Architectural Dimensions and Beyond

www.adb.reapress.com

Arch. Dim. Bey. Vol. 3, No. 4 (2026) 301–310.

Paper Type: Original Article

Assessment of the Security Potential of Shared Spaces in Residential Complexes Based on CPTED Principles Case Study: Lakanshahr Residential Complex

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Citation:

Received: 05 March 2026 *Revised: 12 May 2026* *Accepted: 18 September 2026*	Rahimipour Sheikhaninejad, M. A., & Nikandish, M. (2026). Assessment of the security potential of shared spaces in residential complexes based on CPTED principles (Case study: Lakanshahr residential complex). *Architectural dimensions and beyond, 3*(4), 301-310.

Abstract

Security is one of the fundamental components of quality of life in urban environments and a key factor influencing the desirability of residential spaces. This study aims to assess the security potential of shared spaces in the Lakanshahr Residential Complex in Rasht, based on the principles of Crime Prevention Through Environmental Design (CPTED). The research adopts a descriptive-analytical method with a qualitative approach. Data were collected through field observations and an assessment checklist developed based on the five main CPTED principles: territoriality, natural surveillance, access control, maintenance and management, and activity support. The findings indicate that only 41% of the evaluated CPTED indicators in the case study residential complex meet desirable standards. Furthermore, maintenance and management were identified as the most significant areas of weakness in the residential environment. Based on the findings, a set of context-specific design and management strategies has been proposed to improve the security potential of shared spaces and enhance residents' perceived sense of security.

Keywords: Security potential, Shared spaces, Residential complex, Crime prevention through environmental design, Environmental design.

1 | Introduction

Security and the sense of security are among the most fundamental human needs, directly influencing quality of life, mental well-being, and citizens' social interactions. In recent decades, with the expansion of urbanization and increasing residential density in housing complexes, greater attention has been directed

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https://doi.org/10.48314/adb.v3i4.74

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toward the physical and environmental dimensions of security. Numerous studies have demonstrated that the design of residential environments plays a decisive role in reducing crime and enhancing residents' sense of security [1], [2].

Crime Prevention Through Environmental Design (CPTED), first introduced by Jeffery [3] and subsequently developed by Newman [1] and Crowe [2], is one of the most influential theoretical and practical frameworks in this field. This approach is based on the principle that thoughtful environmental design can reduce opportunities for criminal activity and strengthen residents' sense of security.

Lakanshahr Residential Complex in Rasht, as one of the medium-density residential complexes in the city, represents a relevant case for examining the security challenges of contemporary residential environments in Iran. The main objective of this study is to evaluate the existing conditions of Lakanshahr Residential Complex based on the five CPTED principles and to propose design strategies for enhancing residents' sense of security.

Main research question: To what extent does Lakanshahr Residential Complex in Rasht comply with CPTED principles, and what strategies can be proposed to enhance the sense of security within the complex?

2 | Materials and Methods

In terms of its objective, this study is applied research, while methodologically it adopts a descriptive-analytical approach with a qualitative orientation. The research process was conducted in three main stages:

Stage 1. Theoretical studies: reviewing the CPTED literature and extracting the relevant components and assessment indicators from valid scientific sources.

Stage 2. Data collection: developing a field observation checklist comprising 17 indicators organized under the five CPTED principles, using a binary response format (yes/no), and conducting field visits to Lakanshahr Residential Complex in Rasht.

Stage 3. Analysis and strategy development: analyzing field findings according to each CPTED principle, identifying the strengths and weaknesses of the residential environment, and proposing appropriate design and management strategies.

The study was conducted in Lakanshahr Residential Complex, located in Rasht, Guilan Province, Iran.

2.1 | Understanding the Research Context

According to the 2016 national census (1395 in the Iranian calendar), Rasht was the most populous city in Guilan Province, with a population of 971,956. Of this total, 711,748 people resided in urban areas and 256,208 in rural areas. The population of Rasht was 557,366 in 2006 and 639,951 in 2011. The city experienced a population growth rate of 2.29% between 1996 and 2006, followed by a rate of 2.18% between 2006 and 2011.

