Formulating Basic Spatial Design Standards For Vertical Rental Housing For Industrial Workers In Karawang Regency

Rizky Gilang Fadillah[1], Endah Tisnawati[2*], Hestin Mulyandari[3]

[1,2,3]Architecture Study Program, Faculty of Science and Technology, University of Technology Yogyakarta, Yogyakarta 55164., Indonesia
[*] Corresponding author:
Email: endah.tisnawati@uty.ac.id

Abstract.
Karawang Regency is one of Indonesia's major industrial growth areas, attracting a large number of workers who require decent, affordable, and accessible housing near workplaces. However, the provision of simple vertical rental housing for industrial workers cannot be formulated only through minimum technical building standards, because workers have diverse residential status, household composition, economic capacity, work patterns, and daily mobility. This study aims to formulate the spatial and facility requirements of simple rental vertical rental housing for industrial workers in Karawang based on user characteristics and residential behavior. The study applies a descriptive-qualitative approach based on architectural design inquiry. Data were collected through literature review, site observation, precedent studies, regulatory review, and analysis of user activities. The analysis traces the relationship between worker characteristics, housing needs, daily activities, spatial requirements, space types, spatial character, and basic design principles. The findings show that industrial workers should be understood as heterogeneous users, including single workers, partnered workers, and small-family workers, each with different privacy needs, activity patterns, and facility demands. The required spaces include private dwelling units, service areas, transitional spaces, communal areas, and supporting facilities such as motorcycle parking, laundry areas, drying spaces, small shops or cooperatives, prayer rooms, management offices, security posts, open spaces, and health facilities. The study concludes that basic design standards for workers' vertical rental housing should emphasize affordability, spatial efficiency, privacy, resting comfort, daylighting, natural ventilation, safety, ease of maintenance, workplace accessibility, and social spaces that do not disturb private areas.
Keywords: *Vertical Rental Housing, Industrial Workers, Spatial Design Standards, User Characteristics and Residential Behavior.*

I. INTRODUCTION

Karawang Regency is one of Indonesia's industrial growth centers located along the Jakarta–Cikampek corridor. The expansion of large-scale industrial estates has transformed the spatial structure from an agrarian character into an economically active industrial area, increasing the demand for workers' housing. Karawang Regency has become one of Indonesia's leading industrial regions, accommodating numerous manufacturing, automotive, logistics, and chemical industries. The rapid industrial expansion has attracted a large productive-age migrant workforce, creating increasing demand for affordable, accessible, and workplace-oriented housing. Consequently, vertical rental housing has emerged as a strategic housing alternative for industrial workers [1], [2], [3], [4], [5], [6]. This need becomes urgent because horizontal

housing is considered less efficient due to limited land and rising land values. Based on the architectural programming developed in this study, the proposed design accommodates 104 residential units for approximately 341 occupants. Rental affordability was determined based on the 2025 minimum wage of Karawang Regency (IDR 5,886,853) [7] and the widely accepted housing affordability criterion, which recommends that housing expenditure should not exceed approximately 30% of household income [8], [9]. Accordingly, the maximum affordable monthly rent was estimated at IDR 1,962,284. Field observations conducted at Adiarsa Vertical Rental Housing indicate that the existing housing is characterized by limited supporting facilities, deteriorating physical conditions in several building components, and a negative public perception despite its relatively affordable rental price. This condition is consistent with affordable housing studies that emphasize affordability, location, user needs, and environmental quality [10], [2], [3].

The literature shows that studies on simple vertical rental housing for industrial workers are situated within broader discussions of affordable housing, vertical rental housing, residential satisfaction, and user-based design. Affordable housing studies no longer focus only on cost, but also on design criteria, housing choice, environmental quality, spatial health, and sustainability [10], [11], [3]. Vertical rental housing should also be understood as a living environment rather than merely a collection of units, since its quality is shaped by daylighting, ventilation, comfort, the relationship between private and shared spaces, and communal facilities [12], [13], [14], [15], [16], [11]. In worker housing studies, previous research has emphasized workplace proximity, cost efficiency, shared spaces, and natural lighting [22], [5], [6].

