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Research paper

ORGANIZATION AND SPATIAL QUALITY OF MULTI-STOREY APARTMENTS – CASE OF NIŠ, SERBIA

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Abstract

This paper explores the spatial organization and quality of multi-storey apartments in the city of Niš, Serbia, with a focus on their potential to bridge the gap between single-family housing and traditional multi-family apartments. Through a typological and regulatory overview, the study highlights duplex and mezzanine units as architectural strategies for enhancing the residential experience within multi-family buildings.

Three recent examples from Niš are analysed, examining spatial characteristics such as total area, room dimensions, ceiling height variations, and the availability of private outdoor spaces. The findings suggest that while these units offer design flexibility and the potential for improved ambiance, particularly through increased floor-to-ceiling heights, they do not significantly surpass single-level apartments in terms of spatial comfort. Challenges related to regulatory ambiguities, insufficient private outdoor areas, and variable approaches to area calculation are identified.

Key words: *Apartment units*, *Duplex apartments, Mezzanine apartments, Multi-family housing, Multi-storey apartments*

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1. INTRODUCTION

The challenges of contemporary housing in urban areas present complex dilemmas when selecting residential spaces. The individual family house in peaceful area, long regarded as the ideal living solution, now faces competition from apartments, which require less maintenance and are situated in well-developed, service-rich locations where numerous amenities are "within reach". This results in high demand for apartments in centrally developed urban areas, which is also visible at the local level through the aggressive redevelopments of plots that were originally occupied by single-family houses, but are also suitable for the construction of multi-family buildings. These circumstances suggest that contemporary housing needs and desires are positioned between the family house and an apartment located near the city centre.

A primary advantage of individual, single-family housing is the allocation of a dwelling to a distinct, independent parcel of land. Residency in a detached home provides a significant level of privacy and individuality for its occupants. Also, this type of housing typically offers a high level of comfort, as the size and spatial organization of single-family homes are usually designed to accommodate a wide range of residential needs. However, despite its desirability, this form of housing represents an inefficient model for contemporary urban areas. The implementation of the single-family housing results in lower residential densities, inefficient land use, and unnecessary urban sprawl. Consequently, due to the spatial expansion of urban areas, this model leads to economic inefficiency, reflected in increased investments in infrastructure. Lastly, and perhaps most importantly, this housing model contributes to negative ecological and environmental impacts on the urban ecosystem.

The consequences mentioned above have led to the increasing perception of single family housing in urban areas as an unsustainable model, with greater emphasis being placed on the development of multi-family housing. More efficient use of land and available spatial capacities, better infrastructure and service provision in residential areas, coupled with higher housing density, make multi-family housing a more economical and rational choice for development of urban areas. However, as the advantages of multi-family housing are generally developed at the expense of spatial comfort, privacy, and individuality, many residents continue to favor the comfort provided by single-family homes.

In order to address the shortcomings of apartment living, contemporary models aim to find transitional solutions that reconcile the extremes of these two housing types and provide an adequate alternative. One of the key advantages of single-family homes is the ownership of a private piece of land – in the form of a garden [1,2]. Additionally, the organization of residential space on two, or more levels is often cited as one of the main benefits of living in a house [1-3]. Therefore, the private outdoor space that could serve as the living are on the open and internal circulation within the dwelling unit can be considered one of key benefits of single-family houses [1,2].

2. MULTI-STOREY APARTMENTS

Traditional multi-family residential buildings are characterized by the development of residential units on a single level. While it is undeniable that this spatial organization has its advantages – such as the fact that single-level apartments lack physical barriers and can be equally functional at all stages of individual and family development – differentiation of space along the vertical axis allows for greater variability in spatial organization and individualization of apartments within buildings [1]. Contemporary practice encourages the development of new spatial configurations that would provide a more adequate living environment and better, more stimulating living conditions. The modern architectural approach to improving multi-family housing involves the three-dimensional development of apartment space.

