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ORGANIZATIONAL AND LEGAL ASPECTS OF THE FUNCTIONING OF VOLUNTEER MINING RESCUE TEAMS AS AN ELEMENT OF THE INDUSTRIAL SAFETY SYSTEM OF MINING ENTERPRISES

Abstract. The article presents a comprehensive analysis of the regulatory and legal framework governing the activities of voluntary mine rescue teams (VMRT) as a key element of the primary emergency response system at mining enterprises. The provisions of the Mining Law of Ukraine, the Civil Protection Code of Ukraine, industry safety rules and subordinate legislative acts regulating the functioning of emergency rescue formations in the mining industry are examined. The conducted analysis made it possible to establish the existence of a systemic inconsistency between the legislatively established obligation to create VMRTs and the absence of detailed mechanisms for their formation, organizational structuring, training and material and technical support. It was found that the existing regulatory framework does not contain clearly defined criteria for the number and selection of team members, requirements for their professional competence, the procedure for undergoing special training and the frequency of exercises, as well as regulations for interaction with state paramilitary emergency rescue services. Particular attention is paid to a comparative analysis of safety requirements for underground and open-pit methods of mineral extraction, which demonstrated the uneven level of regulatory detail and the absence of a unified approach to the organization of on-site formations. It is substantiated that such fragmentation of regulation leads to the formalization of the VMRT creation process and reduces the level of their actual readiness to perform their functions during the initial period of emergency development. Efficiency at this stage is critical, as the possibility of localizing hazardous processes, preventing their escalation, and minimizing technological and social consequences depends on the promptness and professionalism of personnel actions. The absence of unified training programs and standardized equipment requirements for teams creates a risk of discrepancy between the formal existence of the VMRT and the real capacity to ensure effective response. The study systematizes the main regulatory gaps and identifies directions for improving the organizational and legal mechanisms for the functioning of voluntary mine rescue teams. Approaches to standardizing their structure, professional training, certification and material and technical support are proposed, taking into account the specifics of mining and technological processes. Implementation of the specified provisions will contribute to increasing the level of industrial safety, reducing occupational risks and strengthening the capacity of enterprises for effective primary emergency response.

Keywords: mining enterprise, voluntary mine rescue team, emergency rescue services, regulatory and legal regulation, accident elimination, industrial safety.

1. Introduction

Ensuring industrial safety at underground mining facilities is a complex multifactorial task, the solution of which directly depends on the promptness of response to incidents that arise [1]. An indispensable condition for the functioning of an effective accident protection system is the availability at the enterprise of resource potential capable of performing regulated actions in the first minutes after an emergency situation occurs [2, 3]. In accordance with the principles of industry safety, such a resource is the voluntary mine rescue service, staffed with voluntary mine rescue teams. The main functional task of these formations is to implement primary rescue measures and to localize accidents at their initiating stage before the arrival of professional emergency rescue service units [4–7].

Despite the existence of a legislative basis, the mechanisms for the practical implementation of regulatory provisions on the organization of voluntary mine rescue



teams remain insufficiently developed. A systemic institutional gap is observed, expressed in the absence of detailed requirements for the procedure of team formation, their legal status and the principles of operational functioning. The most critical aspect is the absence of unified programs of professional training and advanced qualification, adapted to the specifics of particular productions. These circumstances lead to the prevalence of a formal approach in safety management, which causes a reduction in the real readiness of personnel to act under conditions of uncertainty and high risk.

Given that members of voluntary formations are the first to arrive at the affected area, their competence is the determining factor in preserving the lives of victims and preventing the escalation of the accident.

The purpose of this study is to analyze the current legislation and implemented practices of mine rescue service functioning.

Within the framework of the work, tasks are addressed regarding the resolution of regulatory contradictions and the substantiation of the necessity to create an organizational and legal model of the team as a basic element of the safety system.

The scientific novelty of the study lies in the systematic analysis of current legislation in the field of mine rescue formation training and the substantiation of the necessity to form a holistic model of the primary response system that takes into account the specifics of extraction of ore and non-ore minerals.

2. Methods

The methodological basis of the study is a systemic approach to the analysis of the regulatory and legal framework and conceptual modeling of the functioning of voluntary mine rescue teams (VMRT) as a component of the integrated accident protection system of mining enterprises.

