The 57th International October Conference on Mining and Metallurgy
05 - 07 October 2026, Bor Lake, Serbia
https://ioc.irmbor.co.rs

DOI: 10.5937/IOC26147V Original Scientific Paper-Mining

CRITICAL REVIEW OF EXPLICIT MINING REGULATIONS FOR UNDERGROUND EXPLOITATION IN SERBIA

Ivica Vojinović[1a], Miloš Stojanović[1b], Dragan Šabaz[1c]

[1]Mining and Metallurgy Institute Bor, Alberta Ajnštajna 1, 19210 Bor, Serbia
1a ivica.vojinovic@irmbor.co.rs, https://orcid.org/0009-0006-3658-6922
1b milos.stojanovic@irmbor.co.rs, https://orcid.org/0000-0003-0044-5491
1c dragan.sabaz@irmbor.co.rs, https://orcid.org/0000-0002-1373-413X

Abstract

This paper critically examines selected parts of Serbia's legal and technical framework governing underground mineral exploitation. While the Mining and Geological Exploration Law defines the scope of professional supervision during exploitation, no by-law prescribes its content, form or digital reporting format. Several technical regulations date from the former Yugoslavia and do not address modern blasting initiation systems, digital design software, or verification of native digital models. The mineral resource fee relies on self-reported data without independent verification. The paper proposes targeted modernisation of these by-laws and a permanent institutional mechanism for their review, following international practice.

***Keywords**: mining law, supervision, explosives regulation, digital documentation, mineral royalty*

1. INTRODUCTION

In recent years, underground mining in the Republic of Serbia has undergone significant technological change: mechanised and automated operating systems, mass mining methods, modern blasting initiation systems and specialised software for mine design, planning and simulation are increasingly in use. In contrast, the legal and technical framework governing this activity largely rests on regulations dating from the former SFRY, which have not been substantively revised to reflect the current state of technology, equipment and software tools. The primary framework is provided by the Law on Mining and Geological Exploration (hereinafter: the Law) [1], while technical requirements are elaborated through by-laws of varying age. Under the Law's transitional provisions (Art. 192), earlier regulations remain applicable until replaced, so their age alone does not render them inapplicable, but it does warrant a review of their technical adequacy. The Ministry of Mining and Energy has initiated a consultation process for a new Law, aimed at aligning Serbian legislation with EU regulations (the Critical Raw Materials Act) and modern sustainable-mining standards, conducted from 27 October to 11 November 2025 [8]. This presents a genuine opportunity to undertake, in parallel with the legislative reform, a thorough review of the accompanying technical regulations. Should the reform fail to adequately address this segment, it will be necessary for the professional community itself to initiate such a review, a need to which this paper aims to draw attention. The aim of this paper is to identify, on the basis of

underground mine design practice, concrete shortcomings in the applicable by-laws and to propose directions for their improvement — not for the sake of regulation itself, but to advance mining engineering practice, protect state interests and safeguard the interests of local communities. The analysis is not exhaustive; emphasis is placed on areas where the gap between prescribed and current engineering practice has potential safety and economic implications: Professional Supervision During Exploitation and Mining Operations; Handling of Explosives and Blasting; Design, Software and Digital Documentation; Fee for the Use of Mineral Raw Materials.

2. REGULATORY FRAMEWORK AND METHODOLOGY

The analysis reflects the state of regulations as of 25 August 2026. In addition to the Law, the following by-laws were examined: the Rulebook on Technical Standards for Underground Exploitation of Metallic and Non-metallic Mineral Raw Materials (No. 24/91) [3]; the Rulebook on Technical Standards for Handling Explosives and Blasting in Mining (No. 26/88 and 63/88) [4]; the Rulebook on the Content of Mining Projects (No. 27/97) [2]; the Rulebook on the Content and Form of the Professional Supervision Log (No. 74/2021) [5]; the Rulebook on Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres (No. 10/2017 and 21/2020, hereinafter: the ATEX Rulebook) [6]; and the Rulebook on Technical Standards for the Design and Installation of Electrical Installations in Rooms Where Explosives Are Handled (No. 17/74) [7]. Under the Law's transitional provisions, regulations enacted before its entry into force remain applicable until superseded, which is why a substantial part of the technical regulation is, in practice, 35–40 years old. Methodologically, the applicable regulations were compared against the current state of technology and equipment used in domestic underground mines. The gaps identified through this comparison are presented in the following section.

