



## The Need for Design Elements of Inclusive Public Service Space for the Elderly with Limited Balance

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**Abstract.** Public space must be able to accommodate the activities of its users. Especially with users who have special needs or are called inclusive users. One group of users that is often overlooked in the application of the space's design is the elderly. The government has launched the Elderly Friendly City program, Semarang is included in the program as it has the largest population in Central Java. Semarang Poncol Station is an example of a form of public service that has not fully provided equal distribution in terms of design. In fact, Poncol Station offers a ticket price reduction for the passenger. If the purchase is made directly at the station counter, the passenger can get twenty percent reduction from the original price. The elderly activities should be accommodated fully included in the Pre-Area space design: entrance, parking and drop-off, and Building areas such as waiting rooms, counters, toilets and platforms. Therefore, the research question arises "What are the design elements in Poncol Station public services needed to create inclusiveness for the elderly with limited balance?". Therefore, the purpose of this study is to formulate the needs of design elements of public service spaces that are inclusive of the elderly at Poncol Station. Using quantitative research methods so that an overview of elderly activities carried out in each room at Poncol Station and the needs of design elements to create inclusiveness uses quantitative descriptive techniques. The results of this study found a tendency for the needs of design elements and their limitations. Elders with limited mobility and balance need design elements that make their movements feel safe, such as steel handles on various design elements in Poncol Station.

### INTRODUCTION

Public service is a concrete form of service provided by the government both directly and indirectly in the provision of public facilities for which financing is borne by the government [1]. Not discriminating between layers of society or uniformity of service, the community has several other insights. One of these understanding is where the uniformity in question is a product and design environment that can be used and enjoyed by everyone without exception or is the creation of inclusive or friendly designs as much as possible so that it does not require adaptation to the renewal of special designs [2]. The key to an inclusive or friendly design for all users so that the creation of a friendly environment for all is in the layout of accessibility, visual information, directions and adequate space size so that it is not harmful to everyone [3]. However, there is one user who is usually often overlooked in the application of inclusive designs, not because they are considered not to belong to a group that requires specificity but they are considered too difficult to access the complexity of this inclusive design, they are elderly [4], [5]. [6] they have conducted research on the needs of inclusive station design elements in India with the aim of increasing passenger capacity from various modes of public transportation. However, this research does not focus on who the user is, but rather to accommodate all users. The public service often chosen by the elderly to carry out the movement or mobilization is the train. PT. KAI provides a special ticket reduction for the elderly by 20% for on-site purchases. Correspondingly, the growth of the elderly in Indonesia has increased to 8.97% of the total population of Indonesia so that the Semarang City government as one of the largest contributors to the number of elderly people in Central Java applies government regulations on the National Strategy in accordance with Law No. 36 of 2009 concerning the retirement of elderly activities so that they remain productive or the Friendly City. In fact, one of the stations in the city of

Semarang, Poncol Station, is far from inclusive. Therefore, the research question arises "what design elements are needed by the elderly with limited balance at Poncol Station?"

## NEEDS OF ELDERLY DESIGN ELEMENT WITH LIMITATIONS

Movements that are dominated by mobilization activities and service rooms which space characteristics are dominated by service activities are also referred to as public service spaces [7]. Stations are an important elements in public service. Because the station is the point where the movement takes a transit of the community movement from origin to destination [8]. An opinion [7] added that the definition of a station as a public service that is explained as that the train station is a public space in the form of a public service mode transfer or interchange space which, in fact, is a private public space. In addition, the train station is a public space that has a focus on integration between modes of transportation, passenger accessibility, passengers and their needs [6].

