Overview of High Rise Development in Surabaya City in Several Periods of Years

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Submission date: 03-May-2025 11:54PM (UTC+0700)
Submission ID: 2568779707
File name: evelopment_in_Surabaya_City_in_Several_Periods_of_Years.docx.pdf (3.22M)
Word count: 6186
Character count: 34227

Overview of High Rise Development in Surabaya City in Several Periods of Years

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Abstract

Surabaya as a metropolitan city, in this era is facing high business activities, economy, education, entertainment and residential needs. The presence of high rise supported by construction technology such as materials or structures, is a solution and opportunity for architecture to answer problems in urban areas by creating buildings that are comfortable and safe for residents and the environment. Starting with the establishment of Wisma BII in 1992 as the first high rise milestone, Surabaya continues to experience rapid development in high rise development. In this research there are 83 high rise buildings in Surabaya that will be analyzed by comparing the main parameters such as function, form, and material. It was found that most of the high rises developed into a mixed use with a setback form and the main structural material is concrete. The analysis was conducted using data from journals and the Council on Tall Building and Urban Habitat (CTBUH) and produced relevant findings. This research is expected to be useful for architects and urban developers in supporting sustainable development in Surabaya.

Keywords: high rise, building function, building form, building materials, typology

1. Introduction

Surabaya as the second metropolitan city in Indonesia after Jakarta continues to develop to follow interesting trends. Especially in the 21st century, almost all countries are competing to build or build skyscrapers (high rise) to serve as an identity transformation for the progress of a country or city in all fields, especially in the fields of economy, construction and technology (Praditya, 2024). In several major cities spread across Indonesia, there are around 188 high-rise buildings with a height between 150 to 300 m that have been established, making Indonesia the 9th country in the world that has quite a lot of high-rise buildings (Irawan, 2024). Of course, this development is driven by the rapid advancement of science or technology that allows the creation of more modern, efficient and functional building designs and constructions (Aulia Putra, 2018).

The city's economic growth and rapid urbanization can be one of the driving factors in terms of the need for more space. According to UN data, urbanization will continue to increase by 70% especially in urban areas by 2050 and the population in Asian cities will grow to 2.5 billion (United Nations, 2019). Supported by limited land in urban areas, high rise development can be one of the interactive solutions to meet residential and commercial needs but also support the development of trends towards technological innovation in the field of construction to create more efficient and sustainable buildings (Al-Kodmany et al., 2022). Not only does it serve as a spatial solution, high rise development also reflects the successful achievement of SDGs for point 9 on innovation and point 11 on sustainable infrastructure development and procurement (Al-Kodmany, 2022).

In some previous studies, high-rise buildings only focus on the collaboration between structural and technological aspects such as structural development towards building stability or material development and innovation, thus emphasizing high-rise buildings to be able to adapt to the surrounding challenges. Therefore, research related to the analysis of high-rise development in Surabaya is carried out by identifying and classifying to provide an architectural overview through function, form, and facade. Starting from the initial period before 2000 until 2024, with several architectural elements that will be used as the main parameters, namely building function, building form, building structure material and building outer facade material. The existence of this research provides a new understanding of the development of tall buildings in Surabaya and their contribution to sustainable development according to the specified period for readers.

2. Literature Review

2.1. Typology in Architecture

Typology is a word derived from the word "typos" which means to study types or differences based on certain interpretations (Santi, 2023). The concept is rooted in the grouping of objects based

on certain characteristics, which allow for similarities and differences (Craighead, 2009). In architecture, typology refers to the grouping of buildings based on specific features or characteristics (Pfeifer & Brauneck, 2007). This is in line with the idea that typology is a systematic classification process, where through this classification, patterns of homogeneity and diversity of an object can be found. Moreover, in "The Third Typology", Anthony Vidler introduced typology as a tool to understand changes in architectural forms and elements that continue to evolve across several periods (Grover et al., 2019). Thus, typology is not only a grouping study but also an analytical tool to understand the evolutionary patterns of basic building elements, especially in the context of architecture (Dharmatanna, 2024).

2.2. High Rise Typology Based on Material

The development of high rises has been significantly influenced by advances in construction materials from steel as the main construction material due to its strength and durability, to concrete which continues to develop so that its use is in great demand to more efficient composite structures. This can be seen from the increasing number of high-rise buildings around the world that predominantly use reinforced concrete and composite structures that combine steel and concrete as shown in *(Figure 1)* below (Szolomicki & Szolomicka, 2019).

