

IN ORDER OF DISCUSSION В ПОРЯДКЕ ДИСКУССИИ

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Review article
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PROBLEMS OF DEVELOPMENT AND IMPLEMENTATION OF PERSONAL PROTECTION EQUIPMENT FOR PERSONNEL OF RADIATION AND CHEMICAL HAZARDOUS FACILITIES, EMERGENCY AND RESCUE TEAMS AND POPULATION

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Abstract. The article presents a brief review of the activities of the laboratory "Personal protection equipment for the personnel of hazardous production facilities" for creation of the regulatory-legal and regulatory-methodological support system for personal protection of the personnel of radiation and chemical hazardous facilities, of regular and non-staff emergency rescue teams of Rosatom State Corporation and of FMBA of Russia as well as of the population living in the influence area of the mentioned facilities. The issues of standardization and certification of personal protective equipment at NPPs and in the field of atomic energy use — both in the normal operation mode of dangerous objects, and in emergency situations of peace and war time are considered. The problems arising in the implementation of innovative personal protective equipment, primarily due to international obligations, are shown.

Key words: certification, emergency rescue teams, emergencies, personnel, population, personal protective equipment, radiation and chemical hazardous production (objects), sanitary and epidemiological standardization, standardization, technical regulation

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ПРОБЛЕМЫ РАЗРАБОТКИ И ВНЕДРЕНИЯ СРЕДСТВ ИНДИВИДУАЛЬНОЙ ЗАЩИТЫ ПЕРСОНАЛА РАДИАЦИОННО- И ХИМИЧЕСКИ ОПАСНЫХ ОБЪЕКТОВ, АВАРИЙНО-СПАСАТЕЛЬНЫХ ФОРМИРОВАНИЙ И НАСЕЛЕНИЯ

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Резюме. Представлен краткий обзор деятельности лаборатории «Средства индивидуальной защиты персонала опасных производств» по созданию системы нормативно-правового и нормативно-методического обеспечения индивидуальной защиты персонала радиационно- и химически опасных объектов, штатных и нештатных аварийно-спасательных формирований Госкорпорации «Росатом» и ФМБА России, а также населения, проживающего в зоне влияния указанных объектов. Рассмотрены вопросы стандартизации и сертификации средств индивидуальной защиты (СИЗ) на АЭС и в области использования атомной энергии – как при штатном режиме функционирования опасных объектов, так и в условиях чрезвычайных ситуаций (ЧС) мирного и военного времени. Показаны проблемы, возникающие при внедрении новых инновационных СИЗ, обусловленные, прежде всего, международными обязательствами.

Ключевые слова: аварийно-спасательные формирования, население, персонал, радиационно- и химически опасные производства (объекты), санитарно-эпидемиологическое нормирование, сертификация, средства индивидуальной защиты, стандартизация, техническое регулирование, чрезвычайные ситуации

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The Laboratory of Personal Protective Equipment at the A.I. Burnazyan Federal Medical and Biophysical Center was established in 1953 as an independent scientific unit. Before that the work in this direction was carried out by a special group created in 1948 in the structure of the Institute of Occupational Hygiene and Occupational Diseases [1]. In the mid-1950s the intensive work of the laboratory gave great results [2]. Such inventions as light high-efficiency respirators ShB-1 "Lepetok-200", additional film overalls and special footwear, hose-type means of individual respiratory protection, pneumatic suits etc. were created and are still in use today. [3]. Technical characteristics of the used materials and means of individual protection in were published in the USSR the first detailed Catalogue. They can also be seen in the regularly published since 2003 Directory-Catalogue. Its latest edition was published in 2020. [2-5] — Figure.

The laboratory was engaged in the development of personal protective equipment until the 1990s. At that time it had its own large experimental production and more than 500 employees worked there.

Specialists of the laboratory have developed the Standard Table of Equipment for Emergency Rescue Units of Rosatom with Personal Protective Equipment, as well as several documents for different divisions of the State Corporation, which establish Standard Norms for issuing certified personal protective equipment[6].

It should be noted that the laboratory staff has always paid great attention not only to the development of individual protection means, but also to normative-methodological and normative-legal documents on individual protection. So, one of the first standards on means of individual protection which is still in force is GOST 12.4.028-76 [7]. Since that time more than 100 standards for personal protective equipment and methods of their testing have been developed at the Burnazyan Federal Medical and Biological Center. At present, the Center has the PK-1 "Insulating Suits" TK-320 "Personal Protective Equipment". Laboratory staff developed more than 10 SanPiN, which set the requirements for personal protective equipment, including SanPiN 2.2.8.46-03 "Sanitary rules for decontamination of personal protective equipment"; SanPiN 2.2.8.47-03 "Insulating suits for protection against radiation and chemical toxic substances";

SanPiN 2.32.8.48-03 "Personal respiratory protective equipment for personnel at radioactively hazardous production facilities"; SanPiN 2.2.8.49-03 "Personal skin protective equipment for personnel at hazardous production facilities", which were registered with the Russian Ministry of Justice and effective since January 1, 2021.