In contemporary housing practice, it is not uncommon that apartment units are developed on multiple planes. The concept of the three-dimensional spatial organization of an apartment involves planning the living space at different levels, not being restricted to standard ceiling heights, and allowing for the spatial overlap of parts of the apartment [1,2, 4-6]. This approach contrasts with the uniformity that often characterizes multi-family housing.

2.1. Multi-storey apartment types

Multi-storey apartments encompass a variety of residential unit types that span across multiple levels. The most common among these are duplex, maisonette, and mezzanine apartments.

A **duplex apartment** is defined as a single dwelling unit distributed over two floors, connected by an internal staircase. These units are typically accessed via shared entrances and common interior areas. While duplexes can be situated on any level of a building, they are most commonly found on the upper floors, often accompanied by adjoining rooftop terraces.

The **maisonette**, derived from the French term meaning “little house,” like duplex apartment most commonly has the living space split over two floors. However, maisonettes are distinguished by their location on the ground floor, with a private, street-level entrance, separate from the building’s main access. Owing to their ground-level position, maisonettes may include a small garden or outdoor area, making them resemble terraced or individual houses.

In both duplexes and maisonettes, the ground level usually functions as the primary living area, while bedrooms and private spaces are generally located on the upper floor. Nevertheless, alternative spatial configurations can be found depending on design considerations. Because each level often serves a different function, ceiling heights may vary to optimize spatial efficiency and cost-effectiveness. A minimum ceiling height of 2.6 meters is recommended for floors that are design for daily activities, while a reduced height of 2.4 meters may be acceptable for floors with secondary functions, if these area do not exceed 50% of the apartment’s total area.

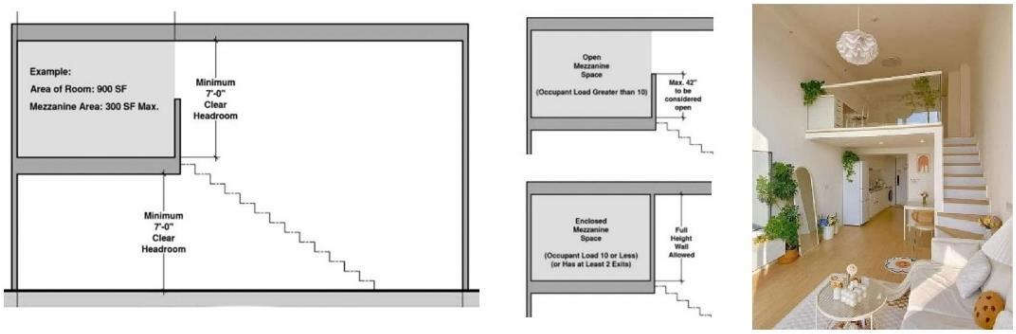


Figure 1. Mezzanine apartment type
(Source: https://buildingcodetrainer.com/mezzanine-code-requirements/)

The **mezzanine apartment** represents a different category. It is not a conventional multi-storey unit but rather features an intermediate level, called a mezzanine, inserted between the main floor and the ceiling (Figure 1). This mezzanine level is considered part of the storey below and is not typically classified as a separate floor. Mezzanines are valued for their ability to provide additional usable space without increasing the official number of storeys. Typically,

a mezzanine will occupy 30–50% of the floor area of the unit. The minimum recommended ceiling height is 2.40 meters, both below and above the mezzanine platform, although exceptions may apply in areas not requiring full clearance [7,8]. Depending on the design, mezzanines may be either open to the floor below or enclosed for privacy.

3. MULTI-STOREY APARTMENTS IN CONTEMOPRARY RESIDENTIAL PRACTICE IN THE CITY OF NIS

In Niš, multi-storey apartments that are part of the existing housing stock were predominantly constructed during the socialist period. Their design was inspired by Le Corbusier's residential concepts, which were widely implemented across Europe during that period. These apartment types were characterized by their narrow width, typically just 4.2 meters, and by their spatial organization across split levels. However, such configurations did not gain lasting popularity either in Niš or more broadly within Serbia.