However, there remains a research gap in explaining how the characteristics of industrial workers influence the spatial and facility requirements of simple vertical rental housing. Many studies still treat vertical rental housing as physical objects or design products, while work patterns, household status, economic capacity, resting needs, social behavior, and living habits have not been sufficiently translated into spatial parameters [12], [16]. Housing quality is also influenced by residents' choices, residential satisfaction, indoor environmental quality, climate-responsive design, and social relationships in vertical rental housing [17], [18], [14], [15], [19]. Therefore, this study uses research parameters consisting of user characteristics, housing needs, residential behavior, supporting facilities, spatial quality, and the industrial context of Karawang.

Based on this background, the research question is how the characteristics, needs, and behavior of industrial workers influence the spatial and facility requirements of simple rental housing in Karawang Regency. This question aims to understand user typologies, activity patterns, privacy needs, communal space needs, and supporting facilities that are most relevant to industrial workers. The objective of this study is to formulate space types, spatial character, spatial relationships, and basic facilities for simple rental housing that better respond to the living patterns of industrial

workers in Karawang. This objective is aligned with user-based housing design, which emphasizes the relationship between architects, end-users, design criteria, and residents' preferences [20], [3], [11].

This research is important because the standard of simple rental housing cannot be understood only through minimum dimensions, unit numbers, and technical building requirements. It should also be examined through the way residents use space in daily life, particularly industrial workers with specific work rhythms, resting periods, mobility patterns, and social needs. Therefore, the findings are expected to provide design directions that are more responsive, affordable, easy to maintain, safe, healthy, and supportive of the quality of life of industrial workers as the main residents of simple rental housing. These directions should also consider quality of life in high-rise housing, residential satisfaction, sustainability, and lessons from local or vernacular contexts as part of a more contextual design approach [21], [4], [11], [10].

II. METHODS

This study applies a descriptive-qualitative approach based on architectural design inquiry. This approach is used because the study does not aim to test statistical relationships, but to interpret the relationship between industrial workers' characteristics, housing needs, residential behavior, and their implications for the basic design standards of simple rental housing. The study is located in Karawang Regency, with simple rental housing for industrial workers as the main object of inquiry. This approach is consistent with affordable housing studies that emphasize design criteria, user choice, residential satisfaction, and environmental quality in formulating spatial needs [3], [2], [14], [15]. The design process integrates site characteristics, user requirements, and the socio-spatial context of industrial workers in Karawang Regency to develop a responsive design framework for vertical rental housing.

Data are collected through literature review, site observation, precedent studies of workers' housing, regulatory review, and, where possible, interviews or questionnaires with industrial workers. The literature review is used to understand affordable housing, vertical rental housing quality, communal facilities, spatial health, and user-based design. Site observation examines accessibility, orientation, noise, wind direction, daylighting, and the relationship between the site and industrial areas [12]. Precedent studies are used to compare spatial patterns, facilities, and the character of workers' housing, while regulatory data ensures that the proposed standards remain aligned with simple rental flat requirements. This method is supported by studies on rental housing quality, worker housing, social space, and interactions between architects and end-users [13], [22], [19], [20]. Table 1 summarizes the analytical variables used to formulate the basic spatial design standards for Vertical Rental Housing based on user characteristics, residential behavior, and spatial requirements.

Table 1. Research Variables and Analytical Indicators

Research Variable	Indicators	Data Source	Expected Output
User Characteristics	Marital status, household composition, current housing, economic condition, transportation mode	Questionnaire, literature review	User typology
Residential Behavior	Resting, sleeping, cooking, washing, drying clothes, receiving guests, praying, social interaction	Questionnaire, observation	Activity patterns
Housing Needs	Space demand, supporting facilities, privacy, accessibility	Questionnaire, precedent studies	Spatial requirements
Spatial Characteristics	Private, service, transitional, communal, public spaces	Design analysis	Spatial character
Spatial Relationships	Adjacency, circulation, zoning hierarchy	Design analysis	Spatial organization
Basic Design Standards	Affordability, spatial efficiency, privacy, daylighting, ventilation, safety, accessibility, communal facilities	Synthesis of analysis	User-based basic spatial design standards
Research Variable	Indicators	Data Source	Expected Output

Source: Authors' questionnaire survey, 2026.