In terms of age structure, Rasht's population was relatively young and undergoing a demographic transition. According to the 2011 census, the three major age groups of 0–14, 15–64, and 65 years and above accounted for 20.45%, 74.61%, and 4.96% of the total population, respectively. Rasht accounted for 46.7% of the province's urban population. In 2006, the number of incoming migrants to the city reached 124,024. According to the approved master plan, Rasht was identified as one of the major migrant-receiving centers in Guilan Province during that period.

In 2011, Rasht had 204,054 households, with an average household size of 3.13 persons. The sex ratio was approximately 98 males per 100 females. Furthermore, out of the total population aged six years and above, amounting to 570,721 people in 2011, approximately 98% were literate (Statistical Center of Iran).

Given that more than a decade has passed since the last national census, the city's demographic structure has gradually shifted toward an older population. Guilan Province is also recognized as one of the oldest provinces

in Iran in terms of population age structure. In addition, climate-related migration in recent years has increasingly positioned Guilan Province, particularly Rasht, as one of the main destinations for internal migration.

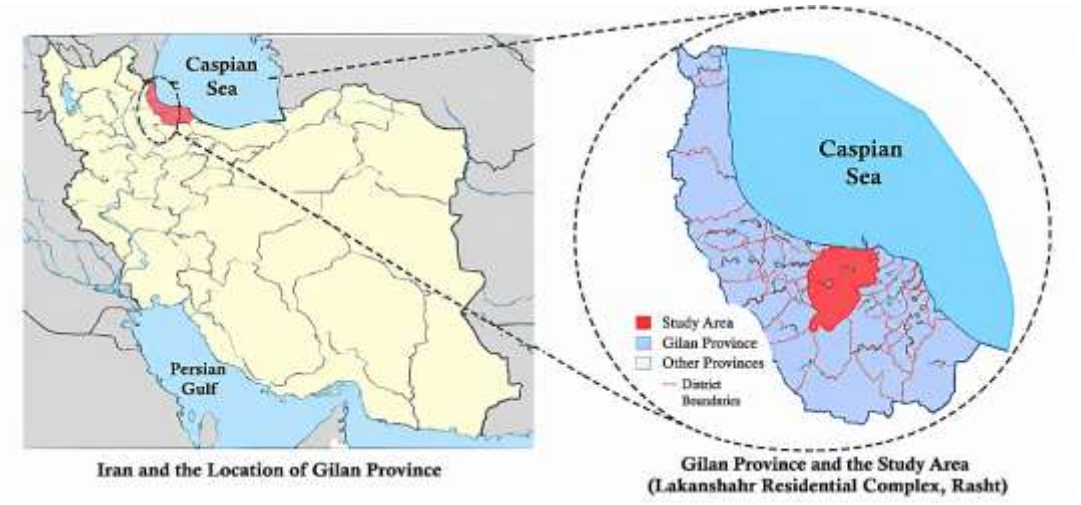


Fig. 1. Location map of Iran and Guilan Province.

As illustrated in *Fig. 1*, Rasht is located in Guilan Province, in northern Iran. The residents of Rasht are engaged in various occupations, including service, commercial, industrial, and agricultural activities. Rice cultivation is one of the major agricultural activities among the rural population of this region. According to the results of the 2006 and 2011 Population and Housing Censuses, the population of Rasht was 557,366 and 639,951, respectively. Of this population, 87.5% were aged ten years and above. The economically active population totaled 321,108 individuals, of whom 74.57% were employed and approximately 15.43% were unemployed (Statistical Center of Iran).

The county consists of three geographical zones: coastal, plain, and foothill areas. Its elevation varies from approximately 5.26 meters along the Caspian Sea coast to 760 meters in the vicinity of Nareh Sar and Dizkuh. The eastern part of the region corresponds to the active channel of the Sefidrud River and its tributaries, while the western part is characterized by plains, with its northern section extending toward the Caspian Sea coast.