The laboratory experts as members of the working groups for the development of the first rules for the certification of personal protective equipment participated in the preparation of the following documents: "Unified sanitary-epidemiological and hygienic requirements for goods subject to sanitary and epidemiological supervision (control)". Requirements approved by the Decision of the Customs Union Commission of 28.05.2010 № 299; Technical Regulations TR CU 019/2011 "On the safety of personal protective equipment".

On the basis of the laboratory the Test Center "Individual Protection", accredited by Rosatom State Corporation for certification testing of all personal protective equipment used at the radiation and chemical facilities of Rosatom operates.

At present the accreditation of the Body for Conformity Assessment (Mandatory Certification) of Personal Protective Equipment in the field of the use of atomic energy is being completed. In general, the laboratory has been engaged in certification of personal protective equipment since 1993, when it was first accredited by Rosstandart.

It must be said that certification of personal protective equipment is currently associated with great difficulties. It is connected with rapid changes in the normative base and transition of the Russian Federation to new American and European standards. In addition, the transition to new methods, which can be implemented only on imported expensive equipment included in the State Register, requires large material and time expenditures. The center must purchase equipment, materials, reagents and services for equipment verification on a competitive basis (the total range of purchased products and services is many thousands of items). And this is a very complicated process. It can be simplified by making a simple decision. If a bona fide supplier produces products with stable technology that meets the established requirements, and has been doing so from the same type of

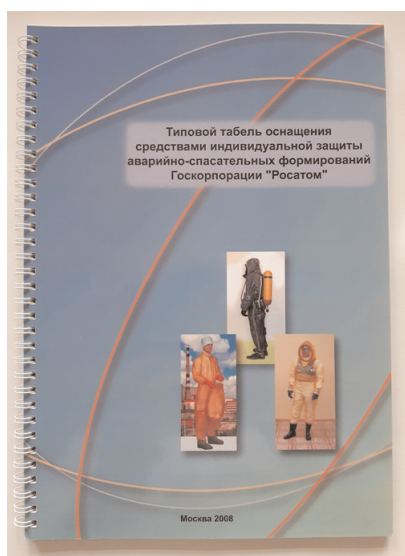


Рисунок. Нормативно-методические и нормативно-правовые документы по средствам индивидуальной защиты человека
Figure. Regulatory and methodological documents on personal protective equipment

raw materials for many years, why do they have to go through lengthy procedures? Especially since they are often conducted by "specialists" who have been trained in new specialties, particularly in "conformity assessment." They do not have any work experience and do not know not only the specifics of real production of personal protective equipment, but also the specifics of its application in conditions of radiation and chemical hazardous production in peacetime and wartime. If there are 25 or 18 technical regulations in the accreditation area of the certification body or testing center, the certificates and protocols issued by them are questionable.

For many years we have been engaged in training and certification of professional rescuers, specialists of regular and non-staff emergency rescue services and formations of ROSATOM. We have been working since their formation at the Central Industry Commission for Attestation of Emergency Rescue Services, Emergency Rescue Units and Rescuers — COAK-1 (State Corporation) and the Industry Attestation Commission — UAC-3 (TVEL). And we can see how long, time-consuming and financially expensive the process of formation of such high-class specialists as production managers and rescuers of the nuclear industry is.

It should be noted that in the system of Rosatom and FMBA of Russia, over the many years that have passed since the Chernobyl accident, this process has been fine-tuned to the smallest detail and is functioning normally. The same cannot be said of the conformity assessment processes. Their rules are very complicated and, unfortunately, change frequently. This happens without taking into account the opinions of professionals who conduct real tests, not purely computer simulations. If you create test centers "in the open field", it will require very large capital investments. And this process will end in the absence of experienced professional staff capable of operating complex imported equipment. Maybe that's why we have to deal with certificates issued on the basis of protocols that do not confirm the real protective characteristics of personal protective equipment, which will be required from the products in the conditions of their use. The fact that business is now really leading the rulemaking and conformity assessment processes is a dangerous trend. For business, it's all about making a profit, not ensuring safety. Under the Labor Code, safety is the employer's responsibility. At the same time the employer has no opportunity to fully verify the characteristics of the personal protective equipment supplied. Very often during certification one product is provided for testing, but a cheaper "analogue" is supplied. In Europe and the USA, testing centers are usually part of large multinational corporations. These corporations can afford to incur large expenses on science. But in our country, it is forbidden by law — a test center must be independent. In addition, they also value long-standing suppliers, while we are offered to change them on a competitive basis all the time.

