
The service life of military constructions from the heritage of the Romanian Ministry of National Defense: between efficiency and adaptability

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Abstract

Romania's military infrastructure has undergone significant transformations over time. Periods of expansion and modernization have alternated with phases of reduction and, sometimes, the transfer of barracks into civilian administration. These changes reflect not just technological advancements but also the adaptation to the dynamic requirements of national defense.

The 2008 infrastructure regulations link the employment duration of military facilities directly to military activity, highlighting the need for a flexible and adaptable infrastructure. In this context, the article examines the legislative framework regarding the amortization of investments, the wear and tear of constructions, and the authorization of works, emphasizing the importance of aligning military regulations with civil ones.

In conclusion, the article analyzes the discrepancies between national legislation and military regulations, suggesting revisions and additions to the existing regulations, particularly regarding temporary and semi-permanent facilities, to meet the current and future needs of national defense more effectively.

Keywords:

Defense Infrastructure; Military Constructions; Barracks;
Construction Legislation; Military Regulations.

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Romania's military infrastructure has undergone significant transformations over time, evolving alongside the emergence and development of the permanent army. This evolution reflects not only technological and architectural changes but also adaptations to the ever-changing tactical and operational requirements. In this context, the usage duration of military constructions is a critical aspect. This article explores how the life expectancy of military buildings, influenced by technical standards and operational requirements, shapes strategies for developing army infrastructure, emphasizing the importance of balancing investment efficiency and the adaptability of military structures to meet the evolving needs of national defense.

1. The evolution of military infrastructure

The evolution of military infrastructure in Romania has been a process of continuous adaptation to the strategic needs of the army, alternating between periods of expansion and modernization and those of reduction and conversion of facilities for civilian use.

The evolution of the Romanian military infrastructure began with the adaptation of existing structures, such as inns, to meet the immediate operational needs of the army. The limitations of these improvised facilities quickly led to the need for the development of specialized military constructions. The first barracks, built under the influence of experts from the Tsarist army in a multifunctional system, were essential for the initial stage of military infrastructure development. After the Unification of the Romanian Principalities, an increase in the number of military units marked a turning point in the development of military infrastructure. This period was characterized by the transition to a pavilion system in the design of barracks and the introduction of the "*Regulamentul casarmelor (Barracks code)*", representing an important step in the standardization and modernization of military constructions (Herjeu 1902, 193-308).

This trend of expansion and modernization continued during the periods of the two world wars. During World War I, most barracks were occupied by enemy forces, necessitating their rehabilitation and expansion after the war. In the period of World War II, investments in permanent constructions doubled, reflecting the ongoing need for expansion and modernization of military infrastructure.

At the end of 1952, in the context of deteriorating international relations, the Romanian army began building new barracks and fortification works. However, in 1958, the withdrawal of Soviet troops freed a large part of the military infrastructure, which then passed into civilian administration.

The modernization of existing infrastructure was a continuous process, and a new stage followed in 1968 when, following the occupation of Czechoslovakia by Warsaw Pact troops, Romania intensified investments for the modernization and expansion of barracks to strengthen the army's combat capacity. In contrast, after 1989, political

and economic transformations led to a major restructuring of the army, with significant effects on infrastructure: between 1995 and 2006, many barracks were transferred to civilian administration as a result of the abandonment of compulsory military service (Petrișor 2011, 93).

In conclusion, the history of Romanian military infrastructure illustrates constant adaptation to the army's requirements and a balance between the need for modernization and efficiency. These dynamics underscore the importance of a strategic approach in defining the life expectancy and use of military constructions for the efficient management of military infrastructure.

2. Life expectancy of military constructions

Regarding the life expectancy of military constructions, military regulations, aligned with civilian standards since the 1960s, have established standards that reflect both the purpose of the buildings and the materials used. Regulatory revisions in 2008 introduced a new perspective, linking life expectancy directly to military activity and emphasizing the need for a flexible and adaptable infrastructure.