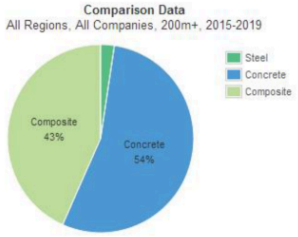

Figure 1. Comparison of material systems applied to tall buildings based on CTBUH global tall building database
Source : *(Szolomicki & Szolomicka, 2019)*

Several modern buildings such as the Petronas Tower in Kuala Lumpur or the Burj Khalifa in Dubai have adopted steel-concrete composite structural technology due to its ability to provide better strength, flexibility and construction efficiency compared to the use of plain steel or concrete. According to CTBUH, the majority of the world's 100 tallest buildings use composite materials or reinforced concrete to signify the high interest in these materials as a more efficient construction solution. Some novelty in materials can make tall buildings not only structurally strong, but also more efficient in all respects including occupant comfort (H. Ilgın & Aslantamer, 2024).

2.3. High Rise Typology Based on Building Function

Functionally, tall buildings have several typologies of functions, the first is commercial, such as office buildings or shopping centers that are designed to support economic activities (Dzuri & Zakariya, 2024). The second is residential, such as apartments or condominiums, which are designed with the comfort and privacy of the occupants in mind, and Mix Use, which combines various functions into one building such as commercial, residential and public facilities such as restaurants. This typology is often found especially in city centers, where land use is limited, and public facilities such as hospitals, universities, banks, etc., are designed with attention to public service functions and accessibility to all users (Santoso, 2013).

2.4. High Rise Typology Based on Building Form

Typology in the form of buildings, especially tall buildings, plays an important role, especially in determining the aesthetics, stability and efficiency of the building. Supported by the development of technology, the shape of the building will continue to be explored from the initial geometric shape to be more dynamic, so that the building is not only visually appealing but also able to withstand wind or earthquake loads (Moon, 2016).

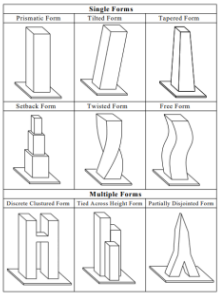

Figure 2. Classification of tower shapes for tall buildings
Sumber : *(Ozsahin, 2022)*

Building forms are classified into several forms as in *(Figure 2)* above, which can reflect innovations in the field of structure and architecture, namely single form and multiple forms (Ilgın & Aslantamer, 2024). Single form is a building form in the form of one continuous tower upwards, which can be divided into several more forms, namely prismatic form (rectangular shape in general), tilted form (rectangular shape that is tilted to give a dramatic impression), tapered form (building form that gets smaller and smaller), setback form (building form that will shrink in some parts of a certain height), twisted form (twisting building form), and free form (building form that is free and does not follow the basic geometric shape). In addition, multiple forms can also be divided into several more forms such as discrete clustered form, tied across height form, and partially disjointed form (Ozsahin, 2022).

2.5. High Rise Typology Based on Facade Material

Facade material is one of the most important architectural elements and is often the key element in determining a building's aesthetics, energy efficiency and sustainability of high rise buildings (Al-Kodmany, 2022). In general, based on their typology, facades can be classified into three main categories namely mono material, mixed material and adaptive or responsive facades. Mono material facades typically use only one type of material such as glass curtain wall or exposed concrete. These options offer ease of maintenance and a minimalist look, but generally tend to lack flexibility in design or thermal performance. In contrast, mixed facades usually combine two or more materials such as glass with metal, glass with composite panels or with wood panels, etc. This selection of mixed materials allows for a more dynamic and energy efficient design as it optimizes daylighting and ventilation. Third is the adaptive facade which usually uses technology to be able to respond to ambient environmental conditions such as automation to regulate interior temperature. This type of façade material usually contributes significantly to the energy efficiency as well as sustainability of the building (Gasparri et al., 2022).

