

ANALYSIS OF UNIVERSAL DESIGN ASPECTS FOCUSING ON THE ELDERLY AT PAN PACIFIC, SINGAPORE

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ABSTRACT

Universal Design (UD) aims to create inclusive, safe, and comfortable environments, yet its application in high – rise buildings for elderly users remains underexplored in specific contexts. This study assesses UD application at Pan Pacific Orchard, Singapore, focusing on accessibility, comfort, flexibility, inclusivity, and key circulation elements (corridors, doors, fire escapes, stairs and elevators). A qualitative approach was used, combining content and descriptive analysis. Data were gathered from literature reviews, floor plan analysis, and relevant references, including UD principles and the Singapore Code on Accessibility. Data were grouped into predefined categories and compared against existing building conditions. The building meets several UD accessibility standards for elderly users: Corridor width (1500 mm) and door openings, (~900 mm) are compliant. Elevator doors width (~1200 mm) exceeds minimum requirements, improving access for wheelchair users and the elderly. Four green terraces support social interaction and psychological well-being. However, some circulation elements fall below recommended standards, notably stairs (width ~900 mm, tread depth 260 mm, landing ~ 1000 mm), compromising elderly safety. While Pan Pacific Orchard demonstrated substantial commitment to inclusive design through several compliant and exemplary features, targeted improvements to stair dimensions are necessary to fully support elderly users.

Keywords: ederly; highrise building; open spaces; universal design

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INTRODUCTION

Pan Pacific Orchard Hotel is a tropical hotel located in Singapore. The building is divided into four levels with greenery, signature Forest, Beach, Garden, and Cloud Terraces. The hotel aims to contribute to the urban environment by replacing 200% of its area with greenery. It is said that the hotel embraces a sustainable concept and has achieved a Green Mark Platinum rating, making it a certified green icon at The Orchard Road.

Pan Pacific is one of many high-rise buildings in Singapore. Architects is not only focusing on aesthetic value but also considering various rules and standards from an architectural perspective when designing a building, especially a high-rise building. ‘Inclusive Design’ is one of those standard, which plays a crucial role in creating an environment and atmosphere that meets the needs of all individuals. Universal Design (UD) is the base for inclusive design that aims to ensure that architectural solutions are barrier-free and accessible to a wide spectrum of society, thereby enhancing the quality of life for all occupants.

Inclusive design is a standard that does not only cater to people with physical or non-physical disabilities, but also includes vulnerable groups such as pregnant women and the elderly. Multi-story buildings designed with Universal Design principles can provide important features such as stairs, doors, barrier-free access (corridors), stair systems, and elevators, which are crucial for the safety and comfort of vulnerable groups. Therefore, it is essential for architects to be well-informed and mindful of existing standards when designing. This is because the elderly often face changes in their needs, both emotionally, in terms of lifestyle, and in terms of space flexibility (Triatmodjo, 2021).

Special considerations in designing high-rise buildings also include accessibility for the elderly. According to the principles of Universal Design developed by the Center for Universal Design, aspects of safety, accessibility, and ease of use must be taken into account in building design (Olodeoku *et al.*, 2024; Yu & Choi, 2023). Things to consider include non-slip flooring materials, clear lighting, and obstacle-free pathways. By considering these factors, an environment that provides a sense of safety and comfort for the elderly to carry out their daily activities, both in public and private spaces, can be created. This approach does not only support independent mobility but also helps boost the confidence of the elderly in using the facilities available in high-rise buildings.

Therefore, it is important for the elderly to have sufficient open space in their high-rise residential buildings. Exposure to greenery within high-rise buildings, such as green walls, rooftop gardens, and natural landscapes, plays an important role in improving the well-being of residents. Green spaces are associated with improved mental health, reduced stress, and enhanced mood, offering a therapeutic environment that benefits all residents, including those with mental health issues. The integration of greenery in urban environments not only contributes to aesthetic appeal but also encourages outdoor activities and social interaction, which are vital for psychological well-being.

