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IMPLEMENTATION OF WAYFINDING SIGN IN THE ACCESSIBILITY OF SOFTBALL STADIUM IN SURABAYA

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ABSTRACT

A stadium typically consists of one or more large-scale building masses designed to accommodate significant numbers of visitors such as spectators, administrators, and athletes. With a large number of visitors, it needs careful planning of land use due to the extensive area required for stadium construction. Efficient movement within the building is essential, particularly in guiding visitors between spaces. The design for the Surabaya softball stadium spans four floors and occupies a substantial land area. However, a key challenge lies in addressing visitor confusion, especially among spectators, regarding access to different spaces. To mitigate this, effective identification systems, such as signage, are crucial for facilitating navigation within the stadium. The implementation of wayfinding signage serves as a solution to direct users to their desired locations, ensuring smooth movement throughout the facility. Additionally, the organization of space and zoning by function, supported by clear markers, helps prevent cross circulation. Unregulated circulation may lead to congestion at specific points if adequate signage and space designation are lacking. Therefore, providing clear names and directional instructions through wayfinding signs is vital to enhance spatial accessibility and streamline visitor movement within the stadium.

Keywords: ***confusion, softball stadium, wayfinding signs, zoning***

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INTRODUCTION

The Indonesian government will continue to improve sports achievements in all fields or championship sectors in order to achieve more competent human resources in the sports sector. No exception with the cultivation of athletes who have been trained since junior to become professional athletes to compete in all championship competitions, both local and international. However, with the improvement of the quality of human resources in the world of sports, it must also be accompanied by facilities for athletes, coaches and administrators from the associations of each sports field. The main facilities to support athletes can be met by both the government and the private sector in the form of stadiums or training centers that have been built in several regions, both central, provincial, city and district. So that the regeneration of athletes for each region is still maintained for all types of age categories in all sports fields. Existing buildings already show the characteristic of easy access because of the symmetrical shape as a marker for the entrance area (main entrance). However, signage is still needed to guide visitors within the stadium building area, especially in the interior sections. An international standard softball stadium building must be free from cross circulation which causes congestion, both indoor and outdoor (H. A. Putra, 2013). The stadium itself is generally a building that has a large enough scale to accommodate a large number of spectators. Therefore, the stadium must have easy accessibility and clear zoning for all visitors. The circulation flow of space in the stadium building must be clear to avoid the accumulation of visitors. In addition, ease of access is essential, including the use of directional markers to support the movement of visitors before and after a match. Accumulated circulation (cross circulation) is a significant issue that must be addressed through the implementation of wayfinding signs, such as nodes or marker points, to enhance visitor convenience. Many stadiums in Indonesia still do not meet international standards and lack accessible pathways for visitors. This is evident from the insufficient presence of markers or signage to guide users during their movement within the stadium. Furthermore, the placement of these markers in several existing stadiums remains unclear, causing confusion among users. Consequently, incidents of mixed circulation (cross circulation) frequently occur inside stadium buildings. Determination of markers for visitors, especially spectators, needs to be considered according to the zoning and direction of circulation accessibility in the softball stadium building. Using the implementation of wayfinding signs, spectators can clearly see the ease of circulation from the entrance to exiting the stadium after watching a match. Markers will be given or determined based on a study related to the direction of human movement in the building which is based on the pattern of visibility for the reach of the pillars of each space in the stadium. Through the continuation of previous research, it can be seen how a marker (wayfinding sign) can help visitors, especially spectators, avoid accumulation at one point. Clarity in achieving a space must make it easier for visitors (spectators) to achieve connectivity, integrity and clarity of circulation flow (H. A. Putra & Hastorahmanto, 2023).

Interior space always determines the level of comfort of a person when they are in it, so that good spatial arrangement and pattern are the main factors to get maximum effectiveness of interior space. In arranging interior space, it is necessary to pay attention to several characters of the existing space towards the circulation flow of users as space accessors. To achieve an effectiveness of accessibility, it is essential to organize the spatial