Regulamentul proprietății imobiliare în Ministerul Apărării Naționale¹ (The Real Estate Code for the Property of the Ministry of National Defense) provides a basis for understanding and addressing the life expectancy of constructions in the military context, classifying military facilities into four categories: initial, temporary, semi-permanent, and permanent. Initial facilities, exemplified by tents used by the Romanian army, are temporary and relocatable structures, intended for short-term use, usually no more than six months, in scenarios such as military exercises or emergency situations. They offer austere conditions, being quick and easy to assemble and disassemble. In contrast, temporary facilities, which include improved tents and modular container constructions with temporary foundations, are designed for use over a longer duration, up to 5 years, offering improved living conditions, with access to utilities such as electricity and water. Semi-permanent facilities, made from more durable materials like steel or prefabricated composite walls, are designed to be used between 5 and 25 years, representing an optimal medium-term solution. They are quicker to execute than permanent constructions and, according to the code, must be able to adapt to meet changing requirements over time. On the other hand, permanent facilities represent the most durable solution, being fixed and definitive constructions, designed for special or representative functions and are suitable for long-term use.

¹ Adopted by Order no. M.91 dated September 12, 2008, approving the *Regulamentului proprietății imobiliare în Ministerul Apărării Naționale* (Regulation on Real Estate Property in the Ministry of National Defense) and updated by Order no. DDI-13 issued by the Head of the Directorate of Domains and Infrastructure on June 17, 2022, approving the *Regulamentului proprietății imobiliare în Ministerul Apărării Naționale* (Regulation on Real Estate Property in the Ministry of National Defense).

This classification, first introduced in the *Regulamentului proprietății imobiliare* of 2008, introduces in military regulations the life expectancy of temporary constructions and, a new concept for Romanian construction legislation, semi-permanent constructions. Adopting new notions also used in the regulations of the United States Department of Defense (DoD)² represents a step towards modernizing military constructions, however, since these provisions have not been fully correlated with national construction legislation, the application of this new conceptual structure regarding the life expectancy of constructions in a military context remains at the stage of intention.

Military buildings are subject to both specific military regulations and national construction legislation. In the field of construction, life expectancy is determined by 3 parameters: the lifespan established by authorization, the designed life expectancy depending on wear and tear, and the operating duration for the purpose of investment amortization. Therefore, to correlate military regulations with civilian ones, it is necessary to clarify the legal framework and define terms such as operating duration, existence duration, or life expectancy.

2.1. Amortization of the Real Estate Investment

The planned economy of the communist era assumed the existence of norms regarding the life expectancy of each type of building for the calculation of investment amortization and the planning of repair works. These regulations, which also applied to military constructions, classified buildings based on their intended use and the nature of the materials from which they were made, and specified the frequency and cost of maintenance and major repair works. Starting from 1975, *Normele tehnice de cazare* (*The Technical Standards for Accommodation*) included a nomenclature of buildings and special constructions in which the standard operating duration of each type of building was specified based on its purpose and the nature of the materials used, including norms for maintenance and major repairs (Colban 1998, 30). The standard operating duration began from the date the building was put into operation and represented the depreciation period to which the planning of major repairs in terms of frequency and value was related. This standard operated until its replacement in 2008 with regulations that separately addressed maintenance and current repairs³ and the domain and infrastructure norms⁴.

In the new regulations, the classification and standard operating durations for constructions belonging to the Ministry of Defence are established as the maximum duration specified in the *Catalogul privind clasificarea și duratele normale de funcționare a mijloacelor fixe* (*The Catalog Regarding the Classification and Standard Operating Durations of Fixed Assets*) approved by Government Decision No. 2.139 of November 30, 2004.

² UFC 1-201-01, Non-permanent DOD facilities in support of military operations: Temporary construction level: This level involves buildings and facilities designed and constructed for a life expectancy of up to five years; Semi-permanent construction level: The buildings and facilities at this level are designed for a life expectancy of under 10 years, but with proper maintenance and repairs, this can be extended to up to 25 years.