The extensive urban area of Rasht, combined with its high population density and compact urban fabric, makes the city particularly sensitive to security challenges and the occurrence of crime. Consequently, crime reduction and the enhancement of urban security have become issues of considerable importance.

The residential complex selected for this study is Lakanshahr Residential Complex, located approximately six kilometers from the city of Rasht, adjacent to the Lakanshahr Road corridor. The complex currently consists of 160 residential blocks and 1,511 housing units, distributed across four residential phases and one commercial phase. Phase 1 comprises 200 newly constructed residential units equipped with elevators, which have not yet been occupied. Phases 2 and 3 each consist of 180 residential units and are not equipped with elevators.

As illustrated in *Fig. 2*, the selection of this complex as the case study is based on several characteristics, including its neighborhood-scale development, its service coverage for a population of approximately 5,000 residents, and its multifunctional nature. Furthermore, the availability of various amenities and land uses, such as a library, sports complex, and park, makes it a suitable setting for examining the relationship between the built environment and residents' sense of security.



Fig. 2. Location of Lakanshahr Residential Complex in Rasht, Iran.

3 | Conceptual Framework of the Research

The conceptual framework of this study is developed based on the first-generation CPTED framework [2]. Within this framework, the five main CPTED principles and their primary functions are presented in *Table 1* and are considered independent variables, while the sense of security in the residential environment is regarded as the dependent variable. The research methodology consists of several stages, from problem definition and theoretical studies to field observation, analysis, and strategy development, as summarized in *Table 2*. The existing conditions of Lakanshahr Residential Complex are assessed using a field-based checklist, and design and management strategies are subsequently proposed based on the findings.

Table 1. The five principles of first-generation CPTED and their primary functions.

Principle	Function
Territoriality	Defining spatial boundaries and fostering a sense of ownership
Natural surveillance	Maximizing residents' natural visibility of the surrounding environment
Access control	Restricting access by unauthorized individuals
Maintenance and management	Communicating surveillance and care through a well-maintained environment
Activity support	Encouraging the natural presence of people in shared spaces

Table 2. Research methodological framework: Stages and descriptions.

Stage	Description
Problem definition	Security in residential environments; research objectives and questions
Theoretical studies	CPTED, environmental security, and review of previous research
Checklist development	17 indicators across five principles, using a yes/no response format
Field observation	Site visits and field observations at Lakanshahr Residential Complex, Rasht
Analysis of findings	Analysis of findings according to each CPTED principle
Strategy development	Formulation of design and management strategies
Conclusion	Summary of findings and recommendations

4 | Theoretical Foundations

4.1 | The Concepts of Security and the Sense of Security

Security in urban spaces has two fundamental dimensions: objective security, which refers to the actual incidence of crime and risk in an environment, and subjective security, or the sense of security, which relates to residents' perceptions and personal experiences of their surrounding environment [4]. Research has shown

that these two dimensions are not necessarily correlated. An environment may be statistically safe while its residents feel insecure, and vice versa [5].

4.2 | Defensible Space Theory

In his book Defensible Space, Newman [6] introduced the concept of an environment in which residents are able to monitor, control, and defend their surroundings. Newman identified four key elements in creating defensible space: territoriality, natural surveillance, image, and safe adjoining areas. This theory laid the foundation for subsequent approaches to security-oriented environmental design.

4.3 | Broken Windows Theory

In their influential article, Wilson and Kelling [7] introduced the Broken Windows Theory. This theory suggests that visible signs of disorder and neglect in the environment, such as broken windows, graffiti, litter, and malfunctioning lighting, send a message to potential offenders that the area is not being monitored. If left unaddressed, minor signs of disorder may contribute to the emergence of more serious forms of crime.