### Forming Elements of an Inclusive Station Design

Station forming design elements are combination of each design element such as color, line, building mass, space, as well as the value of space requirements and user requirements based on the design rules [9]. This element combines the needs of passengers and the movement of passengers starting from entering the station area both from the transit point of transportation mode and from parking, entering the station building area, to the platform, to entering the train, and vice versa for passengers who want to get off at the station (See Table 1)

**Table 1.** Station Elements and Adaptations

Area	Necessary Adaptation of the Station Design						
<b>Need to consider Area</b>	Spaces or rooms and tools of station equipment that is needed by people with disabilities						
<b>Pre-Area</b>	<ol style="list-style-type: none"> <li>1. Distances between buildings</li> <li>2. Parking spaces providing</li> <li>3. Sidewalk or pavement</li> <li>4. Widely hallways</li> <li>5. Tactile floors installation</li> </ol>						
<b>Inside Train Station Area</b>	<table border="0" style="width: 100%;"> <tr> <td style="text-align: center;"><b>Station Building Area</b></td> <td> <ol style="list-style-type: none"> <li>1. Adopting the entrance from the mode of transfer point, the pedestrian path to the buildings (entrance)</li> <li>2. Providing conveyors for transporting passengers to the station building from the entrance or from the parking lot</li> <li>3. Counters office and information center</li> <li>4. Waiting room</li> <li>5. Tactile surface on the floor or tactile grip</li> <li>6. Special design toilet</li> </ol> </td> </tr> <tr> <td style="text-align: center;"><b>Platform</b></td> <td> <ol style="list-style-type: none"> <li>1. Access via conveyor</li> <li>2. Audio-visual information</li> <li>3. Tactile surface on the floor or tactile grip</li> </ol> </td> </tr> <tr> <td style="text-align: center;"><b>Locomotive and Train</b></td> <td> <ol style="list-style-type: none"> <li>1. Entrance to train</li> <li>2. Special room (elderly, female, people with different abilities)</li> <li>3. Wheelchair storage</li> <li>4. Tactile surface on the floor or tactile grip</li> <li>5. Special toilet design</li> </ol> </td> </tr> </table>	<b>Station Building Area</b>	<ol style="list-style-type: none"> <li>1. Adopting the entrance from the mode of transfer point, the pedestrian path to the buildings (entrance)</li> <li>2. Providing conveyors for transporting passengers to the station building from the entrance or from the parking lot</li> <li>3. Counters office and information center</li> <li>4. Waiting room</li> <li>5. Tactile surface on the floor or tactile grip</li> <li>6. Special design toilet</li> </ol>	<b>Platform</b>	<ol style="list-style-type: none"> <li>1. Access via conveyor</li> <li>2. Audio-visual information</li> <li>3. Tactile surface on the floor or tactile grip</li> </ol>	<b>Locomotive and Train</b>	<ol style="list-style-type: none"> <li>1. Entrance to train</li> <li>2. Special room (elderly, female, people with different abilities)</li> <li>3. Wheelchair storage</li> <li>4. Tactile surface on the floor or tactile grip</li> <li>5. Special toilet design</li> </ol>
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Source: [9]

### The Elderly as Users of an Inclusive Public Service Space

Elderly or people over the age of 60 years are members of the community who are free from occupational status or retirees [10]. Elderly is a human who experienced a decline and changes in physical and physical activity. Meanwhile, according to [11], the elderly in America has a physical condition where there are limitations in the form of vision, movement, hearing and frequency of mobility. The problem that is often faced by people over the age of 60 years is physical health.

According to [12], activity in public spaces can be influenced and decreased levels of activity due to limited movement, poor balance of growth, circulatory disorders, a state of lack of stability in walking and impaired hearing and vision. An explanation of each of these characteristics is as follows:

- **Change of Vision (Visualization)**  
Changes in vision can be seen from the level of focus of the eye that cannot see at close range or farsighted because the lens of the eye is stiff. In addition, the elderly usually require twice the lighting of general lighting, but they are also not too strong to see sharp light [11]. The last point of vision changes is that the perception of color is reduced so they are often difficult to distinguish colors such as purple, blue and green. The elderly tends to more easily understand the bright colors such as yellow to red.
- **Hearing Ability**  
Reduced hearing ability is the ability to hear pure tone so you need hearing aids. Elderly people also find it difficult to distinguish consonant pronunciation from one's words (ch, sh, z). Elderly men are usually more difficult to hear high notes so that the sound created from these high notes produces a hiss in his ear. In addition, the elderly is difficult to hear speeches or instructions that are long and ineffective so they are more likely to listen to information close to the ear slowly [13].
- **Touch, Temperature, Movement and Balance**  
Touch perception is usually the elderly are less sensitive to touch. Elderly people tend to react slowly to body contact with objects so often they do not know that they have pressed a button [14]. In addition, the elderly is sensitive to cold temperatures. Finally, the elderly has weakened muscle strength, causing a decrease in body balance and flexibility.
- **Changes in Memory and Cognition Memory**  
Elderly's memories tend to decrease so they tend to be slow to stimulate a question about their memories. In addition, they are difficult to remember instructions and order of commands in a complex manner because the level of focus is reduced [15].  
Elderly also find it difficult to be in public services, such as when they want to do health – related activities such as both medical and physical needs and general situations they tend to be difficult because the distance and their strength are no longer adequate [4], [10], [11]. The elderly also often has difficulty when they want to enter public service areas such as entering the bus, time to get on the bus, and when on the bus when choosing a bus seat. Usually when on the bus the elderly tends to choose to sit in the back seat because the priority seats have to be folded manually while they are not strong enough to do so. Therefore, the elderly with physical limitations, especially in decreasing movement, really need design elements that can accommodate their movements if in public spaces.

## RESEARCH METHOD

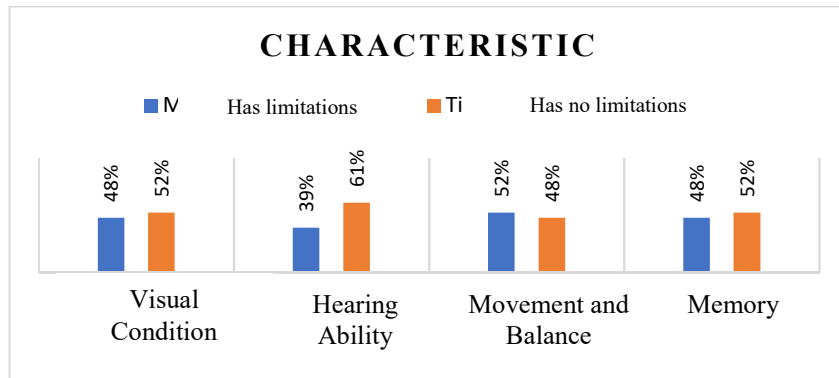
The method used to conduct this research is quantitative methods. Quantitative method was used because these methods are suitable with their characteristics, this method establishes a causal relationship between the concepts which in this study are design concepts that are friendly or inclusive to the needs of the elderly, emphasizing the focus of attention on a particular location by treating its users as research centers where the user is an elderly with physical limitations because it is a type of elderly people whose activities need to be accommodated in accessing a room so as to solidify the results of research that has been done [16].

In describing the results of data collection and comparison of data compilation results used quantitative methods using AHP tools. AHP is a step to change the complex form of qualitative data into quantitative data by modeling the level of importance [17]. The assessment is assisted by the opinions of the station design experts who are inclusive for the elderly and also the expert observer of the elderly regarding alternatives to the design planning that is inclusive for the elderly in formulating the needs of the design elements needed. So that it is expected to be useful for complementing data or by elaborating between user design needs, namely the elderly physical limitations and inclusive design needs according to experts so that the planning of design needs can be in accordance with the needs and availability of space. In addition, the data generated will be more comprehensive and validity more real and quality.