3. RESULTS AND DISCUSSION

For geological exploration, Art. 27 of the Law prescribes professional supervision, a supervision log and reporting, and Rulebook 74/2021 sets out in detail the content of the log, the exploration holder's duty to report identified deficiencies, and the possibility of keeping the log electronically [1,5]. For exploitation, Art. 67 of the Law specifies who may perform professional supervision and its scope: monitoring compliance with the project, the pace and quality of works, application of mining and technical regulations, occupational health and safety, fire protection, and protection of the environment, cultural property and water [1]. However, no by-law defines the content, form, minimum frequency, periodic reporting requirements or digital data-exchange format of professional supervision specifically for mining operations. The Mining Supervision Log under Art. 134 serves a different purpose, as it primarily records orders issued by inspectors, directors and authorised persons. This is a significant gap, since it is precisely

the exploitation phase, not exploration, where the greatest safety risks inherent to underground mining occur; supervision of this phase should therefore be regulated at least as thoroughly as supervision of exploration. An electronic professional-supervision log for exploitation, linked to the project documentation and recording deviations, corrective measures and as-built verification, should accordingly be introduced.

The 1988 Rulebook does not recognise non-electric tube (nonel) initiation systems or electronic detonators as distinct modern categories [4], although nonel systems are today widely used internationally. Permitted explosive quantities in auxiliary magazines are set according to standards that do not reflect current blasting scale, larger borehole diameters and lengths, mechanised charging and, consequently, higher daily explosive requirements per working face. Revision of these quantities should be based on current safety calculations (safe distances, impact and friction sensitivity, storage compatibility) for the explosive types actually in use. The Rulebook also fails to recognise newer explosive categories, emulsion explosives and hydrogen-peroxide-based explosives, regarded in the literature as a potentially safer and more environmentally favourable alternative to conventional ANFO and nitroglycerine-based explosives [13].

The ATEX Rulebook transposes EU Directive 2014/34/EU on equipment and protective systems for explosive atmospheres into Serbian law [6], while the design of electrical installations in rooms where explosives are handled, including underground magazines, remains governed by Rulebook 17/74 [7]. This discrepancy does not automatically amount to legal inconsistency, but it justifies a technical review of terminology, zone classification, documentation and alignment with current standards.

Applicable regulations, enacted before digital mine design existed, do not recognise three-dimensional modelling software for orebody modelling, mine planning and design as an equal and, in current practice, dominant means of producing technical documentation. There is no guidance on the format for submitting digital models to authorities, interoperability with GIS/cadastral data, or archiving and verification of digitally produced project documentation. Consequently, alongside the digital model on which the works are actually based, conventional paper/2D documentation must also be produced solely to satisfy formal compliance, unnecessarily burdening design practice without a measurable contribution to safety or supervision quality. For example, the Rulebook on the Content of Mining Projects (27/97) requires a project to include the total airflow calculation, an airflow-distribution and ventilation-network diagram, and fan characteristics [2], but does not specify how these should be presented where the calculation and simulation are performed using specialised software. This legal vacuum allows inconsistent practice among design organisations and complicates verification of technical correctness during technical review and professional supervision. Rules should therefore require that the competent authority and technical review body be able to reproduce the calculation, verify changes and retain a legible record based on the simulation model with the paper or PDF output serving as a verification excerpt, and the

native digital model forming an integral part of the documentation whenever the design solution is based on it.

Beyond technical regulation, there is also room for improvement in the fiscal obligations of exploitation holders towards the state and local community. The fee for the use of mineral resources and reserves (mineral royalty), governed by the Law on Fees for the Use of Public Goods, amounts to 3% of revenue for coal, 7% for oil and gas, and 5% of revenue or net revenue for metallic raw materials, depending on the processing stage; a 5% rate applies to non-metallic raw materials, except construction materials, for which fixed per-tonne amounts apply. Revenue is generally split 60% to the Republic and 40% to the local self-government, or 50%/40%/10% (Republic/local self-government/autonomous province) where exploitation takes place in the territory of an autonomous province [9]. A methodologically consistent comparative analysis of mineral-resource fee rates in the region is recommended, to assess whether grounds exist for increasing the rate in Serbia. A further weakness lies in verification: the exploitation holder self-determines and self-reports the quantity extracted and revenue generated, with no prescribed mechanism for independent verification, creating scope for underreporting the fee base. Oversight is limited to Art. 271 of the Law on Fees for the Use of Public Goods, which refers determination, control and collection to the general tax procedure and tax administration [9]. Mandatory periodic independent verification of quantities, quality and revenue is therefore proposed.