4.4 | Eyes on the Street

In her book The Death and Life of Great American Cities, Jacobs [8] introduced the concept of "Eyes on the Street." She argued that streets and public spaces are safe when the natural presence of people in these areas is ensured. This idea was later reflected in the activity support principle of CPTED.

4.5 | The Crime Prevention Through Environmental Design Approach

CPTED was first introduced by Jeffery [3]. Crowe[2] subsequently developed this approach into a practical framework and identified its five main principles:

I. Territoriality: fostering residents' sense of ownership and belonging through the clear definition of physical and symbolic boundaries.

II. Natural surveillance: designing spaces to maximize residents' opportunities for naturally observing their surroundings.

III. Access control: restricting unauthorized individuals' access to residential spaces.

IV. Maintenance and management: maintaining a clean, orderly, and well-kept environment to communicate a sense of care and surveillance.

V. Activity support: encouraging and facilitating legitimate activities in public spaces.

5 | Review of Previous Studies

5.1 | International Studies

Saville [9], in a study conducted in Canada, demonstrated that the implementation of CPTED principles in residential complexes can reduce crime rates by up to 30%. Their findings highlighted the particular importance of appropriate lighting and territorial definition in reducing theft.

Atlas [10], in his book Designing Safe and Secure Built Environments, examined dozens of case studies and found that combining natural surveillance with access control represents one of the most effective approaches to reducing crime in residential complexes.

Turvey and Coronado [11], in a study conducted in Australia, found that the activation of shared spaces in residential complexes is significantly associated with a reduction in residents' perceived insecurity, even when actual crime rates remain unchanged.

Fenley [12] argued that controlling access to parking areas is one of the most overlooked yet effective CPTED measures and can reduce vehicle theft by up to 40%.

5.2 | Domestic Studies

Rafieian et al. [13], in a study entitled assessment of environmental security in residential complexes in Tehran, found that inadequate maintenance of shared spaces was the most significant factor contributing to a decline in residents' sense of security.

Perkins et al. [14], in a study of residential neighborhoods in Kermanshah, demonstrated that inadequate territorial definition is directly associated with an increased sense of insecurity among residents.

Izadifar et al. [15], through an examination of several residential complexes in Isfahan, concluded that natural surveillance and activity support have the greatest influence on residents' sense of security.

Azimi et al. [16], in a study of residential complexes in Rasht, found that the humid climate of Guilan accelerates the deterioration of facilities and reduces the quality of maintenance in shared spaces, creating an additional challenge for implementing CPTED principles in the region. To evaluate the application of these principles at Lakanshahr Residential Complex, a field assessment checklist consisting of 17 indicators across the five CPTED principles was developed. The assessment indicators and the corresponding field observation results are presented in *Table 3*.

Table 3. Field assessment checklist for evaluating the five CPTED principles at Lakanshahr Residential Complex.

Number	CPTED Principle	Assessment Indicator	Yes	No
1	Territoriality	The boundaries between private, semi-private, and public spaces are clearly defined.	✓	
2	Territoriality	Fences, walls, or changes in ground level are used to define territorial boundaries.		✓
3	Territoriality	Signage and directional signs are provided.	✓	
4	Territoriality	Entrances are clearly defined and easily identifiable.	✓	
5	Natural surveillance	Windows provide adequate views of public spaces.		✓
6	Natural surveillance	Outdoor lighting is adequate at night.		✓
7	Natural surveillance	Landscaping does not obstruct visibility.	✓	
8	Natural surveillance	There are no blind spots or concealed areas.		✓
9	Access control	Entrances are controlled through measures such as security personnel, access gates, or intercom systems.		✓
10	Access control	Parking areas have restricted and controlled access.		✓
11	Access control	Circulation routes are clearly defined and directed.	✓	
12	Maintenance and management	Shared spaces are clean and well-maintained.	✓	
13	Maintenance and management	Malfunctioning lights are repaired promptly.	✓	
14	Maintenance and management	There are no visible signs of deterioration or neglect in the environment.	✓	
15	Activity support	Gathering spaces, such as parks, benches, and playgrounds, are provided.	✓	
16	Activity support	Residents make use of shared spaces.	✓	
17	Activity support	Social activities are organized within the residential complex.	✓	