3. Methods

This research was conducted using qualitative and descriptive methods by collecting 83 samples of tall buildings in Surabaya to be analyzed based on their architectural characteristics. This method was chosen because the focus of this research lies on in-depth interpretation through the study of the relationship between architectural parameters such as function, form, structural material and outer facade material. The analysis of the relationship between architectural design parameters aims to provide preliminary design guidance for architects and engineers, and to answer the main issue of how far the development experienced by Surabaya City, especially in the field of construction, has affected the minimization of urban land use with vertical building systems. With the help of several journals, articles, books, dissertations and several other internet sources, the researcher was able to find further information related to building data that could not be found in websites such as CTBUH (https://www.ctbuh.org/) because the information contained only certain information about tall buildings such as location, height, function, and structural material only as *Figure 3*. Meanwhile, buildings that do not have sufficient information will be excluded from the data to be analysed.

Figure 3. Data collection method and generation of results in diagrams (*Author, 2024)*

The data that has been obtained will be processed into *(Table 1)* to be classified according to the period of the year of establishment, namely period I (before 2000), period II (2000 - 2010), period III (2011-2020) and period IV (2021-2024), and based on general data that has been obtained such as height, number of floors, function, shape, structural material and outer facade material. The data is further processed by calculating bar charts, pie charts and sum tables which are the results of *(Table 1)*.

***Table 1*. List of Buildings with Classification Parameters (*Author, 2024*)**

	Building Name	Building Height (m)	Number of Floors	Building Function	Building Form	Structure Material	Facade Material
Period I (before 2000)							
Period II (2001 - 2010)							
Period III (2011 - 2020)							
Period IV (2021 - 2024)							

To know more about the development of high rise in Surabaya, can make a relation of the results of the comparison of the five main parameters that will be calculated into the form of a bar chart such as:

- Grouping based on the relationship between height and function
- Grouping based on the relationship between height and shape
- Grouping based on the relationship between height and structural material
- Grouping based on the relationship between height and outer facade material

The buildings that will be the object of analysis in this study range in height from 70 m - 300 m and the number of floors ranges from 20 floors - 55 floors. The distribution of building heights and the development of the number of floors are presented in *Figure 4* below. With the number of buildings 75 m - 100 m in height being 18 buildings, the number of buildings 101 m - 150 m in height being 36 buildings, the number of buildings 151 m - 200 m in height being 16 buildings, the number of

buildings 201 m - 250 m in height being 7 buildings, and the number of buildings 251 m - 300 m in height being 6 buildings.

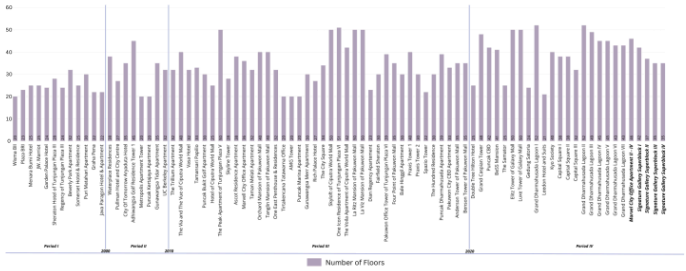

Figure 4. High-rise Building Development Result Chart by Number of Storeys (*Author, 2024)*

4. Analysis and Interpretation

To provide an overall picture, researchers divided the development of buildings into 4 periods, namely period I (before 2000), period II (2001 - 2010), period III (2011 - 2020), and period IV (2021 - 2024). It can be seen in *(Figure 4)* above that in period I where the city infrastructure was still inadequate and not too developed due to limited technology and knowledge so that there were only about 12 buildings with a number of floors that were not too high. In addition, at that time Indonesia was just coming out of the economic crisis in the 1990s so that many tall building projects were delayed or canceled. In period II, Surabaya City was still not growing too fast because the market demand was still limited for its space needs. The mass development of the high rise development trend occurred in period III, namely after 2010, because Surabaya began to experience development, especially in improving access to the city's main roads which automatically supported connectivity and vertical property development which created more attractive areas for investors, making the city of Surabaya an investment magnet, especially in the fields of business and development (Febrinastri, 2020)**.**

In addition, there is support from the city government to overcome the increasing population and limited land supported by the concept of mix use development that combines residential, commercial and office functions. Print media, online and info obtained, this is due to Tri Rismaharini's leadership as mayor who was able to bring Surabaya to follow the trend of existing high rise developments so that it contributed to encouraging demand for large-scale property development ranging from built and repaired highways, pedestrians to surrounding facilities (Petriella, 2021). Since 2010 until now, almost 70% percent of people in Surabaya have begun to adopt an urban lifestyle which has an impact in the form of opportunities for the development of large projects either from the base or extension of existing ones so that several large companies or investors have grown rapidly to answer the urgent market needs through the development of high-rise buildings that surround them (Fadhil et al., 2024).