The analysis traces the relationship between user characteristics, housing needs and behavior, daily activities, spatial requirements, space types, spatial character, and basic design principles. User characteristics include household status, work patterns, economic capacity, transportation mode, and privacy needs. Residential behavior is examined through resting, simple cooking, washing, drying clothes, storing work-related items, social interaction, and the use of shared facilities [16]. The analytical output is then translated into space types, spatial character, spatial relationships, and supporting facilities for simple vertical rental housing. Suggested supporting figures or tables include an analytical framework diagram, a table of research variables and indicators, a data source table, and a matrix linking worker characteristics, activities, spatial needs, and design implications.

III. RESULT AND DISCUSSION

3.1. Characteristics of Industrial Workers as the Basis for Housing Requirements

The characteristics of industrial workers in Karawang Regency indicate that housing requirements are strongly influenced by socioeconomic conditions, household composition, and current residential status. The questionnaire survey involving 139 respondents revealed that 65.5% currently live in rented houses, while 21.6% already own their homes. Respondents living in boarding houses account for 10.1%, whereas 2.2% still live with their parents and only 0.7% occupy housing through mortgage schemes. These findings indicate that rental housing remains the dominant residential option for industrial workers because it offers flexibility, affordability, and proximity

to industrial estates. Regarding family status, 69.1% of respondents are married, 17.3% are single, 8.6% are married with children, 2.9% are married without children, and 2.2% have families with more than two children. These findings demonstrate that prospective residents of rental housing cannot be considered a homogeneous group because each user category has different spatial and residential requirements. Single workers generally prefer compact and efficient dwelling units, whereas married workers require greater privacy, larger storage capacity, and more comprehensive domestic facilities. This finding supports previous studies indicating that socioeconomic characteristics, household composition, affordability, and housing preferences are closely interrelated in determining residential choice [2], [3], [11]. Table 2 presents the demographic and residential characteristics of industrial workers who participated in the questionnaire survey. These characteristics provide the basis for identifying user typologies and their implications for the spatial requirements of Vertical Rental Housing.

Table 2. Characteristics of Industrial Worker Respondents

Variable	Category	Number of Respondents (n)	Percentage (%)
Current Housing Status	Rental house	91	65.5
	Owner-occupied house	30	21.6
	Boarding house	14	10.1
	Parents' house	3	2.2
	Mortgage house	1	0.7
Marital Status	Single	24	17.3
	Married	96	69.1
	Married without children	4	2.9
	Married with children	12	8.6
	Married with more than two children	3	2.2

Source: Authors' questionnaire survey, 2026.

These user characteristics provide an essential basis for formulating the basic spatial standards of rental housing for industrial workers. The dominance of respondents currently living in rented housing indicates that rental accommodation remains the most feasible residential option because it provides affordable costs and convenient access to workplaces. At the same time, the high proportion of married respondents suggests that rental housing design should not be limited to studio units for single workers but should also accommodate couples and small families through diverse dwelling typologies, appropriate spatial capacity, and supporting facilities. Based on these findings, prospective residents can be classified into three primary user groups consisting of single workers, married couples without children, and small families. Each group requires different spatial arrangements for bedrooms, service areas, storage spaces, communal facilities, parking areas, children's play spaces, places of worship, and social interaction areas. Therefore, the questionnaire findings demonstrate that the formulation of basic spatial standards for rental housing should be derived from user characteristics as the principal determinant in defining dwelling unit

types, spatial relationships, and supporting facilities capable of improving residential quality and user satisfaction. These findings are consistent with previous studies emphasizing that residential satisfaction is largely determined by the compatibility between residents' characteristics, spatial quality, and supporting facilities [14], [15], [5], [6].