layout properly and accurately so that spaces can serve their functions optimally (Purnomo et al., n.d.). The effectiveness of space arrangement can be assessed through various perspectives, including functional perception, visual perception, and structural perspective (Zahnd & Frick, 2009). The layout of spaces and furniture should ensure maximum comfort, even within the constraints of limited space (G. H. Putra, 2014). To create a positive impression of spatial design, proportions must be considered both horizontally and vertically (G. H. Putra, 2014). Additionally, interior spaces should provide clarity and convenience for users, particularly in public buildings with large capacities. Instructions must be presented in each user access area to facilitate mobility while in the building. The realization of perfection for maximum user movement space can be realized through the development of the shape and size of the space, the mass of the building is managed and the appearance of the building facade (Hendarto et al., n.d.). Every human movement is always directed to achieve the desired goal both in open spaces and when in indoor spaces. Wayfinding signage refers to information systems that help create mental maps, guiding and assisting human movement from one place to another with greater clarity. This is especially important and highly suitable for public buildings with a large number of visitors. The use of signage can provide an effective solution to address irregular circulation flows by directing spatial movement efficiently (Novianti et al., 2021). Improvements to the simulation to remember a location can be given additional architectural and interior elements to make it easy to remember in finding the way or orientation (Tanuwidjaja et al., 2015). The correct wayfinding signage system can provide an entity to visitors as a good guide so that it can create good or bad perceptions (Pricilia et al., 2023). Uniformity in a marker (color application, material application and font application) for the process of finding a way is a must to be applied to facilitate the search (Minggra, 2020). There are several types of information identification that are included in the group including identification signs, directional signs, warning signs, regulatory and prohibitory signs, and operatory signs (Minggra, 2020). Identification signs mean instructions that identify a place in an area with reference to where visitors or the public have been in the area. Directional signs are directions that are not in the actual location and are generally located separately from the actual location. The purpose of this marker is to direct people in mobility movements in various directions according to the goals of each visitor. Warning signs are markers to provide information about dangers related to safety procedures at a point in the area. This type of marker can also be used in closed indoor areas. Regulatory and prohibitory signs are intended to regulate and prohibit people from carrying out certain behaviors in an area/location. Operatory signs, namely this marker, are a large part of the information that explains the overall paths in a space in a building so that it is easy to see in detail and takes time to understand.

A circulation path that can work optimally needs to have 4 criteria as a fulfillment of the approach, including pathways, edges, districts and landmarks. (Dwitayana, 2023). Sign systems can optimize information as additional media to strengthen existing main media (MAHARIAN AGUNG et al., 2018). The design and aesthetics of signage must be good and attractive to be easily understood and conveyed well because signage itself is part of wayfinding which plays a role in providing instructions and improving the circulation flow system (Tjhin, 2019). The use of an integrated wayfinding sign system can be a design

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empathy in a designed building (Hariyanto et al., 2012). The effectiveness of circulation in a building will be reflected in the form of signage in the form of visual graphics, pictograms and information signs (Azis et al., 2021). Ease of maneuvering for visitors while in the area inside the building is very important to consider so that there is no accumulation at one point in the area that can cause stress. Cross circulation should be avoided, and appropriate zoning adjustments must be implemented to prevent overlap with other visitor activities. Individualistic and collective circulation can provide convenience for users in finding their way in a new environment or building (Iftikhar et al., 2020). The use of markers in an environment or space in a building can increase the rate of circulation and reduce errors in taking paths (O'Neill, 1991). Visitors in buildings prefer wide and large circulation paths and rely on existing directional signs (Vilar et al., 2014).

METHODS

The stadium building is expected to be able to provide a level of comfort and safety for visitors, especially for the spectators. The space for movement in the stadium building must be considered in relation to the size and length as well as the direction of a circulation path to match the capacity and size that can accommodate a large number of people. If a circulation path cannot accommodate a large number of visitors, there will be confusion of direction and misunderstanding of visitors in reaching between spaces. Another thing is if there is a buildup of spectators due to the time coinciding with the match, either on a local or international championship scale. The buildup must be addressed by ensuring ease of movement for spectator accessibility, starting from entering the stadium to their activities during the match. However, particular attention must be given to audience behavior, as the simultaneous movement of spectators within the stadium typically occurs after the match ends. This should be a primary focus to ensure that spectator mobility can be managed and dispersed efficiently in a short time. The softball stadium building serves as the research object, based on the researcher's design, which was further developed for the placement of signage points. These points utilize wayfinding signs positioned at key areas identified as meeting points through space syntax analysis and isovist polygons.

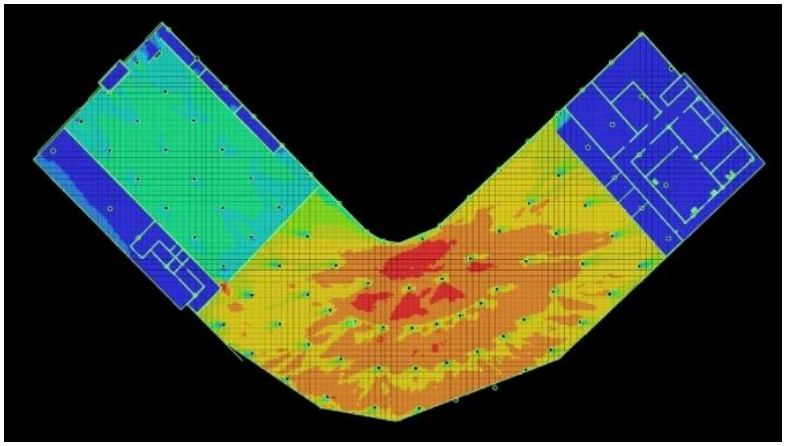

Figure 1. User connectivity density points (in red) on the 1st floor plan of the softball stadium
Source: H. A. Putra & Hastorahmanto, (2023).

