it is possible to achieve greater toxicity and fundamentally new mechanisms of action on living organisms. This, in turn, will make it difficult to detect chemical warfare agents and choose methods for protecting and treating people and farm animals.

The basis of chemical weapons is poisonous substances (PS), which are poisonous (toxic compounds used to equip chemical munitions). PS are designed to affect unprotected people and animals and can contaminate the air, food, feed, water, terrain, and objects located on it.

The main ways of PS penetration are through the respiratory system (inhalation), skin, gastrointestinal tract, and bloodstream, when wounded by contaminated fragments and special damaging elements of chemical munitions. criteria for the combat effectiveness of chemical warfare agents: toxicity, speed of action (the time from contact with the chemical warfare agent to the onset of the effect), and durability.

Toxicity of poisonous substances is the ability of OPs to cause damage when they enter the body in certain doses. The concept of toxic dose (toxicosis) is used as a quantitative characteristic of the damaging effect of OPs and other compounds that are toxic to humans and animals. In the case of inhalation, the toxodose is equal to the product of the concentration of the agent in the air and the exposure time in minutes (mg-min/l); in the case of penetration of the agent through the skin, gastrointestinal tract, and

bloodstream, the toxodose is measured by the amount of the agent per kilogram of body weight (mg/kg).

Suddenness is a prerequisite for the use of chemical weapons. According to experts, lethal doses of chemical agents must enter the human body within a few seconds, i.e., before the use of personal protective equipment for the respiratory system and skin. Depending on the dose of the chemical agent, the effects can range from a sudden and fatal form to a severe and progressive pathological process.

Resistant is the ability of the OP to retain its damaging effects in the air or on the ground for a certain period of time.

In combat states (steam, aerosol, drops) OPs are able to spread in the wind over long distances, penetrate into combat equipment, various shelters and retain their damaging properties for a long time. The transition to the combat state of OPs and their action in the atmosphere and on the ground are influenced by physical and chemical characteristics: volatility, viscosity, surface tension, melting and boiling points, resistance to environmental factors.

Bacteriological (biological) weapons. Their action is based on the use of the pathogenic properties of combat bacteriological agents (CBA). The high combat effectiveness of these agents is due to their low infective dose, the possibility of covert use in large areas, the difficulty of detection, the selectivity of their action (only on humans or a specific species of animals), the strong psychological impact, and the large volume and complexity of work required to protect the population and eliminate the consequences of their use.

To convert the 0V and BS formulations into a combat state, explosive munitions (missile warheads, bombs, shells, mines, and land mines) are used, as well as pouring and spraying devices. Additionally, 0V can be used in thermal munitions (heat packs and thermal generators), while BS can be used in mechanical munitions (entomological bombs, which are containers containing infected vectors). Chemical and bacteriological (biological) munitions are delivered to the target using missiles, aircraft, automatic balloons, and artillery. Biological agents can be sprayed using aerosol generators from ships. Sabotage methods of infecting buildings, food, fodder, and water sources with bacterial agents are also possible. To achieve the greatest effect on enemy personnel, animals, and plants, combined agents containing multiple pathogens, various toxins, and biological agents combined with chemical agents can be used.

The combat properties of bacteriological (biological) weapons are determined by a number of special features of BS actions on the human and animal body. These include:

- the ability to cause massive infectious diseases of humans and animals when ingested in negligible quantities;
- the ability of many infectious diseases to spread rapidly from patient to healthy;
- long duration of action (for example, spore forms of anthrax microbes retain their damaging properties for several years);
- the presence of a latent (incubation period (time from the moment of infection to the manifestation of the disease);
- the ability of contaminated air to penetrate various unsealed shelters and rooms and affect unprotected people and animals; the difficulty and duration of detecting disease-causing

microbes and toxins in the external environment, which requires special laboratory research methods.

To infect people and animals, the enemy may use pathogens of various infectious diseases. Among them, the most dangerous are the pathogens that cause so-called particularly dangerous diseases, such as plague, smallpox, cholera, and anthrax. The enemy may also use pathogens of tularemia, botulism, and other diseases.