3.2. Activity Patterns and Residential Behavior of Industrial Workers

The activity patterns of industrial workers demonstrate that simple rental housing serves not only as a place to live but also as a space for physical recovery, domestic activities, and social interaction. The spatial programming analysis identified six principal user groups within the Vertical Rental Housing environment, comprising single workers, married workers, workers with children, building management staff, security personnel, and visitors. The interaction among these user groups generates different spatial demands and activity patterns, indicating that residential behavior is influenced by household composition, family characteristics, and the functional roles of users within the housing environment. This classification indicates that residential behavior is influenced by household status, family composition, and the specific roles of each user group within the residential environment. Daily activities include commuting to and from work, resting, sleeping, simple cooking, washing clothes, drying laundry, storing personal belongings, receiving visitors, praying, and interacting with other residents. Since many industrial workers are employed under rotating shift systems, domestic activities frequently occur outside conventional daytime schedules. Consequently, residential units are expected to provide quiet and comfortable private spaces with adequate natural lighting and ventilation to support rest and physical recovery after work. The quality of rental housing is determined not only by spatial dimensions but also by the capacity of the built environment to promote physical and psychological well-being through appropriate daylighting, ventilation, and environmental comfort [12], [13] .

The residential behavior of industrial workers further indicates that domestic activities involve an integrated use of private, service, and communal spaces rather than isolated spatial functions. Cooking, washing, drying clothes, storing household items, and receiving guests require efficient spatial organization so that these activities do not interfere with the primary function of the dwelling as a place for rest. At the same time, communal facilities remain essential for encouraging social interaction while maintaining the privacy of individual dwelling units. Therefore, the spatial requirements of rental housing for industrial workers should not be determined solely by minimum floor area standards but should also reflect the way residents occupy and utilize space in their everyday lives. Residential satisfaction is strongly influenced by environmental quality, spatial comfort, and the availability of shared facilities, while the compatibility between residents' needs and housing characteristics constitutes a key determinant of housing satisfaction [14]–[16]. Furthermore, the quality of the built environment is closely associated with residents' subjective well-being [11].

Consequently, the residential behavior of industrial workers provides an essential foundation for formulating spatial requirements, spatial relationships, and supporting facilities capable of accommodating domestic routines, social interaction, and physical recovery within rental housing.

3.3. Spatial Requirements and Supporting Facilities for Simple Rental Housing

The spatial and facility requirements of simple rental housing for industrial workers should be formulated through the relationship between daily activities and the supporting facilities needed in vertical rental housing. The spatial analysis classifies residential spaces into private, semi-private, public, and service areas, including bedrooms, living or main rooms, kitchens, toilets, and corridors, while the wider housing environment includes commercial facilities, health services, management areas, utilities, security, and shared spaces [16]. This indicates that workers' housing should not be limited to dwelling units, but should also provide accessible facilities that respond to workers' daily routines. Affordable housing studies show that design criteria and housing choice are influenced by affordability, location, access to facilities, and suitability to residents' needs [3], [2]. In the context of industrial workers, minimum spatial requirements should include private residential spaces for rest, service areas for domestic activities, transitional spaces such as corridors and balconies, and communal spaces for social interaction. Supporting facilities such as motorcycle parking, laundry areas, drying areas, small shops or cooperatives, prayer rooms, management offices, security posts, open spaces, and health facilities are important because workers require practical daily services within the housing area. This argument is supported by studies emphasizing that housing quality, health, comfort, shared facilities, and residential satisfaction are essential factors in vertical rental housing [13], [14], [15], [16]. Worker housing studies also highlight the importance of shared spaces, daylighting, and user-oriented design in supporting daily life and social interaction [12], [16], [22], [19], [20].