## RESULT AND DISCUSSION

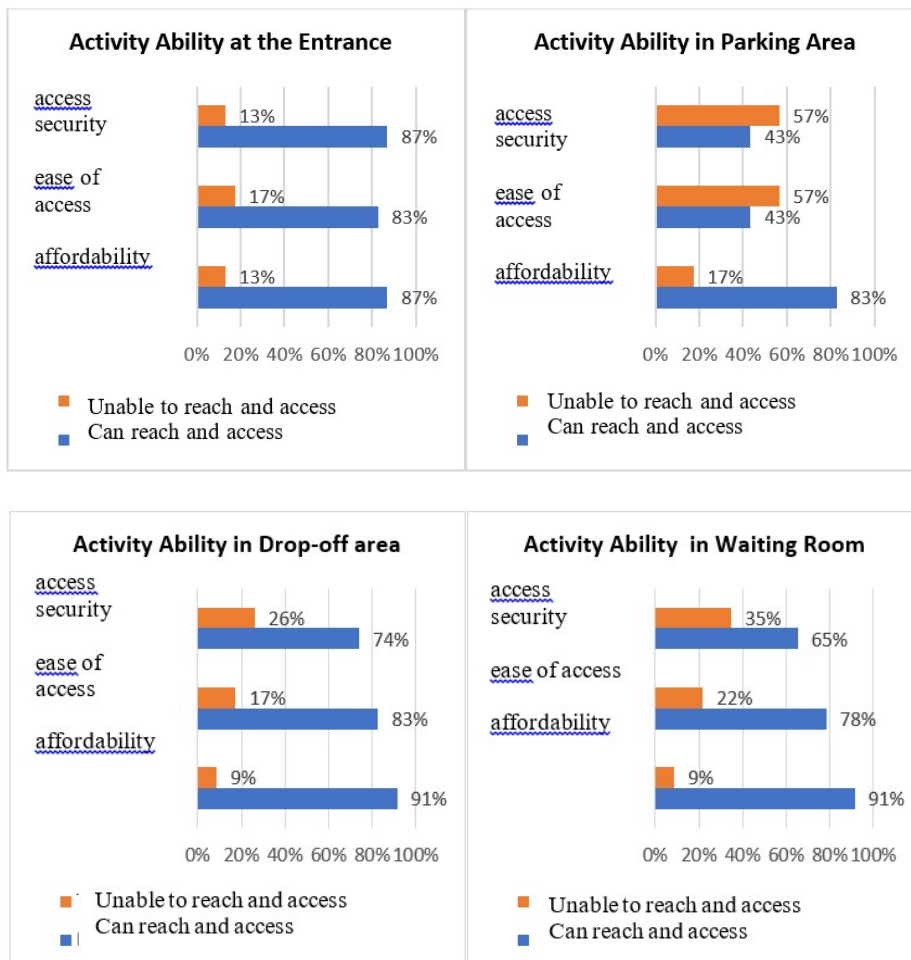
### Tendency of Elderly Limitations in Poncol Stations

