SINEKTIKA Jurnal Arsitektur

p-ISSN: 1411-8912
e-ISSN: 2714-6251
http://journals.ums.ac.id/index.php/sinektika

IDENTIFICATION OF FEEDER STATION INTERIOR WAYFINDING ELEMENTS BASED ON UNIVERSAL DESIGN THROUGH SYSTEMATIC LITERATURE REVIEW

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History of the manuscript:
Manuscript submitted August 21, 2025
Final manuscript accepted January 17, 2026

ABSTRACT
Feeder Train Services serve as a strategic solution in strengthening connectivity between KCJB main stations and urban areas such as Bandung and Cimahi. This study aims to analyze the evaluation methods or conditions of universal design-based interior wayfinding elements applied at Jakarta-Bandung Fast Train (KCJB) feeder stations. This study uses a Systematic Literature Review (SLR) approach with a descriptive qualitative design to identify universal design-based interior wayfinding elements at feeder stations by analyzing academic articles and grey literature from the Scopus and Google Scholar databases between 2021 and 2025. This study describes the regulations and standardization of interior wayfinding components at train stations by reviewing visual, technical, and spatial elements. The results of the literature review show that the evaluation of wayfinding implementation can be done through direct observation and questionnaires for users. This wayfinding evaluation needs to be applied, especially on feeder trains, which will effectively improve user movement efficiency, safety, and overall travel experience, as well as strengthen the integration of public transportation services in metropolitan areas. Furthermore, the literature review also emphasizes that the integration of conceptual evaluation and technical standards in wayfinding is crucial to improve user orientation, accessibility, and travel efficiency, thereby supporting safety and multimodal connectivity at KCJB feeder stations.

KEYWORDS: feeder train, KCJB, train station, universal design, wayfinding

Layanan Kereta Api (KA) Feeder hadir sebagai solusi strategis dalam memperkuat konektivitas antar stasiun utama KCJB dan kawasan perkotaan seperti Bandung dan Cimahi. Penelitian ini bertujuan untuk menganalisis cara evaluasi atau dari kondisi elemen-elemen wayfinding interior berbasis desain universal yang diterapkan pada stasiun-stasiun feeder Kereta Cepat Jakarta-Bandung (KCJB). Penelitian ini menggunakan pendekatan Systematic Literature Review (SLR) dengan desain kualitatif deskriptif untuk mengidentifikasi elemen wayfinding interior berbasis desain universal pada stasiun feeder, dengan menganalisis artikel akademik dan grey literature dari database Scopus dan Google Scholar antara 2021–2025. Studi ini memaparkan regulasi, standarisasi komponen dari wayfinding interior pada stasiun kereta dengan meninjau elemen visual, teknis, dan spasial. Hasil dari literatur review menunjukkan bahwa evaluasi penerapan wayfinding dapat dilakukan dengan observasi secara langsung hingga kuesioner untuk pengguna. Evaluasi wayfinding ini perlu diterapkan khususnya pada kereta api feeder yang mana akan berimplikasi dengan efektif meningkatkan efisiensi pergerakan pengguna, keselamatan, dan pengalaman perjalanan secara keseluruhan, serta memperkuat integrasi layanan transportasi publik di wilayah metropolitan. Selain itu, tinjauan literatur juga menegaskan bahwa integrasi antara evaluasi konseptual dan standar teknis dalam wayfinding sangat penting untuk meningkatkan orientasi pengguna, aksesibilitas, serta efisiensi perjalanan, sehingga mendukung keselamatan dan konektivitas multimoda pada stasiun feeder KCJB.

KATA KUNCI: *kereta feeder, KCJB, stasiun kereta, desain universal, penunjuk arah*

INTRODUCTION

In an era of rapidly growing urbanization, public transportation systems play a crucial role in the mobility of urban communities (Hidayati, 2021). One important component of this transportation system is the existence of feeder stations, which are tasked with connecting residential areas with major transportation hubs. Feeder stations not only function as transit points, but also as public spaces that must be able to accommodate the various needs of users from diverse backgrounds, ages, and physical abilities (Pusparini et al., 2022). However, even though it is only a feeder station, the transportation public area should have good directions for passengers.