These findings demonstrate that rental housing for industrial workers should not be designed solely according to minimum dwelling size standards but should also reflect the relationship between residents' daily activities and the provision of supporting facilities. Previous studies on affordable housing indicate that housing preferences are strongly influenced by affordability, location, accessibility to facilities, and compatibility between housing design and residents' needs [3], [2]. Residential quality is closely associated with environmental comfort and healthy living conditions [13], while the residential satisfaction increases when shared facilities effectively support everyday activities [14]-[16]. Consequently, the primary facilities of rental housing for industrial workers should prioritize comfortable private spaces for rest, efficient service areas, communal spaces that encourage social interaction, and easily accessible supporting facilities. Such an approach produces a residential environment that is more responsive to the needs of industrial workers while improving the overall functionality and management efficiency of the housing complex. Table 4 summarizes

the classification of spatial requirements and supporting facilities required to accommodate the daily activities of industrial workers in Vertical Rental Housing.

Table 4. Classification of Spatial Requirements and Facilities for Rental Housing for Industrial Workers

Space Category	Space/Facility	Primary Functions	Priority
Private Spaces	Bedroom, multifunctional living area, kitchenette, bathroom	Bedroom, multifunctional living area, kitchenette, bathroom	Primary
Service Spaces	Laundry area, drying area, waste collection area, utility room	Supporting household activities	
Transitional Spaces	Corridors, balconies, staircases, elevators	Circulation and spatial connectivity	
Communal Spaces	Shared room, open space, landscaped garden	Social interaction among residents	
Operational Facilities	Management office, security post, utility room	Building management and site security	
Supporting Facilities	Motorcycle parking, convenience store/cooperative, prayer room	Supporting residents' daily needs	
Optional Supporting Facilities	Community health clinic, satellite public health center, ATM, parcel delivery service	Additional services that may be provided within the housing complex or accessed from surrounding neighborhood facilities	Opsional

Source: Authors' analysis, 2026.

3.4. Spatial Character, Spatial Relationships, and User-Based Zoning

The design analysis indicates that the spatial character of Rental Housing for industrial workers should be established based on user characteristics, activity patterns, and residential behavior identified in the previous stages of the study. Spatial requirements are determined not only by the minimum floor area of each dwelling unit but also by the quality of space in supporting residents' everyday activities. Industrial workers employed under rotating shift systems require private spaces that provide acoustic comfort, thermal comfort, adequate natural lighting, and effective cross-ventilation to support rest and physical recovery at different times of the day. In contrast, social interaction, visitor reception, and shared activities should be accommodated within communal spaces to preserve the privacy and comfort of individual dwelling units. The design analysis further demonstrates that service spaces, including laundry areas, drying facilities, storage spaces, and waste management areas, should be located in easily accessible zones without interfering with the primary living spaces. Consequently, the spatial character of Rental Housing should be defined not only by functional requirements but also by levels of privacy, intensity of use, and the relationships between users' daily activities. These findings are consistent with previous studies indicating that residential quality is strongly influenced by spatial organization, privacy gradients, and the relationship between private and shared spaces

[13], [21], [19]. Table 5 presents the relationship between user groups, residential characteristics, priority spaces, supporting facilities, and their implications for the spatial design of Vertical Rental Housing.

Table 5. User-Based Spatial Design Criteria for Rental Housing for Industrial Workers

Space Category	Space/Facility	Primary Functions	Priority
Private Spaces	Bedroom, multifunctional living area, kitchenette, bathroom	Bedroom, multifunctional living area, kitchenette, bathroom	Primary
Service Spaces	Laundry area, drying area, waste collection area, utility room	Supporting household activities	
Transitional Spaces	Corridors, balconies, staircases, elevators	Circulation and spatial connectivity	
Communal Spaces	Shared room, open space, landscaped garden	Social interaction among residents	
Operational Facilities	Management office, security post, utility room	Building management and site security	
Supporting Facilities	Motorcycle parking, convenience store/cooperative, prayer room	Supporting residents' daily needs	
Optional Supporting Facilities	Community health clinic, satellite public health center, ATM, parcel delivery service	Additional services that may be provided within the housing complex or accessed from surrounding neighborhood facilities	Opsional

Source: Authors' analysis, 2026.

Spatial relationships subsequently become the basis for developing building and site zoning. The design analysis identifies four principal spatial zones consisting of private, semi-private, semi-public, and public areas. The private zone comprises dwelling units, bedrooms, and bathrooms, representing the highest level of privacy. Semi-private zones include corridors, balconies, and transitional spaces that connect residential units with communal facilities.