Based on the above analysis, a standing, institutionalised body should be established under the competent ministry, comprising representatives of academia, the Mining and Metallurgy Institute Bor, industry and the Serbian Chamber of Engineers, tasked with continuously monitoring and proposing amendments to mining-specific technical by-laws. International practice suggests that a fixed periodic review cycle (e.g., every five years) is not the prevailing model. In the United States, the Mine Safety and Health Administration (MSHA) has no prescribed review interval but holds standing statutory authority to continuously initiate rulemaking, ensuring ongoing regulatory updates [10]. Similarly, in Australian jurisdictions (e.g., Western Australia, New South Wales), mining codes of practice are revised “as required or when the legislation is reviewed”, with this function permanently performed by a dedicated regulatory agency [11]. The most precise comparative example is the Mining Legislative Review Committee (MLRC) in the Canadian province of Ontario, a standing tripartite advisory body comprising representatives of the ministry of labour, employers and unions, established under occupational health and safety legislation, whose explicit purpose is to advise the minister on an ongoing basis regarding amendments to mining-specific regulations [12]. What these examples share is the existence of a standing, institutionally grounded mechanism dedicated solely to mining regulation. Such a body would be particularly valuable given the current conditions of mining in Serbia, marked by a significant presence of foreign investors in the exploration and exploitation of mineral raw materials, including critical raw materials.

4. CONCLUSION

The analysis shows that selected parts of the mining regulation of underground mineral exploitation in the Republic of Serbia lags behind the current state of technology and engineering practice in several respects, with potential implications for safety, the adoption of modern technologies, and the realisation of the full potential revenue due to the state and local community from the exploitation of national resources. The solution does not lie in isolated amendments to individual by-laws, but in establishing a standing, institutionalised mechanism for reviewing mining regulation, following the experience of the United States, Australia and Canada. The reform of the primary Law, currently underway, should be accompanied by the establishment of such a mechanism, rather than confined to the formal harmonisation of terminology with the ultimate aim of advancing mining engineering practice, protecting state and local community interests, and ensuring the responsible exploitation of national resources.

ACKNOWLEDGEMENTS

Ministry of Science, Technological Development and Innovation of the Republic of Serbia, Agreement on the implementation and financing of scientific research work of the National Research Institute in 2026, No. 451-03-33/2026-03/ 200052.

REFERENCES

[1] Law on Mining and Geological Exploration, "Official Gazette of RS", No. 101/2015, 95/2018, and 40/2021, in particular Arts. 27, 67, 97, 116, 119, 121, 134 and 192.

[2] Rulebook on the Content of Mining Projects, "Official Gazette of RS", No. 27/97.

[3] Rulebook on Technical Standards for Underground Exploitation of Metallic and Non-metallic Mineral Raw Materials, "Official Gazette of SFRY", No. 24/91.

[4] Rulebook on Technical Standards for Handling Explosives and Blasting in Mining, "Official Gazette of SFRY", No. 26/88 and 63/88.

[5] Rulebook on the Content and Form of the Professional Supervision Log, "Official Gazette of RS", No. 74/2021.

[6] Rulebook on Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres, "Official Gazette of RS", No. 10/2017 and 21/2020.

[7] Rulebook on Technical Standards for the Design and Installation of Electrical Installations in Rooms Where Explosives Are Handled, "Official Gazette of SFRY", No. 17/74.

[8] Ministry of Mining and Energy of the Republic of Serbia, Notice on the Commencement of Drafting the Law on Mining and Geological Exploration, public consultation 27 Oct.–11 Nov. 2025.

[9] Law on Fees for the Use of Public Goods, "Official Gazette of RS", No. 95/2018 with later amendments, up to and including 35/2026, Arts. 20–24, 26 and 271.

[10] Mine Safety and Health Administration (MSHA), U.S. Department of Labor, Rulemaking, www.msha.gov/regulations/rulemaking.

[11] WorkSafe Western Australia, Work Health and Safety and Transitional Codes of Practice, www.worksafe.wa.gov.au.

[12] Ontario Mining Association, Mining Legislative Review Committee – statutory committee under s. 21 OHSA, www.oma.on.ca.

[13] Minerals Research Institute of Western Australia, Development and Evaluation of Fume-Free Explosives for Underground Blasting Applications, Report 482, 2018.