Wayfinding is a person's ability to understand and navigate space efficiently and intuitively (Nisa & Martiningrum, 2022). In public transportation environments such as feeder stations, an effective wayfinding system determines the smooth movement,

comfort, and even safety of users (Azis et al., 2021). Failure to design an adequate wayfinding system can lead to disorientation, stress, and accidents, especially for vulnerable groups such as the elderly, people with disabilities, and children.

Universal design is a design approach that aims to create products and environments that can be used by all people as far as possible, without the need for adaptations or special designs (Nielsen & Landa-Mata, 2025). These principles include flexibility of use, simplicity and intuition, accessible perception by multiple senses, and tolerance of error. When universal design principles are applied in the context of interior wayfinding at feeder stations, the result is a navigation system that is not only functionally effective, but also empathetic to the needs of all users (Leffel, 2020).

Furthermore, the importance of integration between universal design and wayfinding in the context of public transportation is not only related to functional aspects, but also closely related to the values of social justice, human rights, and sustainable development (Prandi et al., 2023). An inclusive transportation system reflects a commitment to the achievement of the Sustainable Development Goals (SDGs), especially point 11 which emphasizes the importance of inclusive, safe, resilient and sustainable cities and settlements (Sulasminingsih et al., 2024). Therefore, station signage should have significant social implications in supporting mobility and accessibility for all levels of society.

According to Wilkinson in Aurelia et al. (2020) there are a number of design recommendations aimed at improving the smooth movement of passengers at the station. Some important elements that must be considered include access, information and signage systems, gates, vertical movement facilities, platforms, concourse areas, and the characteristics of the train itself.

Figure 1. Key Elements of Wayfinding
(Source: Aurelia et al., 2020)

Table 1. Better Passenger Flow

Station Elements	Design Recommendation Summary
Overall Station	Systems Led Design: Integration Connects with Local Streets and Parking.
Entrances	Location Of Entrances in Relation to Local Streets. Multiple Entrances.
Signage/Messaging	Real Time Displays of Train Arrivals. Location And Distribution of Signs on Platform to Avoid Overcrowding. Visual Displays and Audible Instruction for Boarding and Alighting.
Gates	Replace Turnstile with Smart Cards/ Cashless Payment/ Tap Cards.
Vertical Movement Elements	Appropriate Location, Variable Escalator Flows, Escalator Sensors.
Platforms	Elimination Of Obstacles and Blind Spots. Column Free Design. Platform Screen Doors.
Concourse	Arrangement Of Surface and Lift/ Escalator Arrangements. Careful Planning of Ticket Purchasing Location.
Train Factors	Longitudinal Versus Traverse Seating. Number Of Doors Per Car.

(Source: Aurelia et al., 2020)

The user's experience in the station space is greatly influenced by his ability to understand and interpret the directional elements (Nugraha & Zuhri, 2022). All of these elements, when designed with universal design principles in mind, make it easier for users to make navigation decisions without having to experience confusion or dependence on others. For example, the use of clear and familiar symbols can help users who have limitations in reading text; the selection of high color contrast can help individuals with visual impairments; and the availability of ramps and rest areas support the mobility of elderly or wheelchair users (García-Catalá et al., 2022).

Furthermore, Goh in Aurelia et al. (2020) explain that wayfinding design in station interiors can be divided into four main elements: space impression, light, color, and visual. The impression of space includes a distinctive station architectural identity and can be influenced by local culture, creating landmarks and meeting points that support user orientation. The impression of light is realized through consistent artificial lighting on the ceiling, guiding the direction of

movement naturally while adding visual comfort. Meanwhile, a consistent sense of color, combined with signage and announcements, acts as a visual confirmation of passenger destinations, and creates an intuitive atmosphere. Finally, visual impressions through signage design and architectural features provide important information at decision-making points, making station interiors not only functional but also pleasant and informative for users.