The object of the study is defined as the primary emergency response system at mining enterprises, and the subject is the regulatory and legal mechanisms for the creation and the conceptual principles of training and functioning of voluntary mine rescue teams.

To assess the state of regulatory regulation, a formal legal analysis of legislative and subordinate acts, as well as industry safety rules governing the emergency rescue services of enterprises, was applied. A comparative analysis of safety requirements for underground and open-pit methods of mineral extraction was conducted in order to establish differences in the regulation of the creation and activities of on-site formations. In the course of the study, the existing regulatory requirements for the creation of voluntary mine rescue teams were determined, conflicts and gaps in legal regulation were identified, and the correspondence between legislative prescriptions and the practice of their implementation was established.

Systemic analysis allowed for the consideration of a mining enterprise as a complex technogenic system with a multi-level organization of emergency response, within whose structure voluntary teams perform the functions of primary accident localization. The structural-functional approach was used to determine the role of the teams in the initial phase of the development of emergency processes, to examine

their interaction with state paramilitary emergency rescue services, as well as to identify the key elements of the organizational model, namely composition, training, equipment and subordination.

To generalize the consequences of the identified regulatory gaps, an expert-analytical approach was applied, based on assessing the impact of insufficient regulation of team activities on the level of personnel readiness to act in emergency situations, the effectiveness of primary accident localization and the risks of escalation of hazardous processes. The assessment was carried out through logical modeling of possible accident development scenarios during the initial period before the arrival of professional emergency rescue units, which made it possible to substantiate directions for improving the organizational and legal support for the activities of voluntary mine rescue teams.

To quantify the consequences of the identified regulatory deficiencies, risk formalization was performed in accordance with ISO 31000:2018, adapted to the specifics of emergency response organizations following the NIOSH industry methodology. Risk is defined as a function of the probability of a hazardous event and the severity of its potential consequences:

$$R = P \cdot C,$$

where R is the aggregate risk level, P is the probability of realization (rated on a scale of 1 to 5), and C is the severity of consequences (rated on a scale of 1 to 5).

The calibration scales for both dimensions and the resulting risk acceptability matrix are presented in Tables 1 and 2. A risk value of $R \geq 15$ is classified as unacceptable and requires immediate control measures; values in the range 10–14 are substantial and require urgent management action; values of 6–9 are moderate; and values of 1–5 are acceptable and subject to routine monitoring.

Table 1 – Scale for assessing risk probability and consequences

Level	Probability (P)	Frequency of Realization	Severity of Consequences (C)	Characteristics of Consequences
1	Rare	< 1 time in 10 years	Minimal	No injuries, minor financial losses
2	Unlikely	1 time in 5–10 years	Moderate	Minor injuries, limited costs (< 50k USD)
3	Possible	1 time in 2–5 years	Substantial	Severe injuries, significant financial losses (50–500k USD)
4	Likely	1 time per year	Critical	1–3 fatalities, reputational damage, suspension of activities
5	Almost Inevitable	Several times per year	Catastrophic	Mass casualties (≥ 4 people), complete loss of capacity

Table 2 – Risk acceptability matrix

P \ C	C=1	C=2	C=3	C=4	C=5
P=5	5	10	15	20	25
P=4	4	8	12	16	20
P=3	3	6	9	12	15
P=2	2	4	6	8	10
P=1	1	2	3	4	5

Legend: ≥ 15 – Unacceptable (critical); 10–14 – Substantial (urgent measures required); 6–9 – Moderate (management action required); 1–5 – Acceptable (monitoring and control).

3. Results and discussion

The main legislative act in the extractive sector is the Mining Law of Ukraine dated 06.10.1999 No. 1127-XIV (Mining Law) [4]. According to Article 1 of this law, a mining enterprise is defined as an integral property complex for the extraction of minerals using mining technologies, where particular attention is paid to mines and quarries. For the implementation of emergency and urgent measures at enterprises of the coal and mining industries, aimed at rescuing people, extinguishing fires, eliminating the consequences of explosions, sudden outbursts of coal and gas, and rock collapses, state paramilitary emergency rescue services are created. These formations exercise control and supervision over preventive measures to prevent accidents. All mining enterprises, regardless of ownership form, during the period of their construction, reconstruction, operation, liquidation or conservation, are obligatorily serviced by such state services, which are financed from the State Budget of Ukraine, enterprise funds and other permitted sources.