A study conducted by B. Stoiljković [1], which focused on identifying the needs and preferences of residents in Niš concerning the individualization of multi-family housing, wich in some part included housing units developed across multiple levels, revealed some striking findings. The study, which examined residential buildings completed up to the year 2015, showed that 54.54% of respondents residing in multi-storey apartments perceived the multi-level layout as a drawback, while only 27.27% considered it an advantage. As the author concluded, this reflects a divergence in perception between residents and architects: while professionals may view the level-based organization as a design quality reminiscent of single-family housing, users more often experience it as an architectural constraint.

It is important to note that the study's sample likely included only multi-storey apartments developed according to the Le Corbusier model, suggesting that this specific spatial layout may not have aligned well with the preferences of domestic users.

Only in recent years has the local real estate market witnessed a resurgence of multi-story apartment development. Unlike earlier examples, these new duplex units vary significantly in width and layout, offering a wide range of spatial configurations. They are most commonly located on the top floors of residential buildings. In some cases, these units serve as a means of integrating previously underutilized attic space into the apartment below. In flat-roof buildings, duplex apartments are often complemented by large private outdoor areas in the form of rooftop terraces.

Residential construction in Serbia is regulated by the Rulebook on Conditions and Standards for the Design of Residential Buildings and Apartments *(Pravilnik o uslovima i normativima za projektovanje stambenih zgrada i stanova, "Sl. glasnik RS", br. 82/2015)*, which does not recognize multi-storey apartments as a distinct typological category. Apartment sizes are determined based on unit's structural layout, with minimum dimensions defined for each individual room (Table 1). Regardless of room purpose, the minimum floor-to-ceiling height for residential spaces is set at 2.6 meters, except in attic areas.

The possibility of developing multi-level residential units is introduced in the Local General Regulation Plan for the territory of the Medijana Municipality in the city of Nis *(Plan generalne regulacije područja gradske opštine Medijana, "Sl. list grada Niša")*. This document envisions the potential for designing ground floors with increased floor-to-ceiling height and the incorporation of mezzanine level. The area of the mezzanine level may not exceed 50% of the net floor area of the ground floor, excluding vertical circulation elements. The construction

of duplex apartments is planned on the top floors, where the upper level of the duplex utilizes attic space. The minimum clear height of the attic level must be at least 2.60 meters across a minimum of two-thirds of the floor area.

Table 1. Minimum apartment and room areas according to Rulebook

Minimum room area according to their function		**Minimum apartment area according to apartment type [4]**	
Living room	16,00 m²	Studio	26,00 m²
Double bedroom	11,00 m²	One-room apartment	30,00 m²
Single bedroom	7,00 m²	One-and-a-half-room apartment	40,00 m²;
Dining area	4,00 m²	Two-room apartment	48,00 m²
Kitchen	4,00 m²	Two-and-a-half-room apartment	56,00 m²
Storage	0,50 m²	Three-room apartment	64,00 m²
Bathroom	3,00 m²	Three-and-a-half-room apartment	77,00 m²
Toilet	1,30 m²	Four-room apartment	86,00 m²
		Four-and-a-half-room apartment	97,00 m²

For the purposes of this study, three examples of newly constructed multi-level residential units were analysed. The first example pertains to a building planned in Sestre Baković Street, the second is located on Bulevar Nemanjića, and the third in Pana Đukića Street (Figure 2). In the first case, the residential unit is situated on the ground floor and includes a mezzanine space. The second and third cases involve duplex apartments located on the top floors of their respective buildings.

To assess the quality of these residential units, the analysis focused on spatial characteristics that influence the quality of multi-level dwellings, specifically: total apartment area, individual room area, spatial zoning, availability of larger private open spaces, and living rooms with increased floor-to-ceiling height.