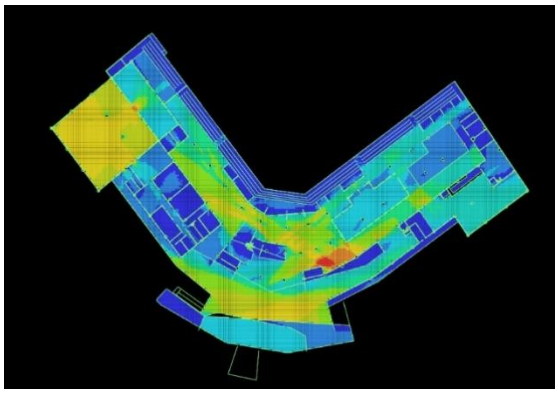

Figure 2. Connectivity density points (red) for users on the 2nd floor plan of the softball stadium
Source: H. A. Putra & Hastorahmanto, (2023).

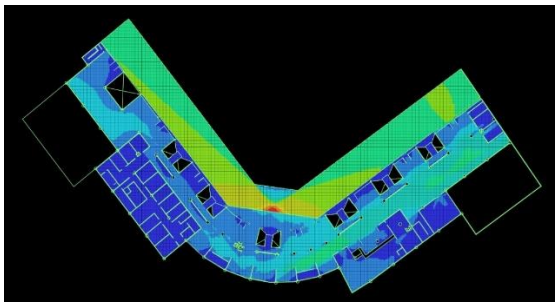

Figure 3. Connectivity density points (red) for users on the 3rd floor plan of the softball stadium
Source: H. A. Putra & Hastorahmanto, (2023).

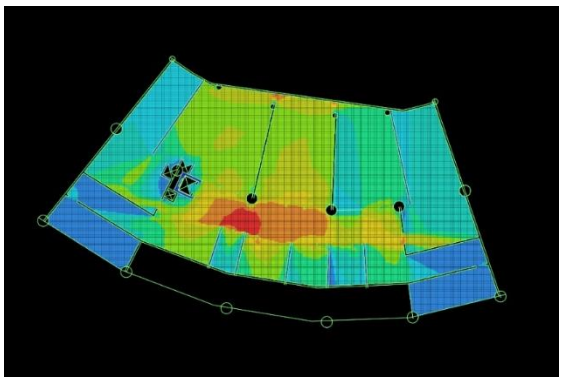

Figure 4. Connectivity density points (red) for users on the 4th floor plan of the softball stadium
Source: H. A. Putra & Hastorahmanto, (2023).

To support all of these conveniences, further research can be carried out from the results of space syntax and isovist polygons to then determine the location of the direction of the signage at several points in the room to facilitate the audience. The application of the wayfinding sign method is very necessary in analyzing the direction or circulation of the right corridor road to be passed by the audience as the main accessibility route. This signage needs to be applied and placed in the area from the main entrance to the exit indicator from the stadium building. In general, the form of this marker will be shown in the form of nodes for several directions of the stadium corridor circulation path which are then described qualitatively by the type of the marker. So that with the existence of these markers, it is hoped that the audience can know the location of the existing spaces and be able to access them quickly while in the stadium to avoid congestion.