Plague is an acute infectious disease that affects both humans and animals. The causative agent is a microbe that is not highly resistant outside the body; in the sputum produced by a sick person, it remains viable for up to 10 days. The disease usually begins with general weakness, chills, and headaches; the temperature rises rapidly, and the patient's consciousness becomes clouded. Sick individuals are sources of infection for others. Patients with the pulmonary form of plague are particularly dangerous. These patients release numerous microbes into the air along with their sputum. Cholera is an acute infectious disease. The causative agent of cholera is the so-called Vibrio cholerae, which is unstable in the external environment. In severe cases, the disease can be fatal. Symptoms of cholera include diarrhea, vomiting, and convulsions. The patient rapidly loses weight, and their body temperature may drop to 35°C. Severe cases of cholera are relatively easy to diagnose, but during an epidemic, mild cases may be difficult to identify.

The only sign of the disease in such cases may be a more or less pronounced diarrhea. Cholera vibrios that are excreted in feces are dangerous.

Anthrax is an acute infectious disease that affects both animals and humans. The causative agent of anthrax enters the body through the respiratory tract, digestive system, or skin wounds. The disease occurs in three forms: cutaneous, pulmonary, and intestinal. In the cutaneous form of anthrax, open areas of the hands, feet, neck, and face are most commonly affected. An itchy spot appears at the site of infection, which develops into a blister filled with cloudy or bloody fluid. The blister soon bursts, forming an ulcer covered with a black scab, around which a massive edema forms. A characteristic feature is a decrease or complete absence of sensitivity in the area of the ulcer. With a favorable course of the disease, the patient's temperature decreases after 4 to 5 days, and the painful symptoms gradually subside.

Botulism is a severe disease caused by botulinum toxin, which is produced by botulism bacteria. Botulinum toxin is a very potent poison, and according to experts, as little as 0.00000012 grams of crystalline toxin is enough to cause poisoning in humans. Botulism is primarily transmitted through the digestive tract. Botulinum toxin affects the central nervous system, the vagus nerve, and the heart's nervous system. The first symptoms are general weakness, headache, visual disturbances (such as blurred vision and double vision), pressure in the epigastric region, and paralysis of the muscles in the tongue, soft palate, larynx, and face. The patient's temperature is usually lower than normal. Without treatment, botulism can lead to death in up to 80% of cases. Recovery is slow, and the patient may experience prolonged weakness.

Tularemia is an acute infectious disease that can leave a person disabled for a long time. The causative agent of tularemia can survive for a long time in water, soil, and dust. Humans can contract tularemia through the respiratory tract, digestive system, mucous membranes, and skin. The disease begins suddenly with a sudden increase in temperature.

It is accompanied by severe headaches and muscle pain. Depending on the route of infection, the disease can manifest in three main forms: pulmonary, intestinal, and typhoid. The pulmonary form is similar to pneumonia, while the intestinal form is characterized by severe abdominal pain and nausea. The typhoid form is characterized by the absence of local signs of the disease, and it is severe and develops in weakened individuals through any route of infection. If antibiotics are administered promptly, the disease can be prevented or the course of the disease can be made relatively mild, leading to a rapid recovery.

Signs of use. At the sites of ammunition detonations, the following are observed:

- droplets of liquid or powdery substances on the soil, vegetation, and various objects, or the formation of a light cloud of smoke (fog) when the ammunition detonates;
- the appearance of a streak behind a passing aircraft, which gradually settles and dissipates;
- the accumulation of insects and rodents, the most dangerous carriers of bacterial agents, which is unusual for the local area and the current season;
- the occurrence of mass diseases among humans and animals, as well as the mass death of farm animals.

Protection against the effects of weapons of mass destruction

Protection against all the effects of nuclear weapons is provided by sheltering the population in protective structures (shelters, shelters-reservoirs). People who are sheltered in protective structures (hereinafter referred to as protective structures) are not exposed to light radiation or shock waves. The construction of protective structures significantly reduces the effects of penetrating radiation and radioactive contamination in the area.

If people are outside shelters (hiding places) during a nuclear explosion, for example, if they are in an open area or on the street, they should use nearby natural shelters to protect themselves. If there are no nearby shelters, they should turn their backs to the explosion, lie down on the ground face down, and put their arms under themselves. 15 - 20 s after the explosion, when the shock wave passes, you should stand up and immediately put on a gas mask, respirator or any other means of protection of the respiratory system (to the point that cover the mouth and nose with a handkerchief, scarf, dense material). After that, shake off the dust settled on the clothes and shoes, put on the available skin protection (use the clothes and shoes worn as means of protection) and immediately leave the affected area or take refuge in the nearest protective structure.