The conducted analysis of the regulatory and legal framework governing the creation and organization of VMRT revealed gaps in the form of an absence of specification and detailing of the mechanism for the formation of VMRTs, their legal status and scope of responsibility, operating procedures, training and functioning. This creates a systemic gap in ensuring industrial safety and real readiness for the elimination of emergency situations.

Article 29 of the Mining Law [4] directly obliges the owner to create auxiliary voluntary mine rescue teams, providing them with premises and equipment at the level of state paramilitary services. Members of such teams are obliged to undergo special training, making the presence of VMRTs at mines and quarries an inescapable legal requirement.

Additionally, the Civil Protection Code of Ukraine dated 02.10.2012 No. 5403-VI (CPCU) [5] in Article 20 establishes the obligation to create on-site civil protection formations and ensure their material and technical base. This expands the functional scope of VMRTs, integrating them into the general state civil protection system.

According to Article 3 of the Mining Law [4], regulatory framework for mining arising in the course of activities of mining enterprises are regulated in particular by inter-industry and industry safety rules. However, an analysis of industry rules

indicates insufficient specificity. Thus, the Safety Rules for the Development of Deposits of Ore and Non-Ore Minerals by Underground Method, approved by the order of the Ministry of Social Policy of Ukraine dated 23.12.2016 No. 1592, registered by the Ministry of Justice of Ukraine on January 30, 2017 under No. 129/29997 [6], establish the duties of the dispatcher regarding the involvement of VMRT members in accident elimination, but do not contain instructions on the procedure for their formation and the organizational structure of the VMRT.

A similar situation is observed in the Instructions for Drawing Up Accident Elimination Plans for Quarries and Processing Plants, approved by the order of the Ministry of Ukraine for Emergency Situations and Affairs of Population Protection from the Consequences of the Chornobyl Catastrophe dated 31.03.2003 No. 87, registered with the Ministry of Justice of Ukraine on April 22, 2003 under No. 321/7642 [8]. Although the document defines a list of measures for rescuing people and using firefighting means, it lacks an explicit definition of the role of VMRTs in implementing these measures. This leads to uncertainty as to who exactly should carry out primary rescue actions during the initial period of an accident.

The Requirements for Safety and Health Protection of Workers at Extractive Enterprises with Underground and Open-Pit Mining Methods, approved by the order of the Ministry of Social Policy dated 02.07.2018 No. 943, registered with the Ministry of Justice of Ukraine on July 27, 2018 under No. 872/32324 [9], establish special requirements for enterprises engaged in underground mineral extraction, in particular, providing for the functioning of on-site non-professional emergency rescue services formed from experienced workers (VMRTs). At the same time, for enterprises engaged in open-pit mining, similar strict requirements for the creation of VMRTs are absent, and the requirements of the Mining Law in terms of Article 29 [4] are not taken into account. No adequate attention is paid to specific instructions regarding the requirements for the formation of VMRTs, personnel training, or the definition of their organizational structure. Thus, the important requirements for ensuring safety in underground mining and the absence of such requirements for open-pit mining, along with the general formalism regarding the creation of VMRTs, indicate a disregard for the real need for comprehensive safety measures.

Scenario 1: Primary Response to Geomechanical Deformation in Open-Pit Mining. Despite the lower level of regulatory detail for quarries compared to underground mines, the primary response system remains critical for bench stability and machinery safety. Upon detecting signs of slope deformation, VMRT members must immediately cordon off the hazardous zone and coordinate the withdrawal of heavy mining equipment. Simultaneously, the deployment of first-aid points directly on the working horizons reduces the time required to initiate resuscitation measures in the event of personnel being injured by falling rock. This operational reality underscores the necessity of unifying VMRT requirements for both underground and open-pit operations to ensure a consistent level of industrial safety.