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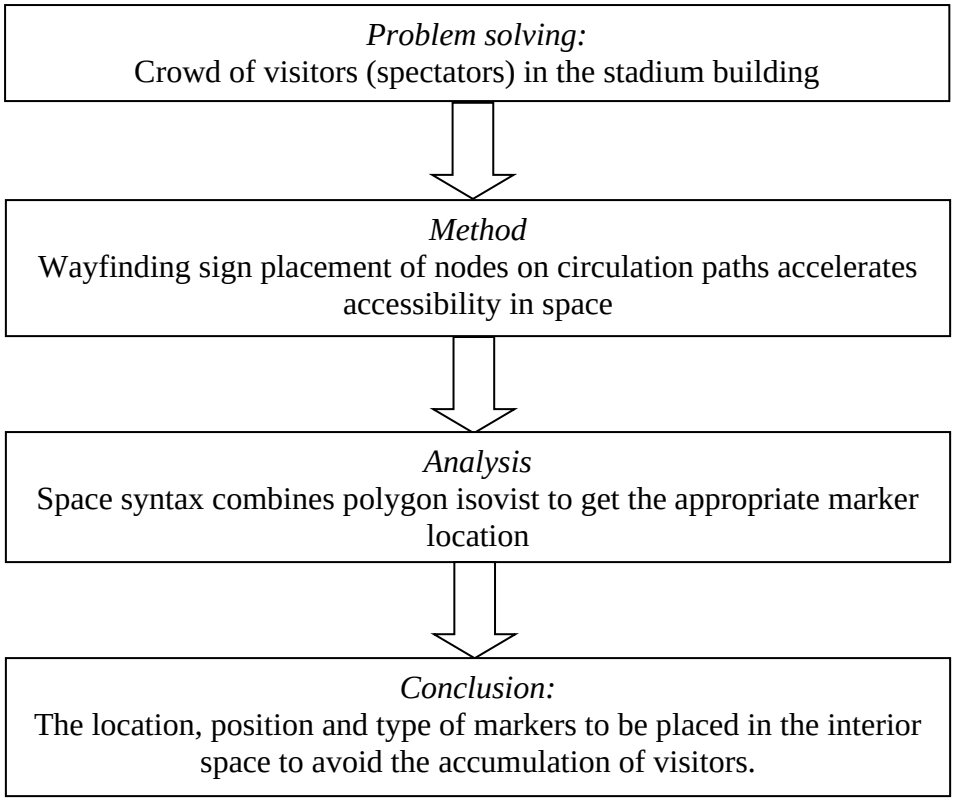

Figure 5. Design process
Source: Rowe, (1991).

RESULTS AND DISCUSSION

Wayfinding Sign

The function of the stadium is a building that can accommodate a large number of users used to watch a sports match. In addition, the stadium must also be able to accommodate all users according to their respective functions which are based on each zone. The softball stadium building has a capacity of 3000 spectator seats so it is expected that special handling is needed to avoid user congestion while in the indoor area. Given the density and number of spectators during a fully attended softball match, the building is expected to provide clear and accurate directional signage in key areas. The provision of these signs is intended to provide ease of movement for user accessibility while inside the softball stadium building so that it is easy and fast and can remember the direction and purpose of the space to be achieved. The movement of human mobility in the softball stadium building space must be based on effectiveness and as an architectural element that gives rise to a certain entity. In its arrangement, it must be standardized and have special characteristics so that it can be easily recognized and not confuse users while inside the softball stadium building. This uniformity is expected to make it easier for users/visitors to access existing spaces and create a mental map. Wayfinding signs are also able to direct the user's orientation in choosing the direction to go to the desired destination. Based on

that, the sign is made based on the isovist polygon points related to the user's viewing distance for each floor, so that the shape, character and color of the sign and the direction of the desired space will be known. This sign will also be adjusted to the connectivity point in relation to the relationship between spaces. On the 1st floor (ground) of the softball stadium, in general, it is a space in the form of a parking lot and service area (mechanical electrical). In addition, this floor is also dominated by vehicle circulation routes that connect one space to another so that the sign for the direction of the entrance (foyer) to the ticketing section really needs to be given a signpost. Audience accessibility begins after they park their vehicles, whether motorbikes or cars, and proceed to the second floor (upper level) using the escalator provided in the parking area. At this point, directional signs are given as a reminder and direction for the audience to walk towards the escalator. The placement of these directional signs is in the vehicle parking area that has been provided because it is quite far from the entrance area (foyer). Meanwhile, the foyer area which is part of the vertical circulation in the form of an escalator is given identification signs showing an image of an escalator. Given the large number of parking lots, both for cars and motorbikes, a sign becomes a must as an architectural part to reduce density and confusion. In addition, there is also a warning sign that indicates the service zoning, where not everyone can enter this area so that it is private. The provision of these warning signs is seen from the viewing distance (polygon isovist) where the audience can see directly and the walls are adjacent to these spaces so that a sign is needed as an appeal regarding all types of spaces in the service zone. The height of the space in the softball stadium building is 3 meters so that the user's visibility can still be easily reached and seen based on the height between spaces. In addition, the distance between one space and another has a multiple of the module between buildings with a distance of 8 meters to 10 meters. So that the visibility based on the distance between spaces is still fulfilled for users.