Protection against the effects of chemical weapons is provided by sheltering the population in sealed shelters. When entering an infected area, it is necessary to use personal protective equipment (hereinafter referred to as PPE) for the respiratory system (gas masks) and skin protection equipment (L-1, OZK, etc.). When moving, do not touch any objects around you. Do not step on visible droplets of toxic substances. Even if you are extremely tired, do not remove your PPE. If poisonous substances come into contact with exposed areas of the body or clothing, immediately treat them with an individual anti-chemical package (IPP-8, IPP-11). After leaving the contaminated area, undergo sanitary treatment.

The effective protection of the population in the area of the bacteriological outbreak is carried out by a single complex of anti-epidemic measures, which include:

- conducting bacteriological reconnaissance;
- isolating the area of infection and restricting contact between people;
- carrying out preventive measures;
- organizing sanitary treatment and disinfection of clothes, shoes, and premises;
- actively identifying, isolating, hospitalizing, and treating patients, and ensuring that the population follows personal and public hygiene requirements.

Alerting.

Alerting the population means to warn them about an impending flood, forest fire, earthquake or other natural disaster, to transmit information about an accident or catastrophe that has occurred. For this purpose, all means of wired, radio and television communication are used.

Time is the main factor. In extreme conditions, it cannot be lost in any way. Often it decides the fate of people.

In Russia, more than in any other country, the radio broadcasting network is widespread. There is not a single city or large settlement that does not have a radio broadcasting center. The vast majority of enterprises, agricultural facilities, and educational institutions have their own local radio centers. These are complemented by an equally powerful system of republican, regional, and provincial television centers and repeaters, as well as broadcast and local radio stations. It is almost certain that there is not a single house or apartment that does not have a radio, TV, or radio-frequency receiver. This system is complemented by a well-developed network of electric sirens located on the roofs of buildings and in noisy factories in cities. This extensive network, which is densely saturated with communication equipment, creates favorable conditions for alerting the population about emergencies and allows for quick dissemination of information about the situation and the rules of conduct in specific circumstances.

In case of danger, people had to be warned, no matter where they were. For this purpose, it was decided to use sirens. Therefore, since then, the howling of sirens, the intermittent beeps of enterprises, mean a different signal – a warning: "Attention to all!", and not an air alarm, as it was provided for before.

When you hear the howling of sirens, you must immediately turn on the TV, radio, radio network speaker and listen to the message of local authorities or the Department of Civil Defence and Emergency Situations.

During the entire period of disaster or accident relief, all these facilities must be kept constantly on. Local radio broadcasting stations in populated areas and national economy facilities are switched to round-the-clock operation

Something similar exists in other countries. For example, in Germany, about 100,000 sirens have been installed and can be activated to draw the public's attention when necessary. In Austria, there are approximately 5,000 sirens, but experts believe that this number is insufficient, and plans are underway to install an additional 5,000 to 7,000 sirens in the coming years.

When there is an air, chemical, or radiation hazard, the sirens also sound first, which is the "Attention All!" signal, followed by information.

For example: "Attention! Attention! This is the Civil Defense and Emergency Management Headquarters. Citizens! Air raid alert! Air raid alert!" or "Radiation hazard!" or "Chemical alert!"

The notification system has significant advantages and a number of advantages.

Firstly, the sound of sirens makes it possible to immediately attract the attention of the entire population of the city, district, region.

Secondly. It can be used both in peacetime - during natural disasters, and in the military. Finally, everyone can now receive accurate information about the event, the current emergency situation, and be reminded of the rules of conduct in specific conditions.

Some rules of conduct for citizens in response to warning signals:

If you hear a warning signal at home, leave the building and go to the nearest shelter, turning off all heating devices, gas, and lights. Take the necessary medications with you, as well as a supply of food, documents, and money, if possible.