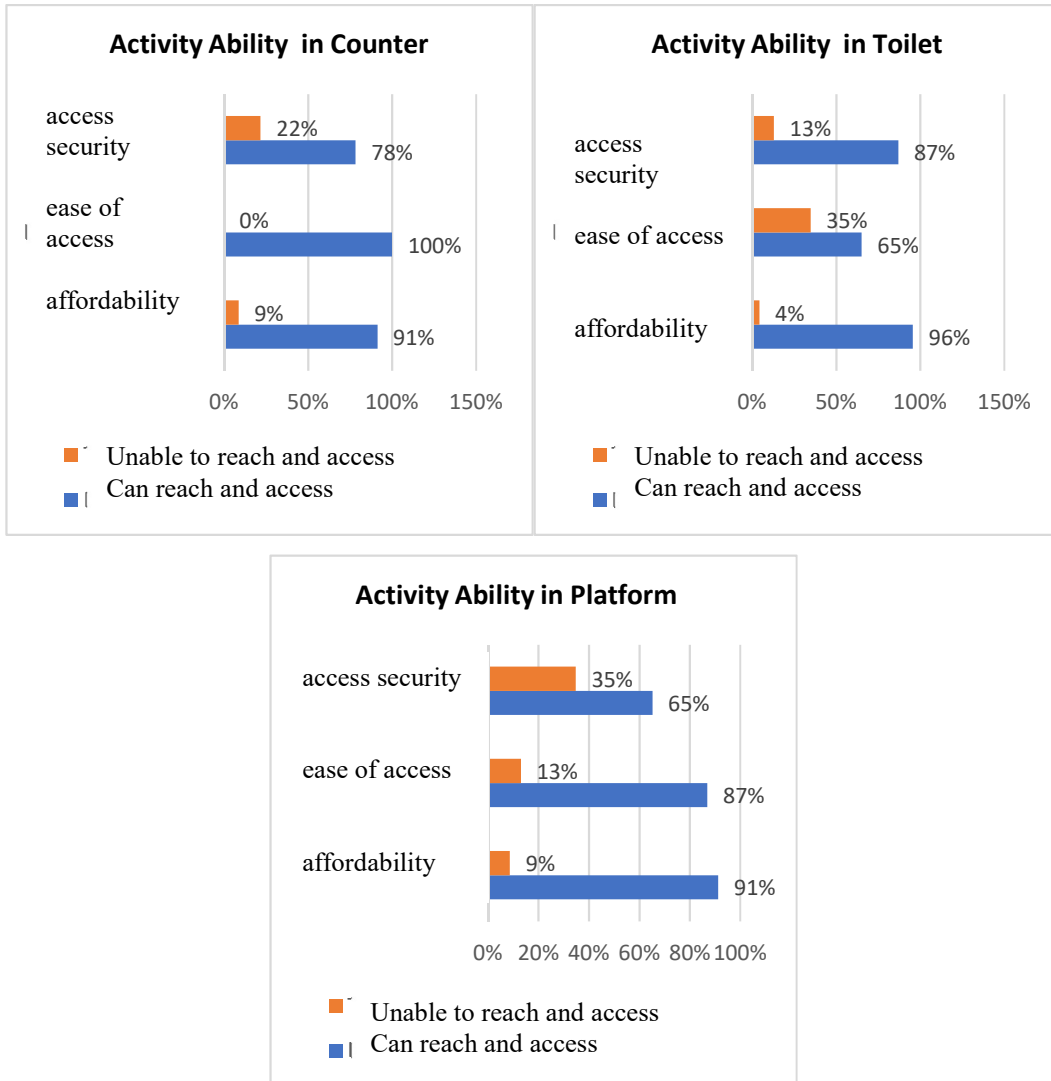
*Physical Characteristics of the Elderly at Poncol Station*



**FIGURE 1.** Physical limitations of the elderly

It can be seen in Figure 1 that the elderly at Poncol Station have a tendency to have only one physical limitation when they are in the public service space. It was said by respondents that 52% of the total respondents of this type have limitations only in the movement and level of balance (Figure 1). As for other levels of limitations such as vision, hearing and memory only a small portion of the number of respondents who feel it. In addition, it can be seen the level of activity capability in each room in Poncol Station from the level of affordability and accessibility to illustrate its activities in Figure 2.





**FIGURE 2.** Ability of Elderly Activities in Poncol Station Public Service Rooms

The need for affordability and accessibility of the elderly in carrying out activities is also felt by the elderly. Figure 4.2 shows a number of spatial elements that these elderly people feel are inaccessible or inaccessible. But for the dominance of the level of access and affordability which according to them is the most difficult is the parking space that is 57% of respondents said they cannot access the space. As for the other elements of space, indeed some say it is difficult to access and reach it, but it does not show the significance of the data.