Beyond a physical access perspective, recent research draws attention to the fact that elderly people may undergo alterations in their spatial requirements which are related with lifestyle preferences, leisure habits and social involvement. Studies of senior

tourism and living environment show that older adults prioritize autonomy, psychological ease, and meaningful social life environments (Xia *et al.*, 2015).

These needs are not only typical of permanent residential contexts, but also apply to other sectors such as hospitality. Quality of space and ease of movement, for example, combined with the availability regenerative urban landscapes have an essential impact on the well being. As the result, the hotels and skyscrapers featuring UD should function not only as places for residences but also as age friendly living spaces which improve the quality of life among elderly users.

Finally, the built environment in high-rise buildings can significantly support the activities and well being of the elderly. Accessible spaces, opportunities for social interaction, and areas that promote physical and mental health are crucial for the elderly. The presence of connecting corridors and common areas facilitates social engagement and provides convenient access to environmental facilities, thereby enhancing the quality of life for elderly residents. By combining these elements, high rise buildings can become more elder users friendly and support active aging.

The purpose of this research is to analyze Universal Design Aspects as well as building safety and accessibility regulations established by the Singapore Civil Defence Force in the Pan Pacific Singapore building, Figure 1 illustrates the overall floor plan of pan pacific Orchard, Showing the spatial organization and circulation layout that form the basis of evaluating Univesal Design ascts in building. The Singapore Civil Defence Force (SCDF) regulations are used as one of the references for standards related to fire safety, emergency access, evacuation systems, and building safety requirements that must be considered in high-rise building planning and operation in Singapore (Teong & Ng, 2025). The study also aims to determine whether the Pan Pacific building meets Universal Design standards, particularly for the elderly. In this context, the research was conducted using content analysis, which was then analyzed descriptively. This study will contribute to knowledge about Universal Design aspects and identify the needs of the elderly regarding open spaces and green areas. This study has the potential to provide a deep understanding the interpretation of universal design aspects focused on the elderly in Pan Pacific, Singapore.

METHODS

The study was done with qualitative method using the descriptive approach. The research process, as described by Tapiwa Muzari (2022), is characterized by emerging questions and procedures. Data typically collected in participant settings, inductive data analysis that builds specific forms into general themes, and researchers making interpretations about the meaning of the data. Interpretive and naturalistic approaches to their subject matter are part of the multi-method focus of qualitative methodologies, according to (de Souza Bispo *et al.*, 2022).

This study uses content analysis to identify and understand relevant themes or patterns from the data obtained. Content analysis is used to analyze literature reviews, Universal Design principles from various references, and other supporting data sources to formulate evaluation categories based on the research variables proposed by the researcher namely accessibility, comfort, flexibility, inclusivity in activity forms,

corridors, doors, fire escapes, and elevators. These categories are then used as analytical tools to evaluate the implementation of Universal Design aspects in the Pan Pacific Orchard building. The analysis process is conducted systematically through steps such as data collection, theme grouping, and comparing the alignment of universal design aspects with the research focus.

This research explore how universal design making space usable for everyone with specific architectural elements and examines how the physical bones of a building can better serve people of all abilities, the study focuses on two main categories :

1. Design principles (how)

These are the qualitative goals used to measure the success of a space

- Accessibility
- Comfort
- Flexibility
- Inclusivity

2. Physical Components (Where)

- Building and Construction Authority
- Pathways and portals (corridor and doors)
- Safety & mobility (Fire Escapes and Elevator)

The data collected was then descriptively processed to provide a clear and organized summary of the research findings. A descriptive analysis was performed to better understanding of the Universal Design features under study and the result were presented in the correlation between data

RESULT AND DISCUSSION

Research location: Pan Pacific Orchard

Pan Pacific Orchard is a mid range hotel located at 10 Claymore Road in the Orchard area of Singapore. The hotel is just a few steps away from major shopping centers such as ION Orchard, Paragon, and Ngee Ann City.

The Pan Pacific Orchard building, standing 21 stories tall, features a modern and elegant architectural design. The hotel's interior features simple, minimalist design elements while retaining an opulent atmosphere, all while keeping comfort and luxury in mind. Additionally, the hotel incorporates natural elements with four distinct views: forest terrace, beach terrace, garden terrace, and cloud terrace. The hotel has more than 300 rooms and suites with contemporary conveniences like comfy beds, high-speed internet, and in-room entertainment systems.