If you hear a warning signal on the street or in public transportation, do not try to get home as quickly as possible. Instead, find the nearest shelter and use it. If there is no shelter available, use nearby underground passages and sewers, basements, tunnels, and metro stations. You can also take shelter in roadside ditches, construction sites, behind low stone walls and fences, railway embankments, and in ravines, gullies, and hollows.

If the signal catches you in a public place (a store, a theater, or a market), listen carefully to the instructions of the administration about where the nearest metro station or other shelters are located and how to get there quickly. If you do not receive any information from the administration, go outside, look around, determine the location of the nearest shelter or natural cover, and use it.

If the signal catches you in a private house or a country house, follow the same instructions as city residents. Basements, cellars, and natural shelters such as ravines, gullies, hollows, ditches, pits, etc. can be used as protective measures.

The population is warned about the possibility of radioactive contamination by the "Radiation Danger!" signal.

The "Chemical Alarm!" signal is used to alert the population in the event of a threat or detection of chemical or bacteriological contamination.

Evacuation and Dismantling.

Evacuation has been used as a means of protecting the population for a long time. It reached especially large scale during the Great Patriotic War. Factories with workers,

employees, and their families were evacuated from the European part of the country. During July-November 1941, more than 1,500 industrial enterprises were relocated to the deep rear. The evacuation from the blockaded city of Leningrad was particularly significant, as it was carried out through the only route, the Ice Road of Life across Lake Ladoga. Children, women, the elderly, and sick people were taken out first.

In the event of an accident at a facility that produces or uses chemical agents, an area of contamination will be formed. In such cases, workers and employees should immediately put on personal protective equipment and move away from the wind direction. It is also necessary to evacuate from the areas where the toxic cloud is moving.

From the above, it can be seen that evacuation is extremely necessary in emergency situations and is sometimes the only reliable way to protect oneself.

Evacuation is carried out both in peacetime (in case of natural and man-made emergencies) and in wartime.

Conducting evacuation measures in wartime.

Evacuation in its pure form is rare, it is usually combined with other protective measures.: shelter, carrying out anti-radiation, medical, fire-fighting, engineering works. It is carried out with the aim of removing people from dangerous areas and minimizing losses.

The main (necessary) way to protect the population is to carry out evacuation measures to remove the population of these cities and place it in a suburban area.

Population evacuation is a set of measures aimed at organizing the organized withdrawal of the population from categorised cities by all available means of transport and the withdrawal of the population on foot, and their placement in the countryside.

A suburban zone is an area within the administrative boundaries of the constituent entities of the Russian Federation that is located outside the areas of possible destruction, possible dangerous radioactive contamination, possible dangerous chemical contamination, and possible catastrophic flooding, and is prepared in advance for the evacuation of the population under the conditions of its priority life support.

Evacuation measures are planned and carried out in order to:

 reduce the possible losses of the population of categorised cities and preserve qualified specialists;

 ensure the sustainable functioning of economic facilities that continue their production activities in wartime;

 ensure the conditions for creating groups of civil defence forces and means in the countryside for conducting emergency rescue and other urgent work in the areas of damage caused by the use of modern weapons by a potential enemy.

Evacuation is subject to:

 workers and employees with non-working family members of economic facilities whose activities, in accordance with mobilization plans, do not cease during wartime and can be continued at a new base that corresponds to their production profile and is located in a rural area;

 essential equipment and documents that are necessary for the resumption of activities at the new base;

 workers and employees with non-working family members of economic facilities that cease their activities during wartime;

 the disabled and unemployed population.

Dismantling is a set of measures for the organized withdrawal from categorised cities and placement in the country zone for the accommodation and recreation of workers and employees of economic facilities, the production activities of which will continue in these cities during wartime.

Dismantling is subject to: - workers and employees:

- unique (specialized) economic facilities, for the continuation of which the relevant production bases in the country zone are absent or located in categorised cities;

- organizations that ensure the production and livelihoods of facilities in categorized cities (urban power grids, public utilities, public utilities);

- education, healthcare, transport and communications, state authorities of the subjects of the Russian Federation, and local governments).

The dispersed workers and employees are located in the suburban areas closest to the borders of the classified cities near railway, automobile and waterways.

General evacuation is carried out on the territory of the country or on the territory of several constituent entities of the Russian Federation and involves the removal (withdrawal) of all categories of the population, with the exception of non-transportable patients, their attendants, and individuals with mobilization orders.