Case 1 – Building in Sestre Baković Street

The multi-level residential units in this building are located on the ground floor. Access to the apartments is provided through a shared corridor. The analysed apartment is a one-and-a-half-room unit with a total area of 46.72 m². The living room and dining area are integrated within a single open-plan space measuring 19.86 m². This area extends through two floor heights. The kitchen is positioned in a separate enclosed space with an area of 4.10 m². There is no sanitary facility on the ground floor. The mezzanine level, which occupies half the footprint of the ground floor, accommodates the sleeping area – comprising a bedroom and a bathroom. A notable drawback is that the bedroom, in terms of area, corresponds to the size of a single bedroom. The apartment does not include a private outdoor space.

Case 2 – Building on Bulevar Nemanjića

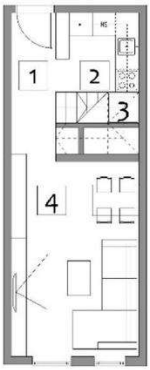
The duplex apartments in this building are situated on the top floors and are accessed via a shared central corridor. The analysed apartment is a two-and-a-half-room unit with a total area of 64.75 m². The living room and dining area are integrated within a single space measuring 21.65 m². The kitchen is spatially positioned within the open-plan living area but is physically separated by partitions.

[4] In local regulation residential units are classified according to the number of rooms, including the living room. For example, a two-room apartment is an apartment with living room and one bedroom with minimum area of 11 m². A half-room is a bedroom with reduced area, range from 7 to 11 m², intended for one person.

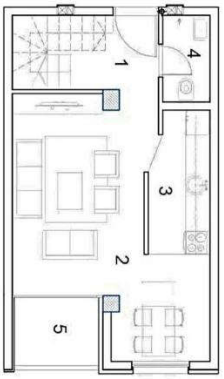
Case 1
Building in
Sestre Baković Street

Case 2
Building on
Bulevar Nemanjića

Case 3
Building in
Pana Đukića Street



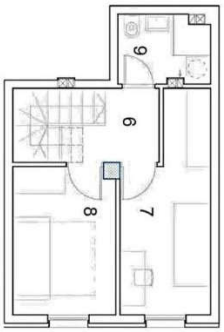
Ground floor



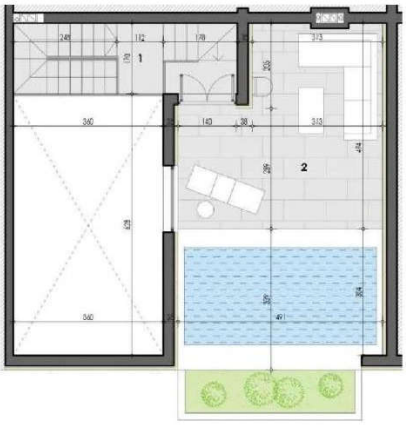
Lower floor

Lower floor

Mezzanine level



Upper floor



Upper floor – rooftop level

Ground floor		**Lower floor**		**Lower floor**	
1.Entrance area	4,00	1.Entrance and staircase	6,40	1.Entrance area	5,66
2.Kitchen	4,10	2.Living room	21,65	2.BAthroom	4,42
3.Staircase	1,67	3.Kitchen	4,88	3.Bedroom	10,97
4.Living room	19,86	4.toilet	2,42	4.Bedroom	10,35
		5. Balcony	3,36	5.Living room	25.88
				6.Balcony	7.29
total	**29,62**	**total**	**38,71**	**total**	**62.85**

Mezzanine level		**Upper floor**		**Upper floor**	
1.Staircase	1,67	6.Hodnik	3,40	1.Staircase	8.89
2.Walkway	3,40	7.Bedroom	10,11	2.Rooftop terrace	35.42
3.Bathroom	3,40	8.Bedroom	8,91		
4.Bedroom	8,63	9.Bathroom	3,62		
total	**17,10**	**total**	**26,04**	**total**	**44.04**
TOTAL NET AREA	**46,72**	**TOTAL NET AREA**	**64,75**	**TOTAL NET AREA**	**106.89**

Figure 1. Case study – examples of multilevel apartments in Niš

A loggia of 3.36 m² is directly connected to the living area. On the upper level of the duplex, two bedrooms and a bathroom are located. The larger bedroom has an area of less than 11 m², which is below the minimum defined area for a double bedroom.