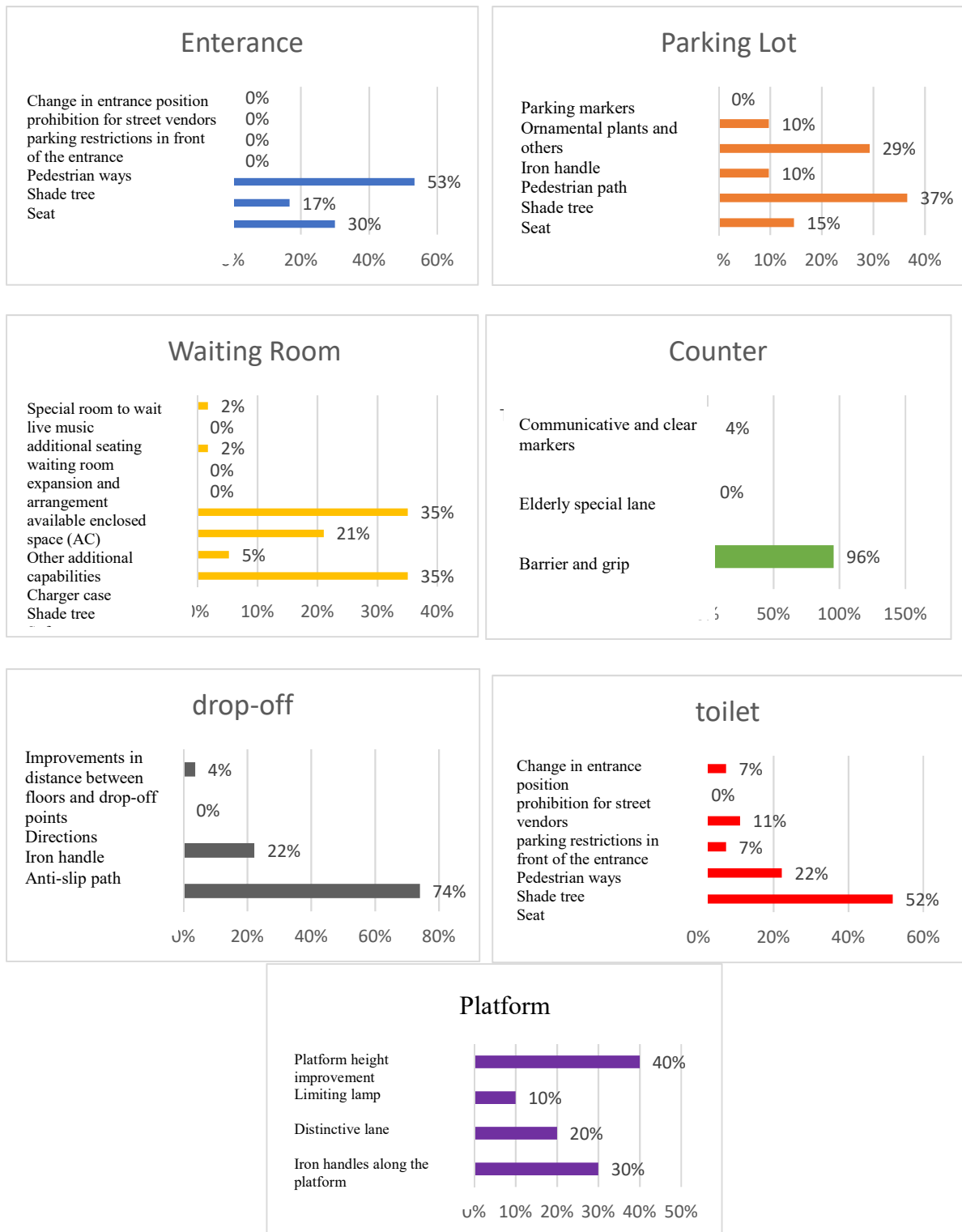
*Tendency in the Characteristics of the Elderly at Poncol Station*

After analyzing the physical characteristics of each elderly based on their activities, the tendency of physical characteristics of each of them is obtained. If formed in the tabulation data, it can be seen in Table 2 that the elderly have their own level of limitations:

**TABLE 2.** Tendency in Physical Limitations of the Elderly in Poncol Station based on their Activity

Physical limitations	Ability	Ease of Access	Security Access
Balance Limitations	Unable to reach	Difficult to access the entrance, parking, toilet and platform	Unsafe Accessing entrances, parking lots, toilets and platforms

## Design Elements Requirement for Elderly in the Poncol Station



**FIGURE 3.** Needs of Elderly Design Elements at Poncol Station

The conclusions which can be drawn from figure 3 are that the needs of design elements according to the elderly at Poncol Station based on their space are as follows:

- The entrance itself has a main point in the addition of design elements: **the addition of a special pedestrian lane**, while the second priority is the availability of parking ban markers in front of the entrance and then the addition of shade trees around the entrance lane.