Despite the fact that the charter of state paramilitary emergency rescue formations of the State Emergency Service of Ukraine for the organization and conduct of emergency rescue and other urgent works at ore mining and non-ore enterprises and

other underground structures, other than coal (order of the Ministry of Internal Affairs of Ukraine dated 14.01.2020 No. 17, registered with the Ministry of Justice of Ukraine on 17.03.2020 under No. 283/34566) [10], provides for the actions of members of voluntary rescue teams in accident elimination, thereby implying their readiness and training, the absence of clear organization and functioning of these teams creates a critical vulnerability. This gap in legislation is actively exploited by unscrupulous owners of mining enterprises who, while formally possessing VMRTs, ignore the real provision of their activities. As a consequence, the implementation of the operational part of the Accident Elimination Plan (AEP) regarding the rescue of people and the initial localization of accidents is placed under direct threat. These problems result in a gross violation of the Mining Law in terms of articles 25 and 27 [4], articles 20 and 23 of the CPCU [5], industry safety rules [6, 7], orders and instructions [8–11], which may lead to tragedy, calling into question the very possibility of effective emergency response at mining enterprises.

It should be noted that the procedure for performing work to ensure mass explosions at mining enterprises by state paramilitary emergency rescue services, approved by the order of the Ministry of Internal Affairs of Ukraine dated 27.11.2017 No. 959, registered with the Ministry of Justice of Ukraine on 20.12.2017 under No. 1538/31406 [11], directly provides for the involvement of voluntary mine rescue team members in performing technical work using respiratory protection equipment and primary firefighting means. These key actions are aimed at directly preventing accidents and the development of emergency situations under hazardous production process conditions, which determines the key role of VMRTs in the system of primary operational response and minimization of consequences at the initial stage of emergency situations. Neglecting or formally fulfilling these duties deprives the enterprise of the most important resource of the "first minutes" of an accident.

Scenario 2: Integration of VMRT with Automated Gas Control Systems (AGCS). In modern deep mines, technosphere safety relies on the continuous monitoring of the atmospheric composition. When permissible concentrations of methane or carbon monoxide are exceeded, the AGCS transmits a signal to the dispatch point. Within this integrated safety model, the VMRT serves as the primary link of the response mechanism. Upon receiving the signal, VMRT members located directly within the affected section conduct primary reconnaissance using portable gas analyzers before work is fully suspended. This proactive approach allows for the localization of gas emission sources—such as the failure of local ventilation fans—and the implementation of atmospheric normalization measures within the first 5–10 minutes, effectively preventing the escalation of the situation to an explosive level.

Scenario 3: Utilization of Real-Time Location Systems (RTLS) and Digital Incident Maps. The integration of VMRT into the broader technosphere safety system necessitates the employment of digital platforms for incident management. In the event of a roof fall or fire, the dispatcher gains an immediate and precise visualization of the location of every worker. Utilizing these digital maps, the VMRT charts the most efficient path to victims while strategically avoiding high-risk zones. Furthermore, through the integrated communication system, team members relay

verified information regarding the nature of the damage directly to professional rescue units, ensuring that the latter arrive on-site equipped with the specific tools required for the task.

VMRTs in no way replace the professional units of the State Paramilitary Emergency Rescue Service, which play the main role in eliminating emergencies. However, it is the qualified and swift actions of VMRT members before the arrival of professional rescuers that determine the successful localization of the hazard and the preservation of the lives of workers who find themselves in the affected area.

Scenario 4: Primary Response Algorithm for Sudden Conveyor Fires. On mining enterprises, the primary response system involves a strictly regulated sequence of VMRT actions that take place before the arrival of state paramilitary units. This process begins with immediate identification and notification, specifically the detection of smoke and the transmission of the "Emergency" signal. This is followed by primary localization, where VMRT members utilize stationary fire suppression systems and primary firefighting means, such as extinguishers or sand, during the initiation stage of the fire.

The final phase involves organizing evacuation and self-rescue, with VMRT members assuming the roles of leaders for evacuation groups. This example demonstrates that without a prepared VMRT, a conveyor fire can escalate within 20 minutes – the typical arrival time for professional services – to a magnitude that may necessitate the flooding of entire mine horizons to achieve suppression.

An analysis of foreign experience [12] allows it to be considered as a contrasting model for identifying systemic shortcomings of national regulatory and legal regulation in the sphere of organizing voluntary mine rescue teams (table 3).

Current analysis indicates a systemic-structural vulnerability of the VMRT, where 40% of identified risks are at an "unacceptable" level. The interdependence of factors (funding deficit, equipment wear, personnel outflow) creates a cumulative effect requiring a comprehensive approach to consequence minimization, as the complete elimination of risks in mine rescue activities is impossible according to NIOSH classification.