Semi-public zones consist of shared lounges, prayer rooms, landscaped open spaces, seating areas, and social interaction spaces intended exclusively for residents. Meanwhile, public zones include motorcycle parking, management offices, security posts, entrance areas, and supporting facilities that may also be accessed by visitors. This zoning hierarchy establishes clear spatial transitions that reduce conflicts between activities, improve circulation efficiency, and maintain an appropriate balance between privacy and social interaction. User-centered housing design should translate residents' needs into coherent spatial relationships, whereas well-organized spatial relationships and a high-quality built environment significantly enhance residential comfort and subjective well-being [11], [20]. Therefore, the spatial relationships and zoning strategy of Rental Housing should be formulated based on user characteristics to establish adaptive and user-oriented basic design standards for industrial workers' housing. Table 6 synthesizes the proposed user-based basic spatial design standards

derived from the relationships between user characteristics, residential behavior, spatial requirements, and design implications.

Table 6. User-Based Spatial Design Criteria for Rental Housing for Industrial

User Group	Residential Characteristics	Priority Spaces	Required Supporting Facilities	Design Implications
Single workers	High mobility, shift work, temporary residence	Compact private unit, sleeping area	Motorcycle parking, laundry, communal kitchen, convenience store	Compact layout, efficient circulation, adequate privacy
Married couples	Shared domestic activities	Bedroom, living area, kitchenette	Prayer room, communal space, laundry	Greater privacy and flexible domestic space
Small families	Family-oriented daily activities	Additional bedroom, living area, storage	Children's play area, open space, parking, neighborhood retail	Larger unit modules and family-oriented communal facilities

Source: Authors' synthesis, 2026.

3.5. Synthesis of Basic Design Standards for Rental Housing for Industrial Workers

The synthesis of the research findings demonstrates that the basic design standards for Rental Housing for industrial workers should be formulated through a user-oriented approach rather than relying solely on technical building standards. The relationships among industrial workers' characteristics, activity patterns, residential behavior, spatial requirements, spatial characteristics, and zoning organization establish an integrated design system. The design analysis reveals that industrial workers are characterized by high daily mobility, shift-based working schedules, and the need for affordable housing with convenient access to industrial areas. These conditions require comfortable private spaces that support physical recovery, efficient service spaces for domestic activities, communal spaces that encourage social interaction without compromising privacy, and transitional spaces that strengthen spatial connectivity throughout the residential environment. Consequently, basic design standards should no longer be interpreted merely as compliance with minimum dimensional requirements but rather as the integration of spatial quality, spatial organization, and the suitability of spaces for residents' daily activities. This finding supports previous studies suggesting that Rental Housing design should simultaneously address affordability, built environment quality, and the relationship between spatial organization and user behavior [3], [13], [20].

Based on this synthesis, the study proposes that the basic design standards for rental housing for industrial workers should be established through nine fundamental principles, namely rental affordability, spatial efficiency, comfortable private living spaces, spatial flexibility, adequate natural lighting and ventilation, safety and security, ease of building maintenance, accessibility to industrial workplaces, and the provision of communal facilities that support balanced social interaction. These principles represent the integration of user characteristics and spatial requirements, resulting in a

design framework that is more adaptive than conventional approaches focused primarily on physical building dimensions. Accordingly, the principal contribution of this research is the formulation of user-based basic spatial design standards that position residents' needs as the primary basis for spatial programming, spatial relationships, facility provision, and the overall planning of Rental Housing for industrial workers. This framework is expected to serve as a conceptual reference for architects, housing developers, and government agencies in developing more responsive and sustainable rental housing within emerging industrial regions. Table 6 synthesizes the proposed user-based basic spatial design standards derived from the relationships between user characteristics, residential behavior, spatial requirements, and design implications.