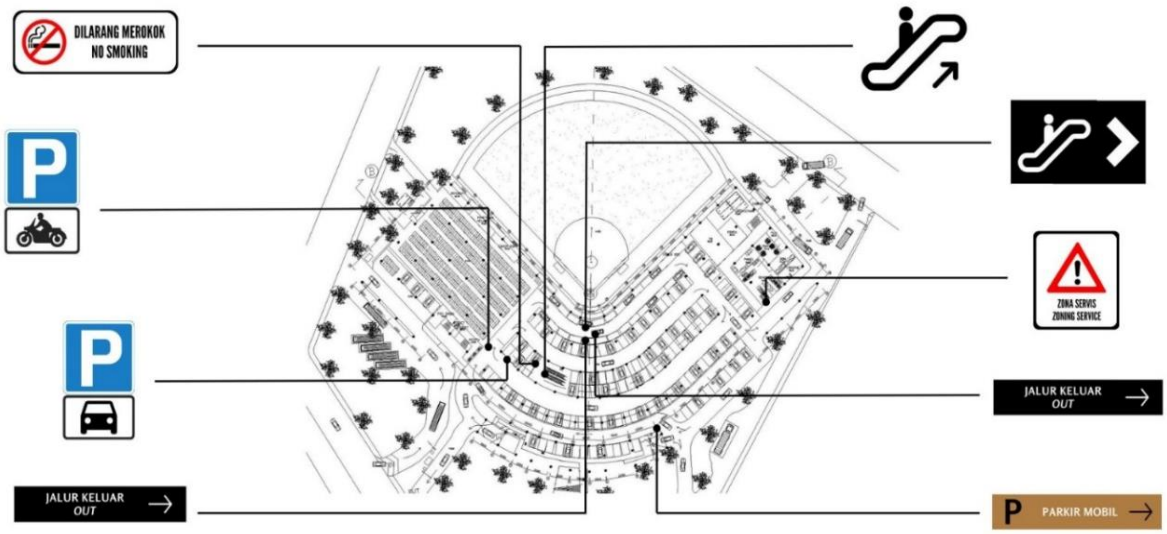

Figure 6. Placement of floor plan signage 1
Source: Research team, (2024).

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Table 1. Floor 1 sign identification

Sign Type	Sign Characteristics	Sign Location	Sign Function
Exit path (Out)	Directional signs	Car park	Directions so that vehicles (cars) can immediately exit the building quickly to reduce congestion in the 1st floor area.
Car park	Directional signs and Identification signs	Entrance to the car park	Directions for spectators to know the location of the parking area/lot that has been provided
Escalator	Directional signs and Identification signs	Car park and escalator foyer	Directional signs that show and direct the audience quickly to go up to the 2nd floor
Motorcycle parking	Identification signs	Car park entrance	Directions to differentiate between car and motorbike parking areas
No Smoking	Warning signs	Escalator Foyer	Directional signs indicating entry into a closed room with the use of active ventilation
Service zone	Warning signs	Generator room and car park	Directional signs to inform the audience as the area is restricted to everyone.

Source: Research team, (2024).

Each floor of the softball stadium building is required to have acceleration in terms of visitor accessibility, especially the movement of spectators both before and after watching the match. The direction of the sign on the 2nd floor is also seen from the main point of view through density and connectivity to help spectators reach their desired room destination. Spectators will head to the ticketing zone before entering the gate inspection section in the main stadium room. This point will require spectators to choose and go to the desired rooms, especially towards the stands. The sign will be placed at the right point where in the gate inspection area in the form of the direction of the stands, dining room, gallery, toilet, retail/tenant and softball games area. This marker falls under the category of directional signs, designed to assist spectators in selecting their desired destination room. Meanwhile, for each of the above rooms, identification signs are provided that make it clearer from the intended destination room. In addition, on this floor, regulatory signs are also provided for several areas as a reminder for spectators and other visitors regarding the prohibitions and provisions that apply when and while in the softball stadium building.