Each room is designed to offer a tranquil and delightful stay with picturesque city view. Some of the high class facilities available at Pan Pacific Orchard include an outdoor swimming pool, gym equipped with modern training machines, and a spa that can be used by guest who want to relax. The hotel also has several dining facilities, such as bars where guest can unwind and restaurant that offer food from all around the world. Some of the conference halls and meeting rooms available at Pan Pacific Orchard have modern facilities to facilitate various social or corporate meetings.



Figure 1. Floor plan of Pan Pacific Hotel
(Source: Archdaily, 2023).

Additionally, the building is ideally situated to provide quick access to public transportation, including the Orchard MRT station, which is only a short stroll away. This makes it easy for guests to explore further into the city of Singapore, including major tourist attractions such as Gardens by the Bay, Marina Bay Sands, and Sentosa Island. Pan Pacific Orchard is the best option for both tourists and business travelers visiting Singapore because of its nice service, good location, and proper amenities.

Universal Design for the Elderly

Based on the analysis of the floor plan of the Pan Pacific Orchard building in accordance with universal design aspects for elderly users as shown in Figure 2, that the circulation layout, door location and elevator position were analyzed to evaluate the accessibility and mobility for elderly users, this is the following applies:

1. The width of the room corridors in this building is 1500 mm, which fully meets the minimum requirements of the regulations and is sufficient for the passage of mobility aids commonly used by the elderly.

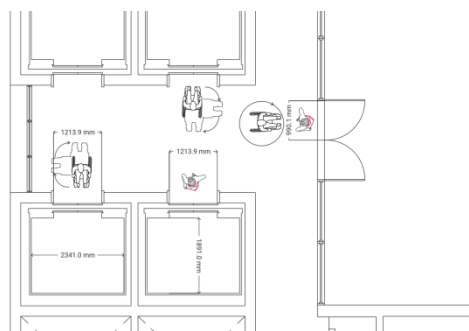


Figure 2. Floor plan of doors and elevators at Pan Pacific Orchard
(Source: Archdaily, 2023).

2. The doors of the Pan Pacific building are more than 850 mm wide, and the double leaf door has a clear opening of around 900 mm (figure 2). This design meets the Universal Design standards for accessibility, which is highly significant for the safety and comfort of elderly users. If the door is the right width, older people, especially those in wheelchairs or using walking aids, can get around without any problems. This also lowers the chance of accidents, makes it easier to get through doors, and makes it easier to leave in an emergency. This design follows the idea of inclusivity, which means that everyone can use the facilities without needing any particular changes.
3. The steps in the Pan Pacific Orchard building are around 900 mm wide, which is less than the requirement width of 1200 mm. In addition, the depth of the stairs is around 260 mm, which is less than the minimum depth of about 280 mm.

The minimum landing height is ± 1000 mm, which is lower than the 1200 mm safety requirement. This doesn't match the standards and isn't safe for older people to utilize because they occasionally need help to walk. The elevators in this building meet universal design standards for the elderly.

This elevator has a clear door width of ± 1200 mm, which is more than the typical requirement of ± 900 mm. This means that it has enough room for people with limited mobility, such the elderly, wheelchair users, or people who use walking assistance. This width makes sure that people can simply and safely get in and out of the elevator without worrying about tight places.

In terms of accessibility, Pan Pacific Orchard follows Universal Design principles in depth. This is in line with the advice of Triatmodjo (2021) and Demirkan (2007), which stress the importance of barrier-free access for older people, including those who use mobility aids or wheelchairs.

The Code on Accessibility in the Built Environment Singapore This elevator has a clear door width of ± 1200 mm, which is more than the typical requirement of ± 900 mm. This means that it has enough room for people with limited mobility, such as the elderly, wheelchair users, or people who use walking assistance. This width makes sure that people can simply and safely get in and out of the elevator without worrying about tight places.