Case 3 – Building in Pana Đukića Street

The top floor of this building accommodates "penthouse" apartments. Although designed as two-level units, the residential space is primarily organized on the entry level. The analysed apartment is a three-room unit with a total area of 106.89 m². The open-plan living room covers 24.96 m² and features increased floor-to-ceiling height. The night zone, located on the same level, includes two bedrooms and a bathroom. All residential rooms are open onto a spacious loggia with an area of 12.75 m². The apartment also includes access to a rooftop terrace located above the unit. This space is reached via an internal double-flight staircase. The associated rooftop terrace is designed as a seating area and includes a private swimming pool.

4. DISCUSSION AND CONCLUSION

The analysis of three contemporary examples of multi-storey residential units in Niš demonstrates the ongoing evolution of spatial organization in multi-family housing. Although previous multi-level configurations inspired by Le Corbusier were largely perceived negatively by residents, the recent resurgence of duplex and mezzanine apartments suggests a growing market interest and diversification in housing preferences.

Each case study highlights different aspects of multi-level living. The apartment in Sestre Baković Street demonstrates the potential for effective space utilization on the ground floor, though it lacks adequate room sizes and outdoor space. The unit in Bulevar Nemanjića offers a more balanced configuration, though it does not fully meet all regulatory standards. The example from Pana Đukića Street illustrates the most advanced application of spatial zoning, luxury amenities, and comfort, demonstrating how multi-level living can successfully emulate the qualities of single-family homes.

If the specific spatial elements of multi-storey apartments is considered, through analysis of unit layout, overall area, and individual room areas, it can be concluded that it does not significantly differ from that of single-level apartments of similar structure. The shortcomings commonly seen in domestic housing construction, particularly regarding the minimal area of individual rooms (often at or below regulatory minimums), are also observed in this type of apartment. Thus, we can conclude that the analysed apartments do not offer a notable improvement in spatial comfort. Additionally, differences in the treatment of staircases were observed. Specifically, in Cases 2 and 3, the staircase area is included in the total area calculation for only one of the levels. In Serbian housing practice, this issue is regulated by the national standard SRPS U.C2.100:2002 – Calculation of Building Areas in the Field of High-Rise Construction *(Izračunavanje površina obejakata u oblasti visokogradnje)*, which states that the area beneath stairs should only be included in the total area calculation if the ceiling height exceeds 1.50 meters. As this standard is not mandatory in domestic practice, it leaves possibility for varying methods of area calculation, and thus, potential manipulation when defining the apartment's structure.

A trend commonly associated with contemporary multi-storey apartments, the development of larger private open spaces, is not evident in domestic practice, except for Case 3. This may be attributed to an insufficiently clear treatment of rooftop terraces and

ground-level yards in local planning regulations. For instance, in Case 1, the unit lacks an associated outdoor space, despite having direct access to the terrain and backyard.

What is noticeable, however, is the use of multi-storey apartments' potential to enhance residential quality in terms of ambiance and visual experience. In Cases 1 and 3, the opportunity to create living rooms with increased ceiling heights has been utilized, which certainly improves the overall residential comfort.

In conclusion, multi-storey housing, offers significant design potential, but only when implemented with a balanced approach that combines creativity with regulatory and ergonomic rigor. Future residential developments should prioritize not only the formal attributes of space but also its livability, adaptability, and compliance with minimum standards to ensure both functional and experiential quality.

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