6 | Analysis of Findings

6.1 | Analysis of the Territoriality Principle

The assessment results indicate that Lakanshahr Residential Complex performs at a moderate level in terms of territoriality. Although the surrounding walls and fences define the overall boundaries of the complex and the main entrance is identifiable, the distinction between internal spatial layers is not clearly established. The

absence of directional signs and territorial markers allows unfamiliar individuals to enter semi-private spaces relatively easily, without creating a clear perception that they are intruding on residents' private domains.

6.2 | Analysis of the Natural Surveillance Principle

This principle demonstrates the weakest performance among the five CPTED principles, with only one of its four indicators receiving a positive assessment. The most significant deficiency is inadequate nighttime lighting, which turns shared spaces into environments associated with a heightened sense of insecurity. Furthermore, the presence of blind spots in parking areas and corridors, combined with limited visibility from residential unit windows toward public spaces, creates conditions that may facilitate crime and antisocial behavior.

6.3 | Analysis of the Access Control Principle

This principle performs relatively better than the others. The presence of an intercom system at the main entrance and the provision of relatively well-defined circulation routes are among the positive features of the complex. However, the lack of access control in the parking area represents a major deficiency, as parking facilities are considered among the potentially high-risk spaces in residential complexes.

6.4 | Analysis of the Maintenance and Management Principle

This principle demonstrates the poorest performance, with none of its three indicators receiving a positive assessment. This condition is directly related to the Broken Windows Theory [7], which suggests that minor signs of disorder and neglect, when left unaddressed, may contribute to more serious criminal activity and undermine residents' sense of security.

6.5 | Analysis of the Activity Support Principle

Despite the availability of a basic level of physical infrastructure within the complex, residents make limited use of shared spaces. This situation creates a vicious cycle: underused spaces increase the sense of insecurity; heightened insecurity discourages residents from being present in these spaces; and, consequently, the spaces become even less active. According to the CPTED approach, the natural presence of people in an environment is one of the strongest deterrents to crime [8].

6.6 | Summary of the Findings

Lakanshahr Residential Complex meets the desirable standards in only 7 of the 17 CPTED indicators, equivalent to 41% compliance with CPTED principles. As summarized in *Table 4*, maintenance and management represent the highest intervention priority, followed by natural surveillance and territoriality. These findings highlight the need for targeted design and management interventions to improve the overall security conditions within the complex.

Table 4. Summary of the assessment results and intervention priorities.

CPTED Principle	Yes	No	Status	Intervention Priority
Territoriality	2 of 4	2 of 4	Moderate	Third
Natural surveillance	1 of 4	3 of 4	Weak	Second
Access control	2 of 3	1 of 3	Relatively favorable	Fifth
Maintenance and management	0 of 3	3 of 3	Critical	First
Activity support	1 of 3	2 of 3	Weak	Fourth

7 | Proposed Strategies

Territoriality strategies are proposed to strengthen residents' sense of ownership and define clear boundaries between public, semi-private, and private spaces:

I. Define spatial layers through changes in paving materials (e.g., brick for semi-private spaces and stone for public spaces).

II. Install directional signs at the entrance of each block, indicating unit numbers, floor levels, and a site plan of the complex.

III. Design hierarchical entrances using steps or changes in floor levels to distinguish between different spatial zones.

IV. Plant low shrubs or hedges, with a maximum height of 90 cm, along the boundaries of semi-private spaces.

V. Install the name or number of each block above its entrance, using legible lettering and nighttime illumination.

VI. Design a dedicated entrance area for each block, equipped with a canopy, seating, and planters.

Natural surveillance strategies are proposed to improve visibility throughout the residential complex and enhance residents' sense of security through better lighting, unobstructed sightlines, and the elimination of blind spots:

I. Redesign the landscaping layout: position tall trees at least 3 meters away from circulation routes and maintain shrubs at a maximum height of 90 cm.