In general, in the nuclear industry the problem of providing certified personal protective equipment to the personnel of the main production facilities, emergency services and formations is solved at a rather high level. But there are individual cases of delivery of counterfeit and counterfeit products, as well as deliveries of personal protective equipment with almost expired warranty shelf life. It is more difficult to provide the population with personal protective equipment, which is regulated by Order No. 543 of the Ministry of Emergency Situations of Russia dated October 1, 2014, as amended by Order No. m309 of the Ministry of Emer-

gency Situations of Russia dated 31.07.2017 and GOST R 22.9.14-2014 "BCHS. Personal protective equipment in emergencies. Gas-dust-proof respirators. RESPIRATORS."; GOST R 22.9.19-2014 "BCHS. Personal protective equipment for respiratory system in emergencies. Filtering gas masks. OTT"; GOST R 22.9.02-2014 "BCHS. Means of Personal Respiratory System Protection in Emergency Situations. Filtering gas masks and self-rescuers. Test methods".

According to item 2 of the mentioned order "Provision of the population with means of individual protection is carried out ... from dangers arising in the course of military conflicts or as a result of such conflicts, as well as for protection of the population in emergencies. Personal protective equipment for the population includes means of individual protection of respiratory organs and medical means of individual protection". It is noteworthy that the order does not mention means of personal skin protection, while many hazardous chemicals, penetrating through the skin, can cause fatal poisoning.

Clause 6 of the Order stipulates that "the population residing and/or working in areas within the boundaries of the zone ... of possible radioactive and chemical contamination established around radiation, nuclear and chemical hazardous facilities shall be provided with personal protective equipment" — contamination zones are not necessarily adjacent to the facility. They can be at a considerable distance from it, for example, where precipitation has fallen, etc. Unfortunately, now four federal agencies cannot agree on the names and criteria for defining zones. It is not clear from point 9 of the order, who is entitled to what respirators and who is entitled to medical personal protective equipment. According to GOST R 58396-2019 and GOST PNST 4285-2020, medical masks are not personal protective equipment. Any requirements for personal protective equipment are not established in the order of EMERCOM of Russia, but it is stated that "after the expiration date based on the results of laboratory tests (inspections) issued by laboratories and other authorized organizations, the storage period is extended or personal protective equipment is written off". In this case the tests are carried out on all indicators — p.17, 18. However, in GOST R 22.9.14-2014 ... there are no sections on acceptance rules and test methods. In addition, it is not clear whether any accreditation is needed, for example, when testing for iodine-131 and methyl iodide, and how the resistance to storage of rubber parts of respirator construction is tested. There is also a question: Clause 1 states that the standard applies to gas-dust-proof respirators intended for use against biological contamination, while Clause 2 establishes that it does not apply to "medical" respiratory protection equipment.

GOST R 22.9.19-2014 formulates requirements for civilian filtering gas masks, including protection from radioactive iodine-131 and methyl iodide. And GOST R 22.9.20-2014 defines methods of testing gas masks and filtering self-rescuers in emergencies. There is also a reference that these indicators are determined by GOST 12.4.217-2001. However, this GOST does not contain a description of this method. At the same time there is STO 95 12035-2018 "Personal respiratory protective equipment. Requirements for the method of measuring the protection factor of filtering materials (filters) in relation to radioactive iodine and its compounds.

Clause 1.3 of the Technical Regulations of the Customs Union 019/2011 "On the safety of personal protective equipment" states that it applies to personal protective

equipment against the listed factors, including the effects of biological factors (microorganisms, insects). At the same time in the text of the regulation there are very few requirements for personal protective equipment against microorganisms.

In the GOST of the system of safety in emergency situations it is also often mentioned that personal protective equipment protects against biological factors, but in fact there are no requirements for it. There are also no requirements for the hygienic characteristics of the materials and even less for their effect on the protective properties.

In 2020, during the COVID-19 pandemic, conducting studies of protective coveralls widely used worldwide for protection against a new coronavirus infection, we confirmed the conclusion of American colleagues: materials with low air and vapor permeability poorly remove sweat from the undergarment space and promote penetration of hazardous substances into the undergarment space [8, 9]. This fact testifies to the necessity of expanding research on the whole complex of protective and hygienic properties of materials and products protecting against the impact of radiation, chemical and biological factors.

Conclusion

This brief review shows the need for a comprehensive systematic approach to ensuring the safety of rescuers, personnel of radiation, chemical and biological hazardous industries and the population living in areas of their impact. This

concerns both standard operation and peacetime and wartime emergencies, as well as the possible combined effects of various factors. It should also be taken into account that about 40% of accidents are accompanied by a fire. And all of them are connected with huge psycho-emotional loads, which are aggravated by the very fact of use of personal protective equipment, which reduce working capacity of a person and require regulation of work and rest regimes.

The system of standardization, selection, quality control, conformity assessment, decontamination and disposal of personal protective equipment, training and certification of personnel of radiation and chemical hazardous industries and emergency rescue teams established in ROSATOM allows the largest enterprises of the nuclear industry to avoid serious accidents and keep occupational disease rate at a low level.

At present, many problems of development of new personal protective equipment and its implementation in the nuclear industry are associated with changes in the system of their standardization and certification at the international and interstate levels. As for personal protective equipment, the key problem here is the lack of regulation of their compliance with the requirements of mandatory certification in the EAU — Eurasian Conformity (EAC) and safety in emergency situations or registration.

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