Partial evacuation is carried out before the general evacuation begins in the event of a threat from modern weapons of a potential enemy, without disrupting the existing transportation schedules.

During partial evacuation, the population that is unable to work and is not employed in production or service (students, pupils from schools, boarding schools, and vocational schools, children from orphanages, departmental kindergartens, and other children's institutions, and pensioners living in homes for the disabled and elderly) is evacuated together with teachers, staff, and their family members.

The evacuated population is accommodated:

 in public and administrative buildings (sanatoriums, boarding houses, recreation centers, and children's health camps;

 in residential buildings, regardless of ownership or departmental affiliation;

 in heated houses of dacha cooperatives and gardening associations - based on orders (prescriptions) issued by local government bodies.

To carry out the immediate preparation, planning, and execution of evacuation measures, evacuation bodies are established, one of which is the sectoral (object) evacuation commission.

The number of people to be evacuated is determined and agreed upon with local authorities, taking into account the recommendations of the Civil Defense and Emergency Management headquarters, based on the conditions, nature, and scale of the emergency situation. It is important for relevant authorities to remember that the evacuation also applies to the population living in areas at risk of catastrophic flooding, which are areas where flooding could lead to the destruction of buildings and structures, loss of life, damage to the main equipment of industrial facilities, and the destruction of other assets. However, this population is not evacuated far away, but rather to nearby settlements.

During evacuation, people are taken (led) to the countryside, i.e. to those areas and settlements where further residence is not dangerous. The distance can vary from a few kilometers to hundreds.

The areas (settlements) where the evacuated population is located are usually close to railways and highways.

In the event of an emergency, the speed of evacuation is of particular importance. For this purpose, it is possible to use not just one type of transport, but a combination of different types.

When preparing for evacuation on foot, it is necessary to prepare shoes that do not rub the feet and are suitable for the season.

If you are traveling to a rural area by transport, you can pack your belongings and food in suitcases, bags, or backpacks. If you have to walk, you can pack everything in a backpack. Attach tags to each item with your name, initials, address, and final evacuation destination. This will help ensure that your suitcase or backpack is not lost.

Children of preschool age should have labels sewn on their clothes and underwear indicating their last name, first name, patronymic, year of birth, place of permanent residence, and final evacuation point.

Before leaving the apartment, it is necessary to turn off all lighting and heating devices, close the water and gas taps, windows, and vents. Set off the security alarm (if there is one), and lock the apartment with all the locks.

In order to evacuate the population by rail and waterways, not only passenger transport, but also freight cars, cargo ships, and barges are used. It is planned to load the evacuated population more densely into the cars, as well as to increase the length of the train.

When transporting people by road, in addition to buses, trucks and trailers adapted for this purpose are used. The use of private vehicles is also possible.

Organization of engineering protection of the population.

One of the most reliable ways to protect the population from the effects of chemical agents in case of accidents at chemically hazardous facilities and from radioactive substances in case of malfunctions at nuclear power plants, during natural disasters: storms, hurricanes, tornadoes, snow drifts, and, of course, in the case of the use of conventional weapons and modern weapons of mass destruction, is

shelter in protective structures. Such structures include shelters and anti-radiation shelters (PRU). In addition, simple shelters can also be used to protect people.

Protective structures can be built-in, located in the basements and ground floors of buildings and structures, or free-standing, built outside buildings and structures. They are placed as close as possible to people's workplaces or residences.

Shelters. They are characterized by the presence of solid walls, ceilings, and doors, as well as the presence of airtight structures and filter-ventilation devices (see Figure 1). All of this creates favorable conditions for people to stay in the shelters for several days. The entrances and exits are also made to be as secure as possible, and in case of blockages, emergency exits are provided.

The capacity of the shelter is determined by the sum of seats and beds (second and third tiers): small - up to 600, medium - from 600 to 2000, and large - over 2000 people.

The shelter will protect people from falling debris, penetrating radiation and radioactive dust, as well as from exposure to hazardous chemicals, toxic substances, bacteria, high temperatures during fires, carbon monoxide, and other dangerous emissions in emergency situations. For this, shelters are sealed and equipped with filter ventilation equipment. It purifies the outside air, distributes it to the compartments and creates an overpressure (backpressure) in the rooms, which prevents the penetration of contaminated air through various cracks and leaks.