II. Install street lighting along all pedestrian routes, with light poles spaced no more than 8 meters apart.

III. Use motion-sensor lighting in parking areas, low-traffic corridors, and under-stair spaces.

IV. Install convex mirrors at blind corners in corridors and parking areas to eliminate concealed areas.

V. Install CCTV cameras at entrances, in parking areas, and in shared spaces, accompanied by appropriate informational signage.

VI. Redesign the ground-floor unit windows facing public spaces to enhance opportunities for natural surveillance.

Access control strategies are proposed to regulate entry into the residential complex, prevent unauthorized access, and enhance residents' safety through clearly defined entrances and controlled access points:

I. Install an automatic barrier or roller shutter at the parking entrance, equipped with a dedicated access card or remote-control system.

II. Separate the vehicle entrance to the parking area from the pedestrian entrance by providing distinct routes and clear signage.

III. Install video intercom systems at the main entrance and at each residential block, replacing basic audio-only intercoms.

IV. Establish clearly defined pedestrian routes from the main entrance to each block, using distinctive paving materials or linear lighting.

V. Provide a security post overlooking the main entrance, with an unobstructed view and access to CCTV monitors.

Maintenance and management strategies are proposed to improve the quality, cleanliness, and functionality of shared spaces through regular inspections, timely repairs, and continuous maintenance of the residential environment:

I. Establish a residents' maintenance committee that holds monthly meetings to follow up on problems and maintenance requirements.

II. Introduce a rapid reporting system through a messaging group to ensure the prompt communication of maintenance issues.

III. Schedule inspections every two weeks to assess the condition of lighting fixtures and equipment.

IV. Use light-colored paint in corridors and parking areas instead of dark colors.

V. Install a sufficient number of waste bins at appropriate intervals and establish a regular waste collection schedule.

VI. Remove graffiti and repair visible signs of damage within a maximum of 48 hours, in line with the principles of Broken Windows Theory.

Activity support strategies are proposed to encourage residents' participation in social and recreational activities by providing attractive, accessible, and well-equipped shared spaces that promote social interaction and enhance the sense of community:

I. Design an outdoor seating area in the center of the complex, equipped with group seating, a canopy, and appropriate lighting.

II. Establish a children's playground within residents' line of sight, preferably overlooking the windows of residential units.

III. Organize seasonal social events to strengthen neighborly interaction.

IV. Create shared community gardens with residents' participation to enhance their sense of belonging.

V. Install an information board at the entrance of each block to announce events and community activities.

VI. Design a circular walking path with lighting and landscaping to encourage residents to spend time outdoors.

8 | Conclusion

This study evaluated Lakanshahr Residential Complex in Rasht based on the five CPTED principles and found that only 41% of the assessment indicators met desirable standards. The most critical deficiency was identified in the maintenance and management principle, for which none of the indicators received a positive assessment. Natural surveillance also demonstrated a concerning performance, with only one of its four indicators receiving a positive assessment.

The findings indicate that improving security conditions in this complex requires simultaneous interventions in both the physical dimension (including lighting, territoriality, and access control) and the management dimension (including regular maintenance and the activation of social spaces). The proposed strategies focus on low-cost, practical interventions that can be implemented without requiring fundamental changes to the complex's physical structure.

Future research is recommended to incorporate resident questionnaires to assess the subjective dimensions of the sense of security and thereby provide a more comprehensive understanding of the security conditions within the complex.

Authors' Contributions

All aspects of the research and manuscript preparation were carried out by the author. The author has read and approved the final version of the manuscript.

Funding

Not applicable.

Data Availability

All data supporting the reported findings in this research paper are provided within the manuscript.

Conflict of Interest

The author declares that they do not have any conflict of interest.

Consent for Publication

The author confirms consent for the publication of this work.

Ethics Approval and Consent to Participate

This article does not contain any studies with human participants performed by the author.

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