³ *Normele tehnice pentru lucrări de întreținere și reparații curente la clădirile și construcțiile speciale din patrimoniul imobiliar al Ministerului Apărării* (*The Technical Standards for Maintenance and Current Repairs Works on Buildings and Special Constructions from the Real Estate Heritage of the Ministry of Defense*), approved by Order no. M.44 dated May 9, 2008, and updated by Order no. DDI-4 issued by the Head of the Directorate of Domains and Infrastructure on April 14, 2020, approving the *Norme tehnice pentru lucrări de întreținere și reparații curente la clădirile și construcțiile speciale din patrimoniul imobiliar al Ministerului Apărării* (*Technical Standards for Maintenance and Current Repairs Works on Buildings and Special Constructions from the Real Estate Heritage*)

⁴ *Normele tehnice de domenii și infrastructură* (*The Technical Standards for Domains and Infrastructure*), approved by Order no. M. 45 dated May 9, 2008, and updated by Order no. DDI-12 issued by the Head of the Directorate of Domains and Infrastructure on April 13, 2022, approving the *Normelor tehnice de domenii și infrastructuri* (*Technical Standards for Domains and Infrastructure*).

This classification approved in 2004 updates the provisions of *Hotărârea nr. 964/1998* for the approval of *Clasificației și a duratelor normale de funcționare a mijloacelor fixe* (*The Classification and Standard Operating Durations of Assets*) that represented a paradigm shift and aligned Romania with international trends, simplifying the classification of depreciable tangible assets by reducing the number of groups and classes. Starting from 1998, in this classification, the material from which a building is made is no longer considered an essential criterion. Instead, a modern, performance-based approach is adopted, which requires that each asset fulfill a specific function for a predetermined operating period, regardless of the material used in its manufacture. For example, a building for administrative purposes, regardless of the materials it is made of, must operate between 40 and 60 years to amortize the investment. According to *Hotărârea Guvernului nr. 2.139 din 30 noiembrie 2004* for the approval of *Catalogului privind clasificarea și duratele normale de funcționare a mijloacelor fixe*, specific norms for classifying and determining the normal operating durations will be established for constructions that are part of the national defense, public order, and national security system. These norms will be developed by the authorized authorities within the defense system and approved by the Ministry of Public Finance, thus ensuring an approach adapted to this specific sector.

The relevance of this duration of depreciation is reflected in the administration of barracks since, according to the *Regulamentul proprietății imobiliare în Ministerul Apărării*, the demolition of constructions is carried out only after the approval of their decommissioning, and the decommissioning of constructions before the completion of the standard usage duration⁵ is administratively investigated⁶. In exceptional situations, fixed assets can be decommissioned before reaching the standard usage duration, based on technical expertise, if they show advanced physical wear and the continuation of their use becomes dangerous or economically inefficient.⁷

In conclusion, the general system for classifying the operating durations of fixed assets does not detail the particular requirements of military infrastructure. To adequately respond to the distinct needs of the national defense system's infrastructure, ensuring the necessary flexibility and adaptability, the development of specific standards that define the normal operating durations for temporary and semi-permanent facilities would be appropriate.

In the context of the regulations of the Ministry of Defence, the standard operating duration of constructions is stipulated both in the *Normele tehnice de domenii și infrastructuri* and in the *Normele tehnice pentru lucrări de întreținere și reparații curente la clădirile și construcțiile speciale din patrimoniul Ministerului Apărării* (*The Technical Standards for Maintenance*

⁵ The normal usage duration is synonymous with the normal operating duration, in *Normele tehnice pentru lucrări de întreținere și reparații curente* (*The Technical Standards for Maintenance and Current Repairs*) the expression "normal usage duration / operating" is used.

⁶ Article 56.

⁷ *Instrucțiunile privind scoaterea din funcțiune și casarea activelor fixe, precum și declasarea și casarea bunurilor materiale, altele decât activele fixe, în Ministerul Apărării Naționale* (*Instructions regarding the decommissioning and disposal of fixed assets, as well as the declassification and disposal of material goods other than fixed assets, within the Ministry of National Defense*), approved by Order No. M.92 of September 16, 2013.

and Current Repairs Works of Buildings and Special Constructions belonging to the Ministry of Defense). To eliminate redundancies *Normele tehnice pentru lucrări de întreținere și reparații curente* could include the normal operating durations for temporary and semi-permanent facilities, while the *Normele tehnice de domenii și infrastructuri* could merely refer to the comprehensive document, thus optimizing the coherence and efficiency of the legislative framework in the field of military infrastructure.