Table 6. User-Based Basic Design Standards for Rental Housing for Industrial Workers

Design Principle	User-Based Consideration	Design Implication
Rental affordability	Limited household income	Affordable rental cost and efficient building management
Spatial efficiency	Compact daily activities	Functional and efficient room layout
Private space quality	Shift work and resting needs	Quiet, comfortable, and private dwelling units
Spatial flexibility	Diverse household composition	Adaptable multi-functional living spaces
Natural lighting and ventilation	Indoor environmental comfort	Optimized daylight and cross ventilation
Safety and security	High residential mobility	Controlled access and continuous surveillance
Ease of maintenance	Long-term building performance	Durable materials and efficient utility systems
Accessibility	Daily commuting to industrial estates	Strategic location with convenient transportation access
Communal facilities	Social interaction and community support	Shared spaces that strengthen community while preserving privacy

Source: Authors' synthesis, 2026.

IV. CONCLUSION

This study shows that the spatial and facility requirements of simple rental housing for industrial workers in Karawang Regency cannot be formulated only through minimum technical building standards. The characteristics of industrial workers as primary users, including residential status, marital status, household size, economic capacity, work patterns, and daily mobility, directly influence space types, spatial character, spatial relationships, and supporting facilities. Therefore, industrial workers should be understood as a diverse group of residents rather than a homogeneous user category.

The activity patterns of industrial workers indicate that housing functions not only as a place to sleep but also as a space for rest, physical recovery, domestic

routines, social interaction, and work-related mobility support. Activities such as commuting, sleeping, simple cooking, washing, drying clothes, storing belongings, receiving guests, praying, and socializing require private spaces, service areas, transitional spaces, communal spaces, and supporting facilities that are effectively connected.

The synthesis of this study produces basic design directions for simple rental housing that emphasize affordability, spatial efficiency, privacy, resting comfort, daylighting, natural ventilation, safety, ease of maintenance, workplace accessibility, and social spaces that do not disturb private areas. These findings confirm that the standards for industrial workers' rental housing should be understood from the perspective of users and residential behavior, so that the resulting design becomes more responsive to the living needs of industrial workers in Karawang's industrial context.

REFERENCES

[1] Badan Pusat Statistik Kabupaten Karawang, Kabupaten Karawang dalam Angka 2025. Karawang: BPS Kabupaten Karawang, 2025.

[2] A. Olanrewaju and S. Y. Tan, "An exploration into design criteria for affordable housing in Malaysia," ***Journal of Engineering, Design and Technology***, vol. 16, no. 3, pp. 360–384, 2018, doi: 10.1108/JEDT-12-2017-0125.

[3] A. Olanrewaju and T. C. Woon, "An exploration of determinants of affordable housing choice," ***International Journal of Housing Markets and Analysis***, vol. 10, no. 5, pp. 703–723, 2017, doi: 10.1108/IJHMA-11-2016-0074.

[4] T. N. Dinh and N. P. Phuong, "Social housing development: A case study in Bac Ninh Province, Vietnam," Housing, Care and Support, vol. 27, no. 1, pp. 17–33, 2024, doi: 10.1108/HCS-05-2023-0010.

[5] F. N. Adnan, "Rumah susun sewa pekerja industri di Kabupaten Sidoarjo," Jurnal Poster Pirata Syandana, vol. 4, no. 2, 2023 [Online]. Available: https://ejournal2.undip.ac.id/index.php/jpps/article/view/18649.

[6] Z. Mubarok, "Rusunawa pekerja industri di kawasan industri Terboyo Semarang dengan pendekatan arsitektur ekologia," ***Jurnal Poster Pirata Syandana***, vol. 6, no. 2, 2025 [Online]. Available: https://ejournal2.undip.ac.id/index.php/jpps/article/view/27266.

[7] Pemerintah Provinsi Jawa Barat, Keputusan Gubernur Jawa Barat tentang Upah Minimum Kabupaten/Kota di Jawa Barat Tahun 2025, Bandung: Pemprov Jabar, 2024.

[8] M. E. Stone, "What is housing affordability? The case for the residual income approach," Housing Policy Debate, vol. 17, no. 1, pp. 151–184, 2006, doi: 10.1080/10511482.2006.9521564.