Long-term stay of people is possible due to reliable power supply (diesel power station), sanitary and technical devices (water supply, sewerage, heating), radio and telephone communication, as well as water, food and medicine supplies. The air supply

system, in turn, will provide people not only with the necessary amount of air, but will also give it the required temperature, humidity and gas composition.

All shelters have two ventilation modes: clean ventilation, where the outside air is purified from dust, and filter ventilation, where the air is passed through absorbent filters to remove all harmful impurities, substances, and dust. If the shelter is located in a fire-prone area (such as an oil refinery) or in an area with potential exposure to highly toxic substances, it also has a third mode: isolation and regeneration.

The water supply system provides people with drinking and hygienic water from the external water supply network. In case of water supply failure, there is an emergency reserve or an independent source of water (artesian well). The emergency reserve contains only drinking water (3 liters per person per day). If there are no stationary tanks, I install portable containers (barrels, cans, and buckets).

Each protective structure has a sewage system that allows for the disposal of fecal water. The bathroom is located in a room that is separated from the shelter's compartments by partitions, and it is equipped with an exhaust system.

The heating system consists of radiators or smooth pipes that run along the walls. It is powered by the building's heating system.

Electricity is necessary to power the air supply system's electric motors, artesian wells, fecal water pumping, and lighting. It is supplied from the city (object) power supply, and in emergency cases, from a diesel power plant located in one of the shelter's rooms. In structures without an autonomous power plant, batteries, various lanterns, and candles are provided.

The food supply is calculated to last at least two days for each person sheltering.

Medical services are provided by sanitary posts and medical facilities at public sector facilities. Each shelter must have telephone communication with the management office of its enterprise and radio loudspeakers connected to the city or local radio network.

Anti-radiation shelters (ARS) are mainly used to protect the population of rural areas and small towns from radioactive contamination. Some of them are built in advance during peacetime, while others are constructed (adapted) only in anticipation of emergencies or the threat of armed conflict.

It is especially convenient to arrange them in basements, ground floors, and first floors of buildings, as well as in utility buildings such as cellars and vegetable storage facilities (see Figure 2). There are several requirements for PRUs. They must ensure the necessary attenuation of radioactive radiation, protect against accidents at chemically hazardous facilities, and save lives during natural disasters such as storms, hurricanes, tornadoes, typhoons, and snowstorms. Therefore, they should be located near the residential (work) areas of the majority of the people being sheltered.

The simplest shelters, such as trenches (open and covered), foxholes, bunkers, dugouts, and basements, have undergone significant historical changes, but their basic structure remains relatively unchanged. These structures are designed to be as simple as possible, requiring minimal time and materials for construction. Trenches can be either open or covered. They consist of a 1.8-2 m deep and 1-1.2 m wide trench at the top and a 0.8 m wide trench at the bottom. Usually, a shelter is built for 10 to 40 people. Each person is given 0.5 m of space. The shelters are arranged in the form of straight sections that are angled to each other, with each section being no more than 10 m long. The entrances are made at a right angle to the adjacent section.

It is necessary to fill the shelters in an organized and quick manner. Everyone should know the location of the designated shelter and the route to reach it. It is advisable to mark the routes with signs placed in visible locations. To prevent people from congregating in one place and to divide the flow of people, it is common to designate multiple routes, clear the area, and remove any obstacles. It is best to place people in the shelter in groups, such as workshops, teams, institutions, houses, or streets, and mark the corresponding locations with signs. A senior is appointed in each group. Those who have arrived with children are placed in separate compartments or designated areas. The elderly and sick are placed close to the ventilation pipes.

Increase the protective properties of the house (apartment) from the penetration of radioactive, poisonous and emergency chemically hazardous substances.

Your house may be close to a water supply station, a textile or cellulose-paper enterprise. At these facilities there is certainly chlorine. If there is a meat-packing plant, a canning factory, a refrigerator, a fat-packing plant or another enterprise of the food industry nearby - there will be ammonia. And if somewhere nearby there is a chemical plant or a plant for the production of fertilizers, plastic masses or a petrochemical enterprise - expect a whole bouquet of chemical substances.