From the user's perspective, the success of a wayfinding system is not only determined by the presence of wayfinding elements, but also by its integration with the user's emotional and psychological needs (Cheirchanteri, 2021). Users will feel more confident, secure and comfortable when they feel in control of their direction of movement in space (Szewczuk & Olszewski, 2024). This is especially important in the feeder station environment, which is often a transit location with short time and high pressure due to busy travel schedules. In contrast to mainline stations that usually have more complete facilities and more complex spatial organization structures, feeder stations tend to be simpler but still crucial as they serve as vital links in the commuter travel chain.

Research by Kunhoth et al. (2020) provides a comprehensive review of the evolution of indoor navigation and positioning technologies. The study highlights the use of technologies such as computer vision, sensors, and radio frequency signals to improve indoor navigation, which is highly relevant for the development of wayfinding systems in feeder stations. A study published on Li et al. (2023) analyzed the factors that affect the visibility of indoor environmental signage based on the theories of environmental psychology, environmental behavior, and visual cognition, and provided guidance for designers through a systematic review.

On the other hand, feeder station design in Indonesia still faces many challenges, both in terms of planning and implementation. For example, wayfinding in Jakarta currently faces various challenges that hinder the mobility of people and visitors to the city. One of the main problems is the absence of a fully integrated system between areas (Lazuardini et al., 2021). Each transportation point or public space tends to have a different wayfinding design, both in terms of visual appearance and information layout. This makes it difficult for users to understand directions, especially when making transit or changing modes of transportation. While Jakarta has started to integrate its transportation system through the Jak Lingko concept, this effort has not yet fully covered the aspect of visual navigation that is unified and easily recognizable.

More than just signposting, a good wayfinding system also plays an important role in building the identity of public places and supporting inclusivity, especially for vulnerable groups such as the elderly, people with disabilities, and tourists. Based on observations by the Jak Lingko Team, there are five main issues in Jakarta's wayfinding, namely the lack of system continuity, irrelevant information content, the absence of a clear information hierarchy, low levels of readability, and inadequate lighting, especially at night (Lazuardini et al., 2021). In fact, the existence of an integrated and universal design-oriented wayfinding system will greatly assist the government in realizing a public transportation system that is friendly to all people.

Therefore, this research comes as an effort to develop a strong theoretical foundation based on global and national literature review to identify key elements that should be considered in the interior design of feeder stations. Therefore, considering the importance of accessibility and legibility of space, this research aims to analyze how to evaluate or from the condition of universal design-based interior wayfinding elements that can be applied to the Jakarta-Bandung High Speed Train (KCJB) feeder stations. This identification is not only the basis for an ideal design, but can also function as an evaluative instrument to assess whether the existing condition of the station interior has met the principles of universal design and supports optimal user navigation. The results of this research can serve as a reference in conducting an evaluation or audit of the quality of feeder station design, as well as making a real contribution to the development of inclusive, informative, and sustainable station design standards.

METHODS

This research uses a *Systematic Literature Review (SLR)* approach with a descriptive qualitative design to identify universal design-based interior wayfinding elements at feeder stations. Literature was collected from two major databases-Scopus and Google Scholar-using keywords such as "wayfinding", "universal design", "interior design" and "feeder station". Inclusion criteria included articles in Indonesian and English, published between 2021-2025, addressing the topic of wayfinding in public transportation spaces, and coming from indexed journals. Articles that were irrelevant, not full access, or focused on digital contexts were excluded. The selection process was conducted through four stages: identification, screening based on title and abstract, full content evaluation, and final inclusion, resulting in 11 articles analyzed and 7 grey literature covering government regulations both nationally and internationally.