2.2. Construction Degradation Over Time

The Government decision *Hotărârea nr. 1.276 din 22 decembrie 2021 privind modificarea anexei la Hotărârea Guvernului nr. 2.139/2004 for the approval of the Catalogului privind clasificarea și duratele normale de funcționare a mijloacelor fixe* specifies that for establishing the classification and normal operating periods of the fixed assets specific to the national defense system, the technical-economic parameters established by designers and manufacturers through the manuals or technical documentations of the respective fixed assets will be taken into account, as well as the effects of moral depreciation. Viewed in terms of wear over time, the standardized service life of buildings or construction elements and related installations is defined within the context of several civil and military regulations.

The usage duration is shorter than the physical life span of the construction. The standard *GE 032-97 privind executarea lucrărilor de întreținere și reparații la clădiri și construcții speciale (Execution of Maintenance and Repair Works on Buildings and Special Constructions)* defines the life expectancy of a construction, also adopted in the *Normele tehnice pentru lucrări de întreținere și reparații curente la clădirile și construcțiile speciale*, as "the period after which the construction or construction element ceases definitively to fulfill the function for which it was created". This standard presents in Annex 1 the life expectancy of buildings and special constructions in normal environmental conditions as well as the life expectancy for construction elements and installations that make up the buildings in Annex 2. Life expectancy underlines a final point in the life cycle of the structure or its component elements, a moment when they are no longer efficiently used for the initially established purpose. The life expectancy of the construction is ensured through maintenance and repair works and even extended through rehabilitation and modernization works. Thus, over the life cycle of the building, a designed life expectancy as well as a standard operating duration are defined.

*The designed life expectancy is the duration estimated by the designer*⁸ for which a structure or part of it is used for the intended purpose without the need for major repairs, provided that maintenance works are ensured⁹.

*The standard operating duration*¹⁰ is determined taking into account the techno-economic duration established by the designer and manufacturer

⁸ SR EN 15978:2012
Sustainability of
construction works
– Assessment of
environmental
performance of buildings
– Calculation method.

⁹ Design code.
Foundations of
construction design CR
0-2012, 1.3.1 Design
terminology.

¹⁰ *Normele tehnice pentru
lucrări de întreținere
și reparații curente la
clădirile și construcțiile
speciale din patrimoniul
imobiliar al Ministerului
Apărării* (Technical
norms for maintenance
and repair works on
buildings and special
constructions from the
real estate assets of the
Ministry of National
Defense), approved by
Order No. M44 of May 9,
2008, Annex 1 Glossary,
point 6.

through technical documentation, as well as the effects of wear over time. This duration coincides with the amortization period¹¹.

In conclusion, the life expectancy of a construction extends beyond the amortization period, i.e., the standard operating duration, but over the life cycle of the building, repair, and rehabilitation works will be carried out with a frequency given by the projected life expectancy, which relates to the wear of the component materials.

Analyzing the characteristics of temporary and semi-permanent military facilities considering this conclusion, the need arises to adapt the technical solutions of building to the operating duration, namely choosing materials whose cost relative to wear over time justifies their use for a limited operating duration of 5-10 years and respectively 10 to 25 years.

2.3. Authorization of the Construction Works

Another aspect of the proposed classification based on the duration of use is the utilization of temporary constructions for providing initial and temporary facilities, while definitive constructions are executed for semi-permanent and permanent facilities.

Regardless of the materials they are made of, temporary constructions have a limited life duration, as established in the building permit. Following the conclusion of the period specified in the permit, these constructions are dismantled and the land returned to its initial state, according to the obligations imposed by the permit.

Temporary constructions are characterized by their greater flexibility compared to permanent ones, as they are not subject to the same rigorous technical standards. This particularity allows for greater adaptability in terms of material selection and equipment, such as thermal insulation or utility connections, depending on specific requirements and costs. Serving temporary purposes or meeting fluctuating needs, these constructions provide a quick and efficient solution for infrastructure without requiring long-term investments in costly materials or technologies. Additionally, according to the legislation regarding construction works authorization, temporary constructions are subject to the same authorization conditions as permanent ones, but with a simplified procedure based on reduced technical documentation presented in Annex 2 of the *Normele Metodologice de aplicare a Legii nr. 50/1991 privind autorizarea executării lucrărilor de construcții*.