- Parking space elements that require availability are **shade trees** as the main priority, the second point in the priority of parking availability is the availability of handrails, followed by the third priority namely seating, and the last priority is the availability of pedestrian paths.
- This drop-off design element has a significant amount of data on the availability of facilities namely at the point of the **anti-slip lane** as a top priority for the elderly. Followed by the second priority is the availability of grip iron at this point so that they feel more secure and comfortable getting on and off the vehicle.
- Elderly people need additional **facilities such as TV, massage chairs and others compared to the cell phone charge area** in the waiting room. The last one is the addition of facilities that are considered to create the cooler atmosphere cooler and not hot.
- The need for the availability of counters of the window space significantly indicates the element of **boundaries and special handles in each lane**, this was stated by respondents. While the needs of both are **more communicative or clearer markers** related to schedules, ticket prices, procedures for waiting in line and others.
- In the toilet room, the most required design element is the **availability of a handle iron in the toilet**, followed by written information about the use of clearer toilets, then the improvement of the toilet location or the addition of the toilet because the distance is too distant.
- The need for platform design elements in the first priority is **improvement in platform height to adjust**, followed by a handle iron around the platform, the next is a special lane to feel safe and finally a clear boundary or lamp between the platform and the car.

### Needs for Friendly Design Elements for the Elderly in Poncol Station

The results of the needs of space design elements at the Poncol Station according to the elderly are then assessed by experts both inclusive Station design experts and elderly observer experts using the importance assessment (AHP). After weighting each of the evaluation criteria for the alternative plans here are the needs of the design elements, priority values per criteria in Table 3 are obtained. From table 3, we can see the conclusion per criteria that:

- The need for the most important design element in the ability criteria is the waiting room. According to experts (1) and (2) enter:
- "The elderly are humans who have a vulnerability to balance and level of movement. Therefore, the waiting room in public spaces must be easily accessible if you want to be categorized to be inclusive."
- The point is easy to reach here is that they are not difficult to get to the waiting room from several other points of space in Poncol Station.
- The needs of the most important design elements or priority in the availability criteria are also waiting rooms. This supports the reason that the elderly required the highest availability in the waiting room design element at Poncol Station.
- The final criterion, accessibility, also has the highest value in the waiting room design element. On the grounds that the convenience, safety and comfort of the waiting room are the main points the elderly feel that the station accepts them with the design provided.

TABLE 3. Design Element Requirements Matrix Per Criteria

	Ability	Availability	Accessibility	Final Score	Priority
<b>Entrance</b>	0,0144	0,0013	0,0024	0,0181	7
<b>Parking Lot</b>	0,0288	0,0026	0,0048	0,0362	5
<b>Drop-off</b>	0,0149	0,0014	0,0025	0,0188	6
<b>Waiting Room</b>	0,1764	0,0162	0,0293	0,2219	1
<b>Counter</b>	0,1022	0,0093	0,0170	0,1285	2
<b>Toilet</b>	0,0815	0,0075	0,0136	0,1025	3
<b>Peron</b>	0,0460	0,0042	0,0076	0,0578	4

The last calculation is the multiplication of each criterion with the needs matrix of Poncol Station design elements in order to obtain the level or priority of the needs of Poncol Station design elements so as to create inclusiveness for the elderly. Table 2 illustrates the form of priority trends in the needs of design elements as shown in Figure 4:

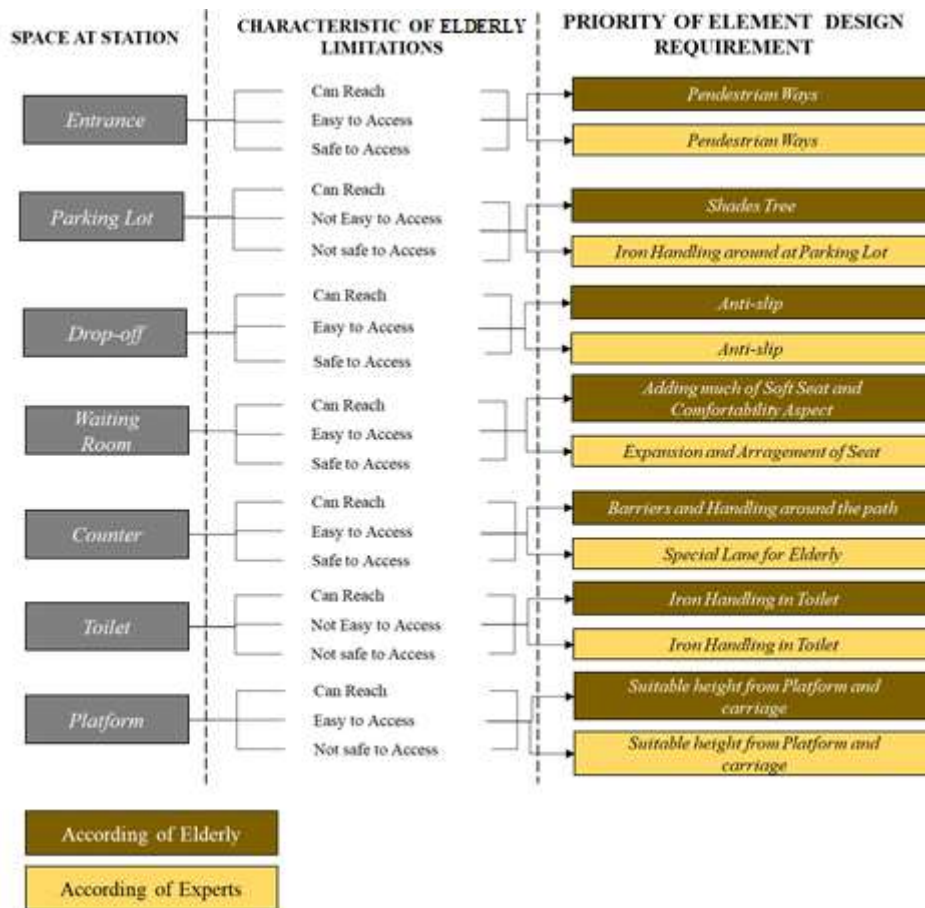


FIGURE 4. The Needs for Elderly Design Elements in Poncol Station

- Priority I in the needs of design elements is **waiting room**, because from the opinion of the level of importance according to the expert in accordance with the criteria of affordability, availability, and accessibility the highest required is waiting room with a final value of 0.2219.
- Priority value II is **counters**, because according to experts when the elderly want to get a reduced ticket they really need an inclusive counter so they can minimize their limitations.
- Priority III is **toilets**. It is also the same as input from experts (1) and (2), that the elderly have a secreted system that has weak muscles so that it requires more removal process. And it must be accommodated in an inclusive space with the principle of reducing the occurrence of things that are dangerous, one of which is by increasing the inclusive value of the toilet.
- Priority IV is **platform**, it is also similar to the two experts entering that the point in the station building that is most common in accidents is platform, so the platform needs to be improved on its inclusive side to accommodate elderly activities, especially for elderly people who have limited movement and balance.
- Priority V is **parking spaces**. Indeed according to the expert (1), elderly activities at this point are rarely found and are often found when the elderly are driving their own vehicle. But seeing the existing conditions of the parking spaces at Poncol Station, the elderly will not feel safe and comfortable while in the room because their design needs are not accommodated at all.
- Priority VI needs of design elements is the **drop-off point**. This is because some elderly people find it difficult to get down from the vehicle that delivered it, especially in the case of the floor which is considered slippery.
- The final priority in the need for design elements of the Poncol Station to be inclusive for the elderly is **the entrance**. The entrance becomes the last priority because the elderly who walk from the first entrance point to the entrance of the station building are only a few and very rarely there but it must be addressed especially in the procurement of pedestrian paths and iron handles.



## CONCLUSION

The needs of the design elements are the limitations. The overall design elements to create an inclusive design for the elderly are the Waiting Room, Toilets, Parking, Entrance and Platform.

Input from experts, both senior observers and inclusive public service design experts, illustrates the importance of the design elements of the Poncol Station. Therefore, it is useful for prioritizing the application of the design elements needed at Poncol Station: Waiting Room, Counter, Toilet, Platform, Space Parking, Drop-Off and Entrance. To conclude, the important design elements of Poncol Station for the elderly are waiting rooms, toilets, platforms and entrances.

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