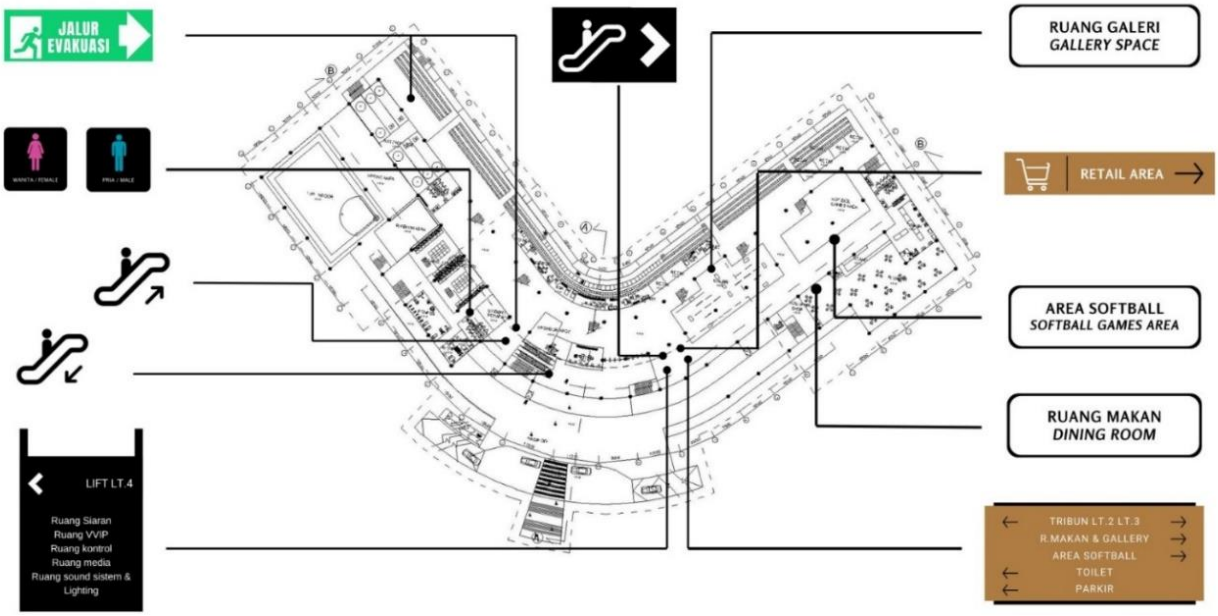

Figure 7. Placing the 2nd floor plan signage
Source: Research team, (2024).

Table 2. Floor 2 sign identification

Sign Type	Sign Characteristics	Sign Location	Sign Function
Evacuation Route	Directional signs	Spectator stands	Directional signs that make it easier for spectators to exit the stands/stadium building quickly if something undesirable happens.
Toilet	Directional signs and Identification signs	Gate ticketing area inspection corridor and bathroom	Directional signs to quickly break up the audience who want to go to the toilet to avoid crowding at one point in the area.
Escalator	Directional signs and Identification signs	Indoor corridor and escalator foyer	Directional signs that show and direct the audience quickly to go up to the 3rd floor or down to the 1st floor
Park	Directional signs	Indoor Corridor	Directional signs directing viewers to the car and motorbike parking area.

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Sign Type	Sign Characteristics	Sign Location	Sign Function
Lift to 4th floor	Directional signs	Indoor Corridor	Directions for VVIP guests, management and match organizing committee to go directly to the 4th floor using the lift
2nd and 3rd floor stands	Directional signs	Indoor corridor and escalator foyer	Directions provided for spectators to access the sheet on the grandstand floor correspond to those printed on the match ticket.
Dining room	Directional signs and Identification signs	Gate ticketing area inspection corridor and dining room	Directions and signage to make it easier for spectators to access the dining room before, during and after softball games
Softball games area	Directional signs and Identification signs	Gate ticketing area inspection corridor and softball games area	Directions and signs for spectators who will access the softball games area to practice their skills in hitting and throwing the ball.
Retail area	Directional signs	Gate ticketing area inspection corridor	Directions for the audience who will enjoy and purchase goods in the retail area are provided.
Gallery space	Directional signs and Identification signs	Gate ticketing area inspection corridor and gallery space	Directions and signs for all spectators or other stadium users to access the gallery/exhibition space regarding the sport of softball

Source: Research team, (2024).

Stadiums are typically characterized by the presence of stands and fields as the main spaces for watching a match. The stands are usually positioned along the side and parallel to the field to ensure optimal viewing. This design ensures that the stands face the field at

an appropriate angle, allowing the audience to comfortably watch the match. In terms of visibility and connectivity, the highest concentration occurs in the spectator stands area, centered around the corner of the tribune triangle. At this point, it is necessary to provide a marker (sign) in the form of directional signs that indicate the direction of the order of the tribune seats, exiting the stands and for accessibility to the supporting spaces on the 2nd floor. With these markers, it is expected that spectators in the stands will easily understand their seating positions when watching a softball match. Additionally, spectators will be able to quickly exit the stands after the match, preventing congestion within the building. The exit from the stands should also be clearly marked with exit signs, serving as identification markers to guide spectators in leaving the stadium and heading to outdoor areas such as the parking lot or stadium grounds. Identification signs are further reinforced by placing codes and seat numbers in each zone or section of the stands, matching the information printed on each spectator's ticket.