However, neither national legislation nor military regulations specifically address temporary military facilities, which leaves room for ambiguities regarding the minimum standards that must be ensured and the documentation necessary for the authorization of construction works. One document that could be used as a model is the American army's standard for

¹¹ GE 032-97 Standard regarding the execution of maintenance and repair works on buildings and special constructions.

non-permanent facilities, UFC 1-201-01, which specifies, in addition to a definition for the typologies of non-permanent facilities, the situations in which they are used, what standards must be ensured and what documentation must be presented for their authorization.

2.4. Changing a building's intended use

Buildings are consistently affected by changes over time in the organization of military units' activities. Altering the purpose of a building may entail significant modifications to its conditions of use, and depending on the degree of adaptation required and the resources available for implementing these changes, they can directly impact the duration of the building's use. (Parker 2016, 134). While in some cases, repurposing a building may extend its lifespan to better serve the operational and strategic needs of the military, in others, it might lead to decommissioning if the necessary adjustments are not economically feasible.

The four categories of facilities outlined in the *Regulamentul proprietății imobiliare în Ministerul Apărării Naționale* (Regulation on Real Estate Property in the Ministry of National Defense) — initial, temporary, semi-permanent, and permanent — are classified based on their construction complexity (moral wear and projected lifespan) and duration of use (authorized existence duration, depreciation period, operational lifespan). Moreover, underscoring the flexible and adaptable nature of military infrastructure, the Regulation specifies that the architecture of the semi-permanent facilities' must ensure "the possibility of compartmentalization /redistribution / remodeling of spaces within these constructions or their partial reconstruction, with minimal expenses, for easy adaptation to new requirements in the future."

A proactive approach from the planning stage can ensure a flexible solution aimed at maximizing the efficiency and durability of military infrastructure in line with evolving operational requirements. Strategies adopted for adapting constructions to different purposes include the use of modular architecture or buildings with open plans (Schmidt 2016, 84). Modular constructions are characterized by flexibility and adaptability to changing needs, as they can be reconfigured or expanded based on operational requirements. Made from containers, they are mobile solutions that can be easily transported, deployed, dismantled, and reused elsewhere. This is the most commonly used technical solution for providing temporary facilities. Another strategy for maximizing efficiency and durability is the use of pavilions with open plans. These buildings can be adapted for various functions, from offices and conference rooms to maintenance workshops or physical training spaces, allowing for the reconfiguration of interior space as needed.

The ability of these constructions to adapt over time by changing their purpose raises issues regarding their classification for depreciation purposes, as the *Catalogul privind clasificarea și duratele normale de funcționare a mijloacelor fixe* (Catalog of Classification and Normal Operating Durations of Fixed Assets) considers the

buildings' intended use. The lifespan of these constructions is influenced by their projected duration and material wear, which considers the established military perspective of 5-10 years for temporary ones and 10-25 years for semi-permanent ones. In conclusion, specific norms from the Ministry of National Defense are necessary to establish the depreciation period of these constructions.

2.4. Adaptable military constructions

The Romanian military infrastructure has undergone significant evolution in the past 20 years, adapting to the requirements and challenges of the current security environment. A notable change is the adoption of new construction typologies characterized by adaptability. Among these are modular container constructions and buildings with structural elements made of corrugated sheet metal. These construction solutions represent a rapid response that allows the army to adjust its infrastructure according to the specific dynamics of the military domain.



Figure 1 Cincu urban training facility modules (SMFT 2022)



Figure 2 Container type (Cabine and Containere, n.d.)

Mobile modular container constructions represent prefabricated structures the size of a transport container, adapted as functional spaces for various purposes, such as offices, warehouses, or medical units. These constructions are characterized by their ability to be easily transported, assembled, and disassembled, offering flexibility and adaptability in diverse contexts and needs. The flexibility of modular container constructions lies in their capacity to rapidly and efficiently adapt to various functions and requirements, through the modular reconfiguration and extension of structures, in a cost-effective and environmentally friendly manner, ensuring the ability to quickly respond to fluctuating operational demands.

According to the *Regulamentul proprietății imobiliare* (MApN Real Estate Property Regulation), the use of relocatable constructions does not entail the approval stages required for real estate investments, with simplified approval representing an additional advantage as the construction process is expedited. However, the use of these constructions also presents several disadvantages, including limited comfort, poor thermal and sound insulation, and spatial limitations. In most cases, without significant technical efforts, these constructions do not meet the energy efficiency criterion imposed on permanent constructions or semi-permanent facilities, limiting

their use generally to the duration specified in the regulation of 5-10 years, which is correlated with the technical solution for these types of structures, with a projected lifespan of around 10 years.