4.1. Development Analysis Based on Building Function Aspects

One of the most significant parameters is building function, which is categorized into two types: single functional and multi-functional. A high-rise building is categorized as single functional if more than 85% of its total floor area is used for one type of function only. Whereas it is categorized as multifunctional if it is designed for two or more functions, each of which gets an equal and significant proportion in the total building space (Xie et al., 2022). As in *(Figure 5)* which classifies high rise into 3 single functional categories, namely hotels, apartments or condominiums, and offices. Meanwhile, the multi-functional category is in the form of mix use which generally consists of 2 or 3 functions. From the analysis results *(Figure 5)*, 83 high-rise buildings in Surabaya have been grouped and classified according to function. The results show that the majority of high rises are designed for mixed use, although a number of buildings retain a single dominant function of residential apartment or condominium.

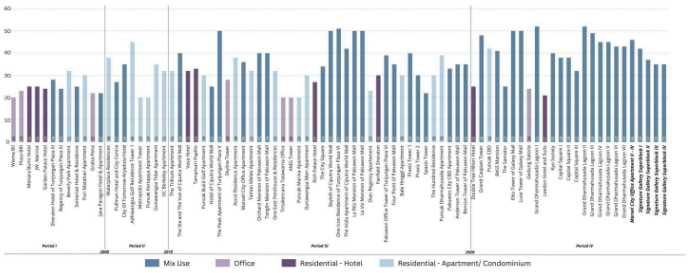

Figure 5. Diagram of High-rise Building Development Results Based on Function Aspects (*Author, 2024)*

The comparative diagram analysis *(Figure 6)* shows a significant increase in mixed use buildings from 28.6% before 2010 to 66.1% in period III. This trend shows a shift in high-rise building design towards more efficient integration of multiple functions in one building. Although single functions are declining, some functions such as apartments still dominate more than hotels or offices. The adoption of multifunctional design reflects that some high-rise buildings are implementing sustainable solutions to future land constraints and the increasing urban population.

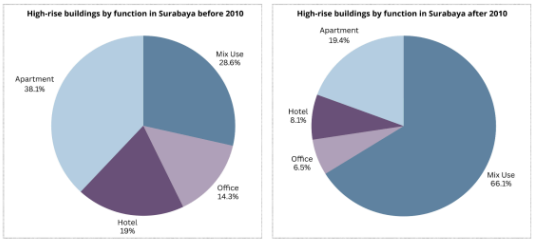

Figure 6. Comparative Results of High-rise Building Development Based on Function Aspects Before and After 2010 (*Author, 2024)*

Table 2*. Number and Percentage of Tall Building Development Based on Function Aspect (*Author, 2024)

Building Function	Quantity	%
Mix use	47	56,6%
Office	7	8,4%
Residential - Hotel	9	10,8%
Residential - *Apartment* / Condominium	20	24,1%
Total	**83**	**100 %**

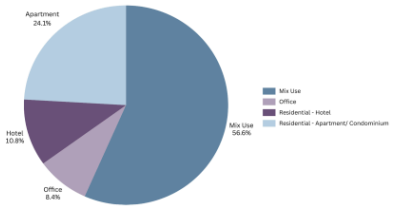

Figure 7. Percentage Results of Tall Building Development Based on Function Aspects (*Author, 2024)*

When viewed *(Figure 7)* and (*Table 2)* from period I to period IV, the most dominant function remains mixed use with 56.6%, while the dominant single function in the city is apartment with 24.1%.