Thus, in Canada (Ontario Province), the requirements for mining work safety are defined by the provisions of the Mining Health and Safety Act [13], which provide for detailed regulation of the activities of rescue units at enterprises. Personnel training is carried out in accordance with the Mine Rescue Training Standard, developed by the Workplace Safety and Insurance Board, which provides for mandatory certification, regular qualification confirmation and practical training of accident scenarios. Annual rescue team competitions simulate real production incidents, and the technical equipment of units is subject to clearly defined requirements and systematic monitoring.

In China, the functioning of the safety system at hazardous production facilities is coordinated by the State Administration of Work Safety (SAWS). Regulatory acts provide for the creation of so-called Enterprise Emergency Rescue Teams with state-approved training programs, standard structures and material and technical support

standards. An important component is the existence of mechanisms for independent readiness audits of units and defined sources of financing for their activities [14].

A comparative analysis shows that in the aforementioned countries, a transition has been implemented from the declarative consolidation of the requirement to create rescue formations to a process-oriented safety management model, within which such teams are regarded as an institutionally integrated element of the response system with clearly defined competencies, readiness indicators and external control mechanisms.

Table 3 – Risk Register of the VMRT

Category	Risk	P	C	Level	Existing Controls
Operational	Death/severe injury during emergency rescue operations	4	5	Unacceptable	SCBA, gas analysis, NIOSH-standard training
	SCBA/technical equipment failure in ERO zone	4	5	Unacceptable	Scheduled maintenance, backup sets
	Erroneous tactical decisions under stress	4	4	Unacceptable	Training, Decision Support Systems
	Deterioration of conditions during long operations (≥ 24 h)	3	4	Substantial	Shift rotation, spare SCBAs
Personnel	Outflow of qualified personnel	5	4	Unacceptable	Reservation, bonuses, social package
	Psychological burnout / PTSD	4	4	Unacceptable	Psychologist, rotation, rehabilitation
	Injuries during training sessions	3	3	Moderate	Briefings, insurance protocols
	Interpersonal conflicts under combat stress	3	2	Moderate	Psychological service, team culture
Financial	Underfunding of technical modernization	5	4	Unacceptable	Budget planning, IMRB assistance
	Reduction of operating costs	4	3	Substantial	Partnership programs, grants
	Financial liability for death/injury of personnel	3	4	Substantial	Insurance, social protection funds
Legal	Regulatory uncertainty regarding VMRTs	5	3	Unacceptable	Lobbying for law-making, contracts
	Duplication of functions	3	3	Moderate	Interaction protocols, joint training
	Reorganization / change of subordination	3	4	Substantial	Strategic partnership with IMRB
	Incomplete ERO documentation	3	3	Moderate	DSS, digital operation log
Force majeure circumstances	Involvement in ERO under active combat	3	5	Unacceptable	Interaction with AFU, ballistic protection
	Reduction of facilities due to mine closures	4	3	Substantial	Unit restructuring, diversification

Based on the conducted analysis, the necessity of creating a conceptual model of the VMRT response system with the definition of quantitative and structural criteria for evaluating their effectiveness becomes evident. This involves the development of

detailed requirements for the quantitative composition and criteria for the selection of VMRT members, the definition of their legal status in terms of rights and responsibilities, as well as the regulation of the consistency of their actions with state services. The most critical is the need to create unified training programs, without which it is impossible to guarantee the real competence of personnel.

The specified VMRT response system model (Fig. 1) must ensure the proper functionality of VMRTs, the adoption of effective measures to improve the safety situation at extractive enterprises, and the elimination of a formalized approach by management to the implementation of regulatory and legal acts in the extractive industry. Clear standards will ensure compliance with safety rules [6, 7] and increase readiness for actions in real emergency situations.