Let's say all this is far away from you, and you think you can feel at ease. But there may be a railway nearby, or even more dangerously, a railway station. Such a proximity should also cause fear and concern.

At home, you should have cotton-gauze bandages prepared in advance for all family members, as well as baking soda and citric acid. To seal the room, keep strips of paper and glue. Remember where you keep these items. In the event of explosions, fires, or collapses, people may suffer injuries, fractures, bleeding, fainting, shock, or heart attacks. To provide first aid, you should have a home first aid kit. It should contain all the necessary items: bandages (band-aids, napkins, bandage bags), iodine, ammonia, nitroglycerin, valydol, analgin, besalol, valerian tincture, potassium permanganate, boric acid, bactericidal adhesive tape, cotton wool, and a polyethylene cup for taking medications. It is advisable to have a rubber tourniquet or a cloth twist to stop bleeding. And, of course, don't forget

that if you have to evacuate for a while, you should take your documents, money, valuables, and everything you need for the first case.

Personal protective equipment for the respiratory system.

Personal protective equipment for the respiratory system includes filter gas masks (military, civilian, children's, and industrial), isolating gas masks, respirators, and simple protective equipment. The most commonly used filter gas masks for protecting the population are the GP-5 (GP-5M) and GP-7 (GP-7V).

The GP-5 civilian gas mask is designed to protect humans from ingestion of radioactive, toxic, chemically hazardous substances and bacterial agents into the respiratory system, eyes and face. The principle of protective action is based on the preliminary purification (filtration) of inhaled air from harmful impurities.

The GP-7 civilian gas mask is one of the latest and most advanced models. It provides reliable protection against toxic and many chemically hazardous substances, radioactive dust, and bacterial agents.

Additional cartridges. As a result of the development of the chemical and petrochemical industries, all sectors of the national economy have increased the use of chemicals in production. Many of these chemicals are harmful to human health. They are known as hazardous chemical substances (HCS). In the event of an accident at a production facility or on a transportation route, these chemicals can be spilled or released into the atmosphere. This can lead to human exposure.

The simplest means of respiratory protection. When there is no gas mask or respirator, i.e. industrial-made means of protection, you can use the simplest ones - cotton-gauze bandage and dust-proof fabric mask (hereinafter - DPM) see figure No. 6. They reliably protect the human respiratory system (and DPM skin of the face and eyes) from radioactive dust, harmful aerosols, bacterial agents, which will prevent infectious diseases. It should be noted that they do not protect against chemical warfare agents and many chemical hazards.

Skin protection products are designed to protect people from exposure to hazardous chemicals, toxic substances, radioactive materials, and bacteria. They are divided into special and improvised products.

The simplest means of skin protection. The simplest means of human skin protection can be used, first of all, production clothing: jackets, trousers, overalls, gowns with hoods, sewn in most cases from tarpaulin, fire-resistant or rubberized fabric, rough cloth. They are capable not only to protect against the skin of radioactive substances in accidents at nuclear power plants and other radiation-hazardous facilities,

but also from drops, vapors and aerosols of many ACHV. For example, tarpaulin products protect against liquid chemical warfare agents and chemical agents of chemical warfare in winter for up to 1 hour and in summer for up to 30 minutes.

Medical personal protective equipment.

As a result of accidents, disasters and natural disasters, people get injured, they may be threatened by exposure to highly toxic, poisonous and radioactive substances. In all cases, medical personal protective equipment will be the very first, faithful and reliable assistants. They include: individual dressing package, individual first aid kit (AI-2), individual anti-chemical package (IPP-8, IPP-9, IPP-10). In addition, it is extremely necessary to have your own home first aid kit.

Sanitary treatment of people.

Sanitary treatment of people is divided into partial and full.

Partial, as a rule, is carried out directly in the zone (focus) of infection or immediately after leaving there. In this case, everyone independently removes radioactive substances, neutralizes AHS, OHS and bacterial agents trapped on exposed skin, clothing, shoes and protective equipment.

During full sanitary treatment, the entire body is washed with warm water and soap, and underwear and clothing are changed. This is done at stationary washing stations, in baths, shower rooms, or on specially set up washing platforms and special treatment stations. In summer, full sanitary treatment can be performed in non-contaminated flowing water bodies.