4.2. Development Analysis Based on Building Form Aspect

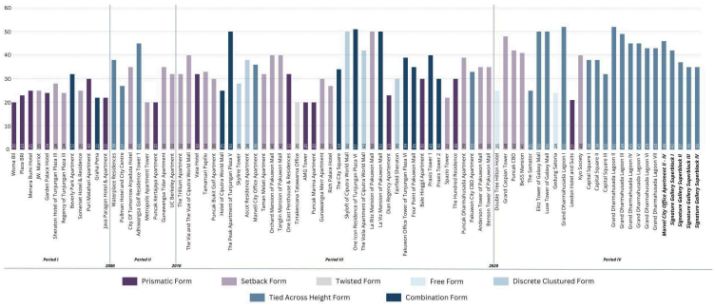

Figure 8. Diagram of Tall Building Development Results Based on Shape Aspects (*Author, 2024)*

In the evaluation of architectural design of high-rise buildings, the shape of the building also plays an important role in aesthetics and response to loads, especially wind. Therefore, the design of high-rise buildings must have many architectural considerations in order to control lateral displacement due to wind, which includes the application of aerodynamic design, the use of aerodynamic shapes, adjustments to the top of the building, reduction of cross-sectional area and improvements to the corners of the building (Yadav & Roy, 2024). Tall buildings can be divided into 3 major parts, namely the head (top), main body (tower), and base (base) (Yadav & Roy, 2024). In this study, one of the building parts to be analyzed is the body part (tower) based on the number of forms, namely single forms which include prismatic form, tapered form, tilted form, setback form, twisted form, and free form and compound forms which include discrete clustered forms, tied across height forms, and partially disjointed forms. Based on the analysis *(Figure 8),* it shows that the majority of high rises in Surabaya City are designed with setback forms and tied across height forms because both forms are effective in overcoming wind pressure and lateral loads so as to increase stability and thermal comfort (Ozsahin, 2022). In addition, the setback form is also able to support maximum natural lighting due to its slender shape, as well as green space at the base. Meanwhile, tied across height forms enable multifunctional designs with structures that are more efficient and stable against problems in the surrounding urban environment (Ali & Moon, 2018).

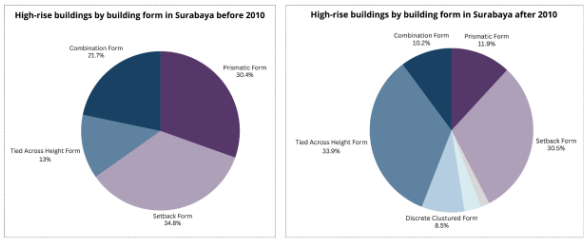

Figure 9. Comparative Results of Tall Building Development Based on Form Aspects Before and After 2010 (*Author, 2024)*

Based on the analysis on the comparison diagram *(Figure 9)*, it can be seen that the development of high-rise building forms in Surabaya shows the dominance of the use of setback forms from the early period until now. In addition, prismatic forms are also still widely used, especially from period I to period II with a percentage of around 30.4% but has decreased to 11.9% because it has begun to be replaced by tied across height forms which reached 33.9% due to its efficiency in distributing lateral loads and design flexibility. In addition, several innovative forms such as twisted forms, free forms and discrete clustered forms began to appear in period III or after 2010 along with the demand for more aesthetic designs. Some buildings in Surabaya also take the form of a mixture of several existing single forms to create unique and creative design solutions for the evolving urban needs.

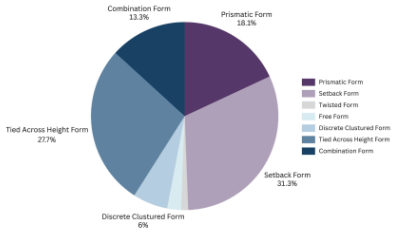

Figure 10. Percentage Results of Tall Building Development Based on Building Form Aspect (*Author, 2024)*

When viewed from *(Figure 10)* and *(Table 3)*, period I to period IV, the most dominant building form used is the setback form with a percentage reaching 31.3%, tied across height forms at 27.7%. Some other forms that are still often used but not too dominating are prismatic form at 18.1% and combination form at 13.3%.