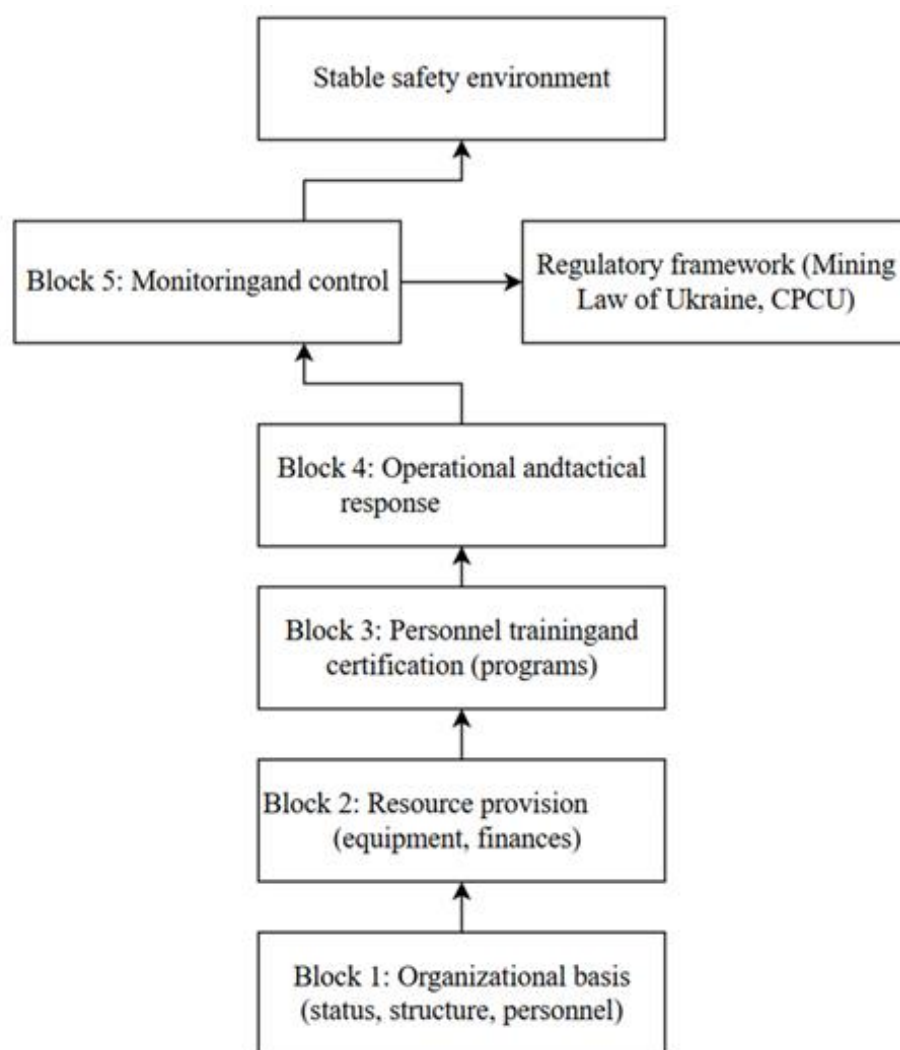


Figure 1 – Conceptual model of the VMRT functioning system

To overcome the identified legal and organizational shortcomings, a multi-level conceptual model of VMRT functioning is proposed, integrated into the overall enterprise safety management system. The model (Fig. 1) is based on a process approach and includes the following key blocks:

1. Regulatory and organizational block. Clear legislative consolidation of the status, structure, minimum number and duties of VMRTs for all types of mining operations.

2. Resource provision block. Standardized requirements for material and technical equipment (personal respiratory protection equipment – PRPE, communication means, firefighting, diagnostics), basing and financing.

3. Training and certification block. Unified, industry-wide programs of initial training and regular exercises (at least 2 times per year) with mandatory certification at training centers of the State Paramilitary Mining Rescue Service or accredited organizations. Implementation of an objective skills assessment system (practical application of knowledge, assessment of behavior in simulation).

4. Operational and tactical block. Integration of VMRTs into Accident Elimination Plans with detailed action regulations for typical accidents, including interaction with Emergency Rescue Services, enterprise services and the State Emergency Service of Ukraine. Implementation of digital maps and incident management systems.

5. Monitoring and control block. Internal readiness audit (quarterly) and external oversight by Emergency Rescue Services and the State Labour Service with public reporting.

Implementation of this model will require amendments to subordinate acts (Safety Rules [6; 7], departmental instructions [8–11]) and the development of new standards or regulations on the organization of VMRTs. The proposed structural model makes it possible to eliminate the gap between the regulatory requirements of legislation and the absence of real regulations in industry rules, creating a unified algorithm from the initiation of the creation of an on-site team to its practical application in cooperation with professional rescuers.