In terms of accessibility, Pan Pacific Orchard follows Universal Design principles in depth as well. The Code on Accessibility in the Built Environment Singapore bea-coa2025 says that corridors must be at least 1500 mm wide and doors must have a clear opening of at least 900 mm. This is in line with the advice of which stress the importance of barrier-free access for older people, including those who use mobility aids or wheelchairs (Triatmodjo, 2021).

That corridors must be at least 1500 mm wide and doors must have a clear opening of at least 900 mm. This is in line with the advice of, which stress the importance of barrier-free access for older people, including those who use mobility aids or wheelchairs.

The elevator system is well-designed, incorporating the principle of intuitive interaction as described previously. Features such as large buttons, automatic sensors, and

slow-closing door mechanisms create an inclusive and safe experience, minimizing the risk of accidents and providing psychological comfort for the elderly.

Flexibility Aspect in this building contains the automatic elevator operating system, equipped with modern technology such as large, easily accessible buttons, makes it easy for users of various ages and abilities to operate the elevator without difficulty. This technology provides access flexibility, this allowing everyone to use the elevator properly.

The principle of flexibility in design, as described by (Blackler *et al.*, 2018), is well accommodated through features such as movable garden chairs, stairs with elevator access as an alternative, and open spaces not restricted by a single function. This allows the elderly to use the space according to their physical needs, whether for resting, light walking, or socializing.

For comfort and safety, this building has elevator with great lasers sensors on its door, it can detect the presence of objects or people in the door path. This feature minimizing the risk of the elevator door closing on its own to almost zero, providing a high level of safety for people, especially the elderly who often need more time to get in or out of the elevator.

Figure 3 presents the overall configuration of the open space area at Pan Pacific Orchard, demonstrating the integration of greenery and communal spaces within the building.



Figure 3. Top view of the open space area at Pan Pacific
(Source: Archdaily, 2023).

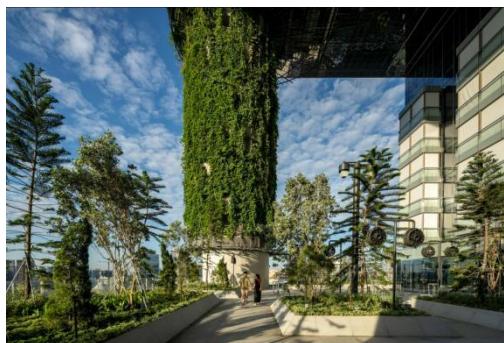


Figure 4. Open Space Area at Pan Pacific.
(Source: Archdaily, 2023).



Figure 5. Garden Terrace Pan Pacific
(Source: Primary, 2025).

Modern technologies like laser sensors and autonomous operation lower the chance of accidents and ease worries about unwanted incidents, which is important as requirement for liveable condition for elderly. Pan Pacific Orchard has four gardens that are green areas. One of these gardens is the Garden Terrace, which is illustrated in Figure 4. These gardens help improve the quality of life for older people by giving them places to socialize. And also the garden Terrace that illustrates in figure 5 are one of the key green spaces within Pan Pacific Orchard building that serves as a social and therapeutic environment for elderly users.

Researchers have found that older individuals who can get to green and recreational spaces are happier and have better mental health. That's why this building has multi-level green terraces. Studies done in both cities and tourist areas show that being around plants reduces stress, improves mental stability, and encourages moderate exercise and social interaction, all of which are important for older persons to stay healthy as they age (Yoda et al., 2021). More over, green spaces within hospitality buildings function as transitional environments that blur the border between the private and public space, allowing older user to join in social life at their own pace. In this building, the garden terraces that illustrated in Figure 6 have functioning not only for aesthetic input but can be used as therapeutic and social supportive spaces that follows the principles of universal design.



Figure 6. Garden Terrace Pan Pacific
(Source: Pinter Poin, 2021).