Table 3*. Number and Percentage of Tall Building Developments Based on Building Form Aspects (*Author, 2024)

Building Form	Form Group	Quantity	%
Prismatic Form	Single	15	18,1 %
Tapered Form	Single	0	0 %
Tilted Form	Single	0	0 %
Setback Form	Single	26	31,3 %
Twisted Form	Single	1	1,2 %
Free Form	Single	2	2,4 %

Combination Form	Multiple	11	13,3 %
Discrete Clustered Forms	Multiple	5	6 %
Tied Across Height Forms	Multiple	23	27,7 %
Partially Disjointed Forms	Multiple	0	0 %
Total	-	**83**	100 %

4.3. Development Analysis Based on Material Aspects of Building Structures

Materials commonly used as ordinary lateral and vertical structural elements include reinforced concrete, composite and steel. Composite structures can be formed through a combination of steel and concrete components. In Surabaya based on (Figure 10), structural materials for high-rise buildings are dominated by concrete, although there are still some that use composite materials. For steel materials, it is rarely used because in terms of construction costs which are quite expensive compared to concrete, besides that it also requires more complex technical expertise in installation especially for high rise buildings, also limited infrastructure for fabrication and transportation of steel elements is a major obstacle, while concrete can be cast directly at the construction site so as to reduce logistical complexity (Anwar, 2018).

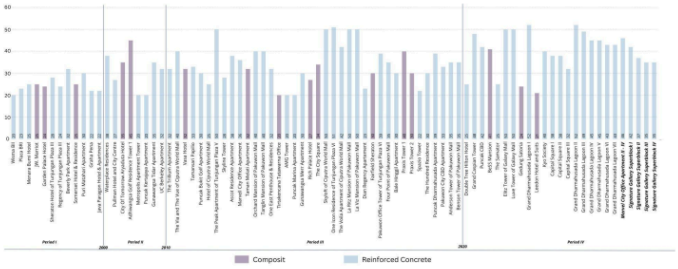

Figure 10. Diagram of High-rise Building Development Results Based on Building Structure Material Aspects (*Author, 2024)*

Table 4. **Number and Percentage of Tall Building Developments Based on Structural Material Aspects (*Author, 2024)***

Structure Material	Quantity	%
Reinforced Concrete	67	80,7 %
Composite	16	19,3 %
Steel	0	0 %
Total	**83**	**100 %**

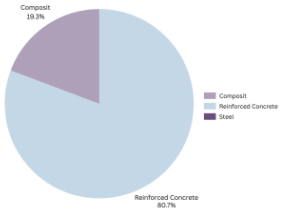

Figure 11. Percentage of High-rise Building Development Results Based on Structural Material Aspects (*Author, 2024)*

As in Surabaya alone, 80.7% of existing high-rise buildings use concrete materials for their structures, and only 19.3% use composite materials. The data in *(Figure 11)* and *(Table 4)* is consistent with the material classification in the CTBUH database for tall buildings in Surabaya City, which shows a preference for structural efficiency and more economical construction.

4.4. Development Analysis Based on Material Aspects of the Building Facade

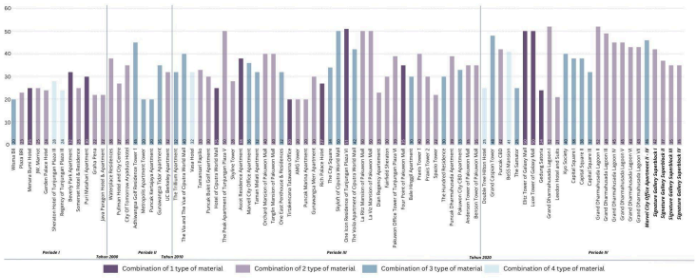

Figure 12. Diagram of High-rise Building Development Results Based on Material Aspects of the Outer Facade (*Author, 2024)*

Facade materials play an important role in aesthetics and sustainability. Common materials used include curtain walls (glass), composite panels, wood panels, metal panels, ceramics and even original concrete walls with a coat of paint (Mastropasqua et al., 2023). The selection of materials is tailored to the design concept, such as reflective materials for modern styles that give a futuristic look or high albedo materials that support energy efficiency (Speroni et al., 2022). Facade materials can be divided into single materials or the use of 1 type such as curtain walls only or concrete walls only to make it cleaner and easier to maintain, or mixed materials that combine 2 or more materials to make it more aesthetic and functional which supports the sustainability of the building (Goyal, 2023).

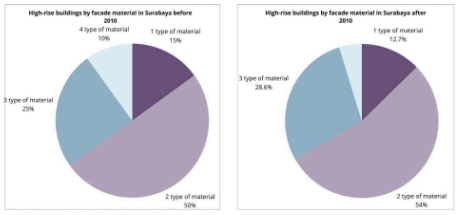

Figure 13. Comparative Results of High-rise Building Development Based on Material Aspects of the Outer Facade Before and After 2010 (*Author, 2024)*

Based on the analysis of the comparison diagram *Figure 13* it can be seen that the dominant high-rise buildings in Surabaya use compound materials with a combination of 2 materials for the facade from 50% to 54%. In addition, the combination of 3 materials is also still often used in some high-rise buildings from 25% to 28.6%. In contrast, the combination of 1 type of material has decreased, reflecting changes in design preferences as the city develops.