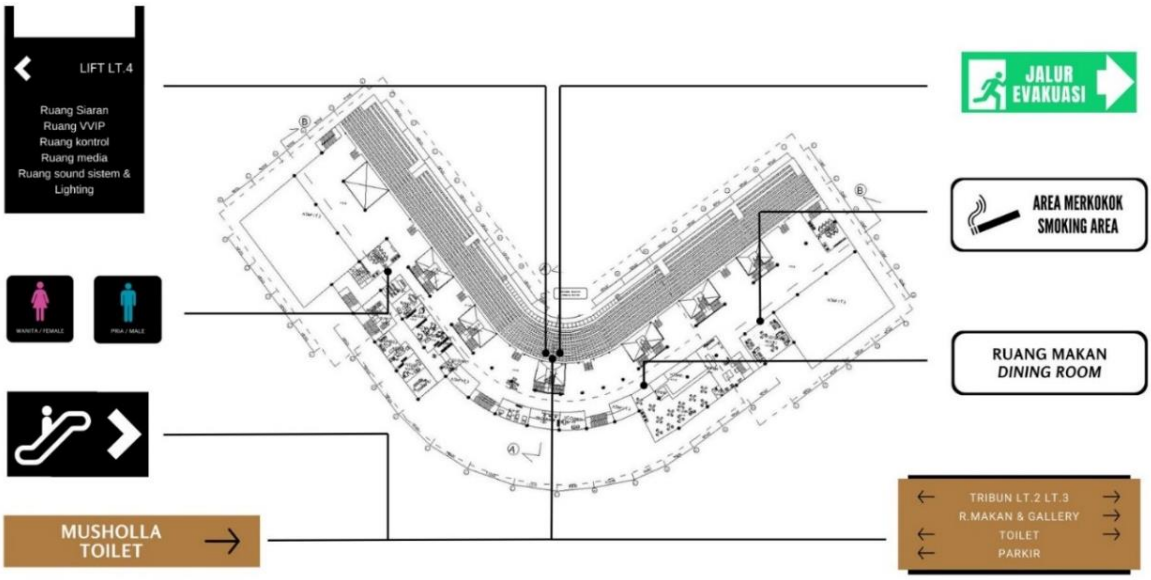

Figure 8. Placement of floor plan signage 3
Source: Research team, (2024).

Table 3. Floor 3 sign identification

Sign Type	Sign Characteristics	Sign Location	Sign Function
Evacuation Route	Directional signs	Spectator grandstand and stair access	Directional signs that make it easier for spectators to exit the stands/stadium building quickly if something undesirable happens.
Toilet	Directional signs and Identification signs	Indoor corridor near circulation stairs and toilet area	Directional signs to quickly break up the audience who want to go to the toilet to avoid crowding at one point in the area.

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Sign Type	Sign Characteristics	Sign Location	Sign Function
Escalator	Directional signs and Identification signs	Indoor corridor and escalator foyer	Directional signs that show and direct the audience quickly to go up to the 3rd floor or down to the 1st floor
Park	Directional signs	Indoor corridor near circulation stairs	Directional signs directing viewers to the car and motorbike parking area.
Lift to 4th floor	Directional signs	Indoor corridor near circulation stairs	Directions for VVIP guests, management and match organizing committee to go directly to the 4th floor using the lift
2nd and 3rd floor stands	Directional signs	Indoor corridor near circulation stairs	Directions provided for spectators to access the sheet on the grandstand floor correspond to those printed on the match ticket.
Musholla	Directional signs	Indoor corridor near circulation stairs	Directions for spectators who want to take a break to worship before, during and after the softball game
Dining room	Directional signs and Identification signs	Indoor corridor near circulation stairs and dining area	Directions and signage to make it easier for spectators to access the dining room before, during and after softball games
Smoking area	Warning signs	Indoor Corridor	Markers for spectators and all stadium users regarding areas/points where smoking is permitted while inside the stadium building.

Source: Research team, (2024).

It is a private zone or designated for VVIP guests and a broadcast area (AV broadcast room), the 4th floor has a small number of rooms and floor sizes compared to the three floors below it. In addition, this floor is also the top floor of the softball stadium building. On this floor there is a special main access in the form of a lift that starts from the 2nd floor directly to the 4th floor. The location of the sign needs to be provided in the front

area of the lift which can help VVIP guests or officers/organizing committees in watching and monitoring the progress of a match. Directional signs are placed right in front of the lift area by providing directions to several types of rooms such as broadcast/commentator rooms, bathrooms, VVIP rooms, emergency stairs, control rooms, media rooms, sound system rooms and lighting. Each of these rooms is also given a marker in the form of identification signs which are used to strengthen and find out in detail the position of these rooms.