The Pan Pacific Orchard building demonstrates a good implementation of Universal Design aspects to support accessibility, comfort, and safety for elderly users. The room corridors are designed with a width of 1500 mm, exceeding the minimum requirement specified in Universal Design, thus providing adequate space for elderly people to move around, including those who use wheelchairs or walking aids. This guarantees freedom of movement and minimizes chances of accidents. Furthermore, the doors inside the building have been constructed with dimensions wider than 850 mm, including of double leaf doors with a free space of about 900 mm. The above mentioned door dimensions ensure that senior citizens move from room to room freely and also aid in their evacuation in case of emergencies.

Nevertheless, there are notable defects in the staircase. First, the stairway width of 900 mm falls short of the minimum requirement of 1200 mm, whereas its depth of 260 mm is less than the minimum requirement of 280 mm. Furthermore, the landing space of 1000 mm is below the minimum requirement of 1200 mm. Such measurements can pose a threat to the safety of older people who might use walking aids.

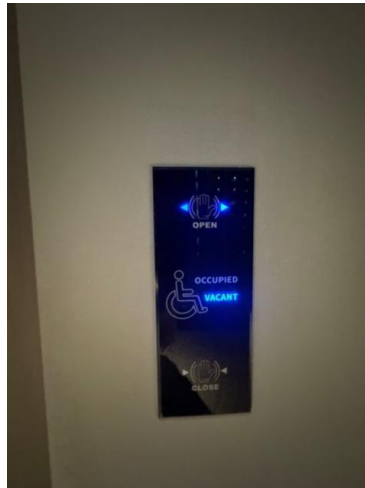


Figure 7. The Automatic operating system of pan pacific elevator.
(Source: Primary, 2025).



Figure 8. Universal design aspect
(Source: Primary, 2025).

On the other side, this building elevator is very well designed, goes above the Universal Design standards. With a door width of 1200 mm, The elevator's door width of 1200 mm makes it suitable for wheelchair users and the elderly. The automatic operating system, equipped with modern technology such as laser sensors (Figure 7) and easily accessible buttons, ensures high comfort and safety for users. These features reduce the risk of accidents such as door pinching and provide flexibility in use, and for figure 8 summarizes the Universal design aspects identified in Pan Pacific Orchard, including accessibility, comfort, flexibility, inclusivity, circulation system, and open spaces that support elderly users.

Additionally, the presence of four tiered gardens (Forest, Garden, Beach, Cloud Terraces) at Pan Pacific Orchard not only enhances the building's facade but also contributes to the mental well-being of elderly residents. According to research by (Xia *et al.*, 2015), green spaces help older people sleep better, interact with others more, and can help reducing stress. This feature helps the older people with age constraints to develop psychological resilience.

This green space is not only provides a place for relaxation but also encourages social interaction, which is this can improve the mental health and well-being of older adults. According to Nurfadilah *et al.* (2018), open spaces serve as social hubs in communities of older adults.

The garden terrace of the Pan Pacific skyscraper can be a vertical community area that supports the idea of aging in place in a crowded city. Overall, this building can be a good example of inclusive design that meets the needs of all users, including the older people. Although some elements are still below requirement, such as the stairs, the building already has features that support the Universal Design requirements.

CONCLUSION

Pan Pacific Orchard has generally implemented Universal Design principles for elderly users, particularly in the aspects of accessibility, comfort, flexibility, and inclusive activities. Corridor width of 1500 mm and door openings of approximately 900 mm are in accordance with the specifications under Singapore Code on Accessibility in the Built Environment, hence facilitating safe circulation for elderly persons both wheelchair and walking aid users. Also, elevators have met the basic accessibility specifications by having door opening size of approximately 1200 mm, automatic system operation, laser sensor, and control panels that are easy to access. However, other elements identified as non-compliance with Universal Design principles include stairs of approximately 900 mm width, tread depth of 260 mm, and landing size of approximately 1000 mm. Other features identified to promote Universal Design in the building are the presence of green open spaces including the Forest Terrace, Garden Terrace, Beach Terrace, and Cloud Terrace that enhance psychological and social comfort for elderly people. In summary, Pan Pacific Orchard is an excellent illustration of Universal Design principles in high rise hotel buildings since most features meet the Universal Design specifications but some elements such as stairways are still deficient.

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