Considering that the use of these container modules covers a wide range of functions, for establishing the depreciation period, we propose defining a new class of constructions dedicated to these types of structures, whose period of use is related to the projected lifespan and material wear and tear, respectively operational military constructions with a duration of use of 10 years.



Figure 3 Corrugated Sheet Structural Elements
(Agenția media a armatei 2019)



Figure 4 Corrugated Sheet Pavilions
(Agenția media a armatei 2022)

Buildings with corrugated sheet structural elements are constructed modularly, allowing for expansion and reconfiguration according to requirements through project design. Their production involves manufacturing the sheet structural elements, which are then assembled on-site to form the final structure of the building. These constructions are internally insulated, ensuring along with interior installations (electrical, thermal, sanitary) the specific thermal efficiency and comfort of permanent constructions.

Implemented through the army's own structures, the deployment of these buildings is based on technical execution projects prepared by field specialists and verified by certified project validators according to current regulations.

In Romanian military bases, buildings with corrugated sheet structural elements are used for sheltering and maintenance of aircraft, storage, or as dispensaries, sports fields, to meet the food, rest, or hygiene needs of military personnel. Moreover, the adaptability and flexibility in use due to the open plan ensure the possibility of reconfiguration and reuse for different purposes and successive functions.

As a result, the lifespan of constructions is not defined by their initial purpose but rather by the projected duration, determined by material wear and maintenance level. To clarify this issue, we propose defining a new class of constructions dedicated to these types of structures, whose service life should be based on the projected duration and material wear, namely adaptable military constructions with a service life of 25 years.

Conclusions

Modular container constructions and those made with corrugated sheet structural elements offer a high degree of adaptability and flexibility in use, allowing for reconfiguration and use for various purposes and functions, such as office spaces, storage, or maintenance workshops. However, their ability to adapt to multiple destinations leaves room for interpretation in establishing the amortization period, as they do not fit into the existing categories in the *Catalogului privind clasificarea și duratele normale de funcționare a mijloacelor fixe* (Catalog regarding the classification and normal operating durations of fixed assets) or are not correlated with the operating durations specified in military regulations.

The introduction of modern construction typologies has brought opportunities for the modernization of existing infrastructure but also challenges in coordinating national construction legislation with new military infrastructure regulations. Regarding the duration of use of constructions within the Ministry of Defence regulations, the general system of classification of operating durations of fixed assets does not fully meet the specific requirements of military infrastructure. Therefore, specific standards need to be developed to define appropriate operating durations for temporary and semi-permanent facilities, taking into account the specific needs of national defense and the necessity of infrastructure flexibility and adaptability. For these facilities, from the perspective of construction wear over time, standardizing already tested technical solutions that justify their cost in relation to operating duration of 5-10 years for temporary ones and 10-25 years for semi-permanent ones is opportune. Also, national legislation and military regulations do not specifically address the authorization of temporary military construction works, leaving room for ambiguities regarding the necessary standards and documentation. The US Army Regulation UFC 1-201-01 provides a useful model for addressing these issues, thus establishing standards and documentation required for non-permanent facilities.

In conclusion, addressing the differences between national legislation and military regulations is necessary to ensure the efficiency of the Romanian military infrastructure in its current and future context. For the development of norms that complement existing regulations and provide a clear basis for establishing the duration of use in the military context of modular container constructions and those made with corrugated sheet structural elements, as well as other construction typologies to ensure semi-temporary facilities, the elaboration of regulations specifying the following is opportune:

- Construction typologies and technical solutions;
- Minimum technical standard regarding insulation level, fire protection, and operational safety;
- The technical documentation required for the building permit and who is responsible for its elaboration (especially clarifying the content of the technical documentation accompanying the container module set);

- Type of fixed asset (military equipment or construction) and duration of use for establishing the amortization duration.

Additionally, to ensure an efficient response in terms of duration and costs, this regulation should be accompanied by a catalog of standard projects, already tested and optimized solutions, for providing various facilities in the military bases through the use of modular, prefabricated constructions, or generic plan constructions such as buildings with corrugated sheet structural elements.

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