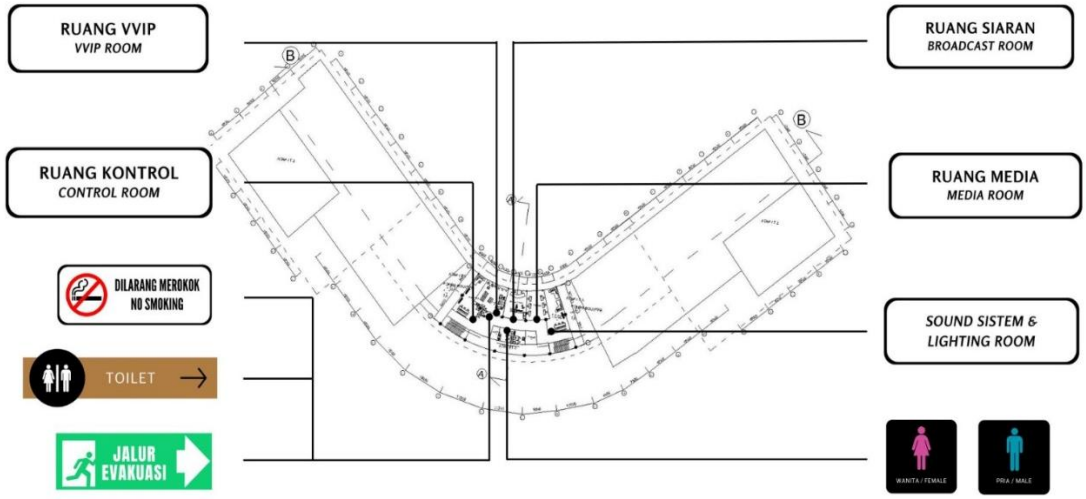

Figure 9. Placement of floor plan signage 4
Source: Research team, (2024).

Table 4. Floor 4 sign identification

Sign Type	Sign Characteristics	Sign Location	Sign Function
Evacuation route	Directional signs	Indoor Corridor	Directional signs that make it easier for spectators to exit the stands/stadium building quickly if something undesirable happens.
Toilet	Directional signs and Identification signs	Interior corridor and toilet area	Directional signs to quickly break up the audience who want to go to the toilet to avoid crowding at one point in the area.
VVIP Room	Identification signs	VVIP room area	Special room marker for VVIP guests
Control room	Identification signs	Control room area	Room markers for organizers and committees in controlling a match

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Sign Type	Sign Characteristics	Sign Location	Sign Function
Ruang siaran	Identification signs	Broadcast room area	Room markers for presenters and match commentators in live TV broadcast status
Media room	Identification signs	Media room area	Room markers for reporters and mass media in conducting softball match press conferences
Sound system & lighting room	Identification signs	Sound system & lighting room area	Room markers for stadium managers and officers in managing the entire sound system & lighting during the match.
No Smoking	Warning signs	Interior space corridor	Directional signs indicating that you are in a closed room using active ventilation

Source: Research team, (2024).

All spaces presented and given markers are expected to be able to guide visitors, especially spectators, to carry out all activities while inside the softball stadium building. The movement pattern guides the audience to find and look for markers that have been provided with the aim of each intended space. Wayfinding is a benchmark for ease and effectiveness of accessibility for spectators by considering functional perception, visual perception and structural perception. In addition, wayfinding signs are able to provide simulations of spatial circulation direction so that there is no accumulation in large numbers which results in density in the space inside the softball stadium building.

CONCLUSION

The softball stadium building has a large floor area and wide access coverage. This requires spectators to move quickly within the building to avoid congestion. Density within the building can hinder wayfinding, making it essential to prevent disorientation. Directional markers will help accelerate movement patterns within the stadium, particularly in terms of accessibility within the indoor areas. These signs will indicate the direction and destination of each floor, based on the users' needs. Since these markers are not located at the actual destinations, clear direction is necessary to assist visitors. Therefore, directional signs will be strategically placed at key points, identified through the connectivity levels and highest density areas of each floor. The signboard also functions to analyze visitors and provide memories related to the direction of movement and destination. Achievement at each point of space will be met with the type of identification signs where visitors will know the existing spaces and have arrived at the desired

destination. This type of marker is generally placed right in the area of the space, visitors can immediately respond and recognize the shape and character of each existing space. The creation of identification signs is combined with images and writing to make it easier for visitors to identify the space or other elements. In addition to these two types of markers, warning signs also need to be made and placed at several points in certain areas because they are related to the function that is more than the space. So that the characteristics of the markers for warning signs are placed in spaces that contain appeals in the form of prohibitions because the space has special characteristics. A softball stadium is a type of building with a general function that has a fairly large area so that the type of use of directional signs, identification signs, and warning signs must be present and installed in this building. Wayfinding signs will be easily recognized if all types of main markers are available that can provide direction assistance to visitors. In general, the placement of signs or wayfinding signs is in the main circulation area for visitors such as corridors, public spaces, and spaces that have a shared function (communal). All markers are placed with the intention of making it easier for visitors to move around in the building without any accumulation at one point in the space area, especially before and after the softball match is held.

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