4. Conclusions

The analysis of the regulatory framework identifies systemic inconsistencies and regulatory gaps where the legislative mandate for establishing VMRTs at mining enterprises lacks detailed implementation mechanisms in subordinate acts. This discrepancy results in formalistic compliance, creating a critical vulnerability in industrial safety systems. Within the scope of this study, it is established that VMRTs function as auxiliary units providing essential primary response to localize hazards before the arrival of professional services. To address these issues, the study substantiates the necessity of a multi-level conceptual model for VMRT operations, encompassing regulatory, resource, certification, tactical, and control components.

The practical implementation of this model and the mitigation of associated risks require a phased approach, prioritizing operational safety in the short term (up to 6 months). This involves the introduction of rigorous protocols for inspecting self-contained breathing apparatus and gas detectors using standardized checklists (analogous to the NIOSH pre-entry checklist) with a minimum 80% resource threshold. Simultaneously, human resource protection is ensured through institutionalized mentorship, documentation of unique competencies, and bi-annual psychological screening, while wartime risks are managed through the

decentralization and duplication of equipment storage facilities. Concurrently, efforts should focus on lobbying for a unified regulatory act to define the legal status of VMRTs and their interaction with state rescue services, which serves as a prerequisite for international technical assistance, while a comprehensive retention program ensures personnel stability through material incentives and career pathing.

Conflict of interest

Authors state no conflict of interest.

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ОРГАНІЗАЦІЙНО-ПРАВОВІ АСПЕКТИ ФУНКЦІОНУВАННЯ ДОБРОВІЛЬНИХ ГІРНИЧОРЯТУВАЛЬНИХ КОМАНД ЯК ЕЛЕМЕНТА СИСТЕМИ ПРОМИСЛОВОЇ БЕЗПЕКИ ГІРНИЧИХ ПІДПРИЄМСТВ

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Анотація. У статті здійснено комплексний аналіз нормативно-правового забезпечення діяльності добровільних гірничорятувальних команд (ДГК) як ключового елемента системи первинного реагування на надзвичайні ситуації на гірничовидобувних підприємствах. Розглянуто положення Гірничий закон України, Кодекс

цивільного захисту України, галузевих правил безпеки та підзаконних нормативних актів, що регламентують функціонування аварійно-рятувальних формувань у гірничій галузі. Проведений аналіз дозволив встановити наявність системної невідповідності між законодавчо закріпленою обов'язковістю створення ДГК та відсутністю деталізованих механізмів їх формування, організаційного структурування, підготовки й матеріально-технічного забезпечення. Виявлено, що чинна нормативна база не містить чітко визначених критеріїв чисельності та відбору членів команд, вимог до їх професійної компетентності, порядку проходження спеціальної підготовки та періодичності навчань, а також регламентів взаємодії з державними воєнізованими аварійно-рятувальними службами. Особливу увагу приділено порівняльному аналізу вимог до забезпечення безпеки при підземному та відкритому способах видобування корисних копалин, що засвідчив нерівномірність нормативної деталізації та відсутність єдиного підходу до організації об'єктових формувань. Обґрунтовано, що така фрагментарність регулювання спричиняє формалізацію процесу створення ДГК та знижує рівень їх фактичної готовності до виконання функцій у початковий період розвитку аварії. Саме на цій стадії від оперативності та професійності дій персоналу залежить можливість локалізації небезпечних процесів, запобігання їх ескалації та мінімізація техногенних і соціальних наслідків. Відсутність уніфікованих програм підготовки та стандартизованих вимог до оснащення команд створює ризик невідповідності між формальною наявністю ДГК і реальною спроможністю забезпечити ефективне реагування. У роботі систематизовано основні нормативні прогалини та визначено напрями вдосконалення організаційно-правових механізмів функціонування добровільних гірничорятувальних команд. Запропоновано підходи до стандартизації їх структури, професійної підготовки, сертифікації та матеріально-технічного забезпечення з урахуванням специфіки гірничотехнологічних процесів. Реалізація зазначених положень сприятиме підвищенню рівня промислової безпеки, зменшенню виробничих ризиків та посиленню спроможності підприємств до ефективного первинного аварійного реагування.

Ключові слова: гірниче підприємство, добровільна гірничорятувальна команда, аварійно-рятувальні служби, нормативно-правове регулювання, ліквідація аварій, промислова безпека.