[9] United Nations Human Settlements Programme UN-Habitat. (2003). The challenge of slums: Global report on human settlements 2003. Earthscan Publications. https://unhabitat.org/sites/default/files/download-manager-files/The%20Challenge%20of%20Slums%20-%20Global%20Report%20on%20Human%20Settlements%202003.pdf .

[10] A. Afshar, W. Alaghbari, E. Salleh, and A. Salim, "Affordable housing design with application of vernacular architecture in Kish Island, Iran," ***International Journal of Housing Markets and Analysis***, vol. 5, no. 1, pp. 89–107, 2012, doi: 10.1108/17538271211206680.

[11] P. N. Ghumare, K. A. Chauhan, and S. M. Yadav, "Exploring preferences for affordable housing criteria importance among EWS in India," ***International Journal of Housing Markets and Analysis***, vol. 14, no. 4, pp. 759–778, 2021, doi: 10.1108/IJHMA-06-2020-0073.

[12] E. Setyowati, E. Tisnawati, and Zamrudin, "Energy saving strategy for sustainable vertical housing design," in Universitas Ahmad Dahlan Public Health Conference (UPHEC) Proceedings, vol. 1, 2025, pp. 125–134.

[13] T. Peters and A. Halleran, "How our homes impact our health: Using a COVID-19 informed approach to examine urban apartment housing," Archnet-IJAR: ***International Journal of Architectural Research***, vol. 15, no. 1, pp. 10–27, 2021, doi: 10.1108/ARCH-08-2020-0159.

[14] P. Kumar, P. Kumar, R. K. Garg, and R. Garg, "Urban housing: A study on housing environment, residents' satisfaction and happiness," Open House International, vol. 46, no. 4, pp. 528–547, 2021, doi: 10.1108/OHI-12-2020-0179.

[15] F. Ahmadi, "Residential satisfaction with affordable housing in northern Iran," Open House International, vol. 49, no. 1, pp. 144–162, 2024, doi: 10.1108/OHI-09-2022-0226.

[16] E. Tisnawati, S. Suparno, and A. U. N. R. Ellyanando, "Sustainable vertical housing based on social and cultural activities," ***International Journal of Engineering Technology and Natural Sciences***, vol. 6, no. 1, 2024, doi: 10.46923/ijets.v6i1.348.

[17] H. H. Ali and S. N. Alzu'bi, "Design optimization of sustainable affordable housing model in hot-arid climate: Case of Jordan," ***International Journal of Housing Markets and Analysis***, vol. 10, no. 5, pp. 607–627, 2017, doi: 10.1108/IJHMA-01-2017-0009.

[18] H. Ali, A. Abed, and A. Rababah, "The impact of building regulations on indoor environmental quality: The case of detached houses in Jordan," Archnet-IJAR: *International Journal of Architectural Research*, vol. 18, no. 1, pp. 102–120, 2024, doi: 10.1108/ARCH-11-2022-0260.

[19] N. B. Bican, "Spatial design in recent housing developments in Copenhagen: A perspective of social mix and mixing," Open House International, vol. 48, no. 4, pp. 729–748, 2023, doi: 10.1108/OHI-04-2022-0112.

[20] A. Mertens, Y. Hamarat, and C. Elsen, "Interactions between architects and end-users during housing design processes: A systematic literature review," Archnet-IJAR: International Journal of Architectural Research, vol. 17, no. 4, pp. 703–724, 2023, doi: 10.1108/ARCH-03-2022-0079.

[21] L. T. H. Na, J. Park, Y. Jeon, and S. Jung, "Analysis of vernacular houses in southern Vietnam, and potential applications of the learned lessons to contemporary urban street houses," Open House International, vol. 47, no. 3, pp. 533–548, 2022, doi: 10.1108/OHI-12-2021-0276.

[22] W. Sheta, M. El Hussainy, and S. Abdelwahab, "Labor camps in Dubai: Implications of courtyard regulations on daylight performance," Open House International, vol. 50, no. 1, pp. 2–19, 2025, doi: 10.1108/OHI-11-2023-0265.