Table 5. **Number and Percentage of Tall Building Development Based on Material Aspect of Outer Facade (*Author, 2024)***

Structure Material	Quantity	%
Combination of 1 type of material	12	14,5 %
Combination of 2 type of material	43	51,8 %
Combination of 3 type of material	23	27,7 %
Combination of 4 type of material	5	6 %
Total	**83**	**100 %**

In accordance with *Table 5* and *Figure 14*, overall from period I to period IV, high rises in Surabaya almost mostly use compound materials with a combination of 2 types of materials which amounted to 51.8%, a combination of 3 types of materials by 27.7% and a combination of 4 types of materials only 6%. However, some buildings still use only 1 type of material generally due to cost efficiency or conformity with the design concept which reaches 14.5%.

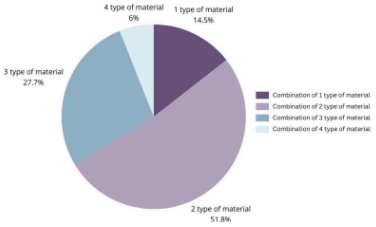

Figure 14 Percentage of High-rise Building Development Results Based on Material Aspects of the Outer Facade (*Author, 2024)*

4.5. Analysis of High Rise Architecture Development in Surabaya Based on Relationship Between Building Height and Building Function

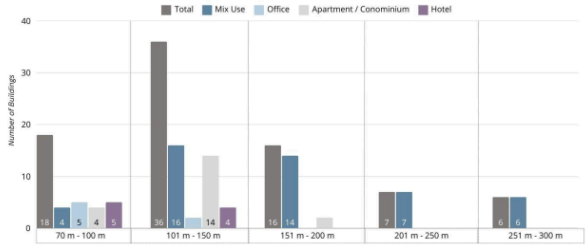

Figure 15. Diagram of Relationship Results Between Building Height and Function (*Author, 2024)*

In *Figure 15* explains that the high rise in Surabaya is dominantly tall between 101m - 150m with a mix use function of 44.4%, office only 5.6%. While the apartment function is quite a lot around 38.9%, and hotels around 11.1%. In the height range between 70m - 100m, 22.2% functioned as mix use, 27.8% functioned as offices, 22.2% functioned as apartments / condominiums and the remaining 27.8% functioned as hotels. In the 151m - 200m range, almost 90% also function as mix use and the rest function as apartments. In the height range of 201m - 250m and 251m - 300m range, 100% of buildings in Surabaya function as mixed use.

4.6. Analysis of the Development of High Rise Architecture in Surabaya Based on the Relationship Between Building Height and Building Forms

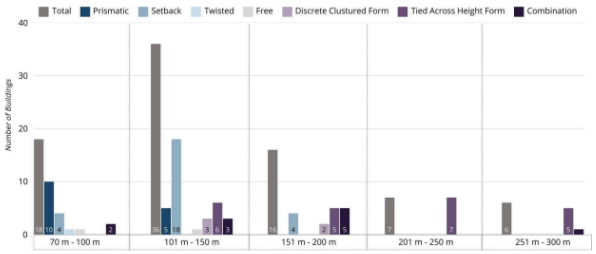

Figure 16. Diagram of the Relationship between Building Height and Shape (*Author, 2024)*

In *Figure 16* states that the height range of 101m - 150m the most building form is setback form by 50%, then prismatic form only reaches 13.9%. While the tied across height form is also quite a lot which is around 16.7%, while for some other forms it is still rarely found in Surabaya. In the height range between 70m - 100m, 55.6% are in prismatic form, 22.2% are still in setback form, 11.1% are in combination form and 11.2% are in twisted and free form. In the height range between 151m - 200m prismatic form is rarely found, some forms that are still dominant are 21.1% setback form, 10.5% discrete clustered form, 42.1% tied across height form and the remaining 26.3% is combination form. In the height range of 201m - 250m only tied across height form is around 100%. In the range of 251m - 300m also only 2 kinds of forms were found, namely 80% tied across height form and 20% still combination form.

4.7. Analysis of High Rise Architecture Development in Surabaya Based on Relationship Between Building Height and Building Structure Material

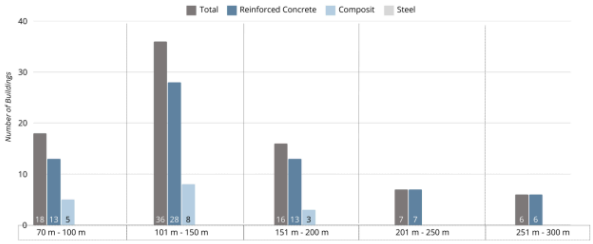

Figure 17. Diagram of Relationship Results Between Height and Building Structure Materials (*Author, 2024)*

Figure 17 illustrates the variation of building structural materials according to building height. The gray colored bars represent the total number of high rise buildings. It can be seen that high rises in Surabaya dominantly have a height range between 101m - 150m with the most material is concrete

around 77.8% and 22.2% composite material. In the range of 70m - 100m 72.2% use concrete and 27.8% composite. In the 151m - 200m range, 84.2% use concrete and 15.8% use composite. While in the range 201m - 250m and 251m - 300m, 100% uses concrete material.

4.8. Analysis of the Development of High Rise Architecture in Surabaya Based on the Relationship Between Building Height and Building Outer Facade Material

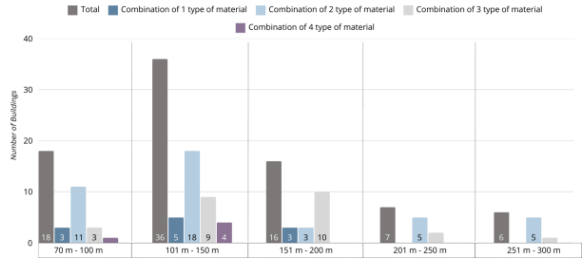

Figure 18. Diagram of Relationship Results Between Height and Materials of the Outermost Facade of the Building (*Author, 2024)*

In Figure 18 states that in the height range between 101m - 150m, the most facade material is a combination of 2 types of materials by 50%, 25% use a combination of 3 types of materials, 13.9% a combination of 1 type of material and 11.1% with a combination of 4 types of materials. In the range of 70m - 100m dominant as much as 61.1% still use a combination of 2 types of material, 16.7% use a combination of 1 type of material, 16.7% use a combination of 1 type of material and the rest use a combination of 4 types of material. In the range 151m - 200m dominant 52.6% began using a combination of 3 types of materials. In the 201m - 250m range as much as 60% with a combination of 2 types of materials and 40% already with a combination of 3 types of materials, while in the 251m - 300m range still 100% use a combination of 2 types of materials.

5. Conclusions and Suggestions

The increasing demand and interest in high-rise buildings, especially in the city of Surabaya, makes the design of high-rise buildings must offer structural strength and attractiveness. This research is expected to provide insight into the condition of high-rise buildings in Surabaya and help designers to understand architectural forms and materials for structures. With the information obtained from the 83 buildings studied, the results presented aim to assist designers in making decisions and provide architectural design guidance as well as provide a basis for a comprehensive study that allows them to understand the possibilities and limitations of existing architectural and structural designs of high-rise buildings. From several analyses that have been carried out from the period before 2000 to 2024, it is found that the tallest building currently standing is the Grand Dharmahusada Lagoon with a height of 271 m or equivalent to 52 floors. In high-rise buildings in Surabaya, the mix use function is the most common function because it reflects adaptation to the growing market needs, followed by the apartment function.

The most common form of tall buildings today is the tied across height form which began to appear after 2010, followed by the setback form and prismatic form which has existed since the period before 2000. The free form, split group form, and combination form are not very common. In some high-rise building structures in Surabaya, almost 80% use concrete materials, followed by composite materials at 20%. As for facade materials that are often found are a combination of 2 types of materials between curtain walls and composite panels, curtain walls and concrete walls or composite panels and concrete walls. In designing a high rise, sufficient understanding and expertise are needed to overcome the increasingly complex challenges in this modern era, because high rise will be one of the main components in the development of a city in the future, either because of the increasing need for space or public perception.

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