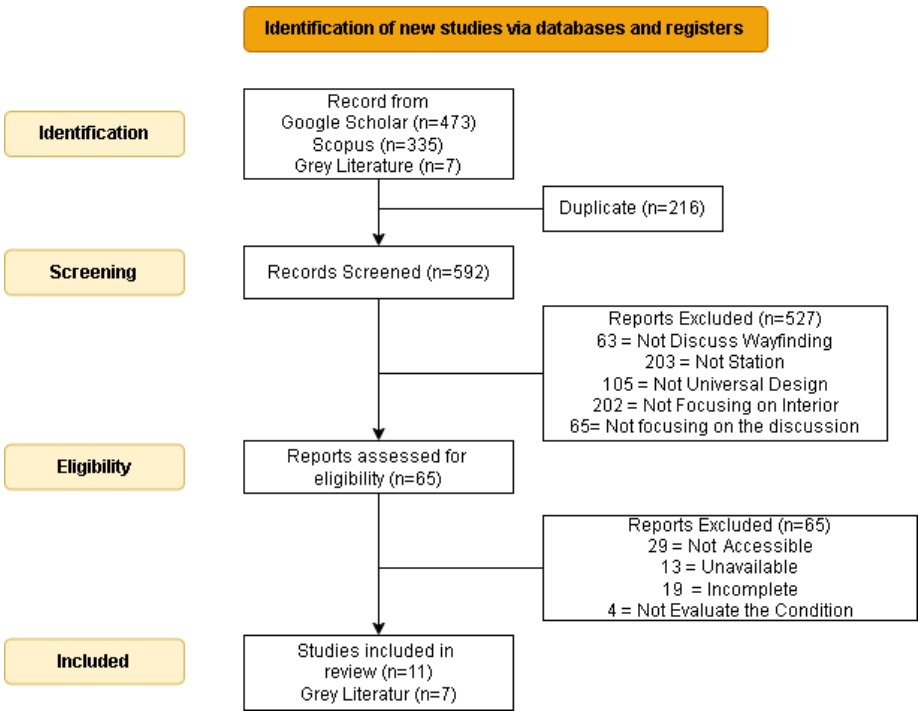

Figure 2. Prisma Diagram
(Source: Author's Analysis, 2025)

RESULTS AND DISCUSSION

Along with the operation of the Jakarta-Bandung High Speed Train (KCJB), the need for intermodal integration is becoming increasingly important to create an efficient, comfortable, and affordable transportation system. In this context, the Feeder Train service comes as a strategic solution to strengthen connectivity between KCJB main stations and surrounding local activity centers, such as Bandung City and Cimahi City. Designed to reach areas not covered by the main high-speed rail line, the Feeder Train connects Padalarang Station with Cimahi Station and Bandung Station. KCJB passengers arriving at Padalarang Station can continue their journey to downtown Bandung or vice versa by utilizing this service for free, as it is included in the Whoosh Fast Train ticket package.

The Feeder Train service uses a series of electric diesel rail trains (KRDE) produced by PT INKA, with five trains consisting of four train units each with a capacity of up to 393 passengers. In a day, the Feeder Train operates as many as 72 trips or 36 round trips with a travel time of about 19 minutes from Padalarang to Bandung, and a train arrival break every 25 minutes. With a busy schedule and adequate facilities, the existence of the Feeder Train is not only a complement to KCJB services, but also an important part in creating an integrated, fast, and user-friendly public transportation system in the Greater Bandung metropolitan area.

Regulation

Network Rail's Wayfinding Design Manual states "*Where a space is not easily understood visually, wayfinding information needs to be conveyed in a way that enables users to understand and use it quickly and effectively. The success of the signage system is largely determined by how well the information is organized so that it can be processed and utilized by users in making decisions efficiently during the journey*" (Dewar & Anatole, 2022). The importance of efficient delivery of wayfinding information in a space that is not easily understood reflects universal design principles and is in line with the regulation of Minister of Transportation Regulation No. PM 98 Year 2017 on Accessibility in Public Transportation Services which requires the provision of information that is easily accessible and understood by all users, including people with disabilities.

In addition, Minister of Transportation Regulation No. 32 of 2024 concerning Procedures for the Implementation of Public Service Obligations for the Transport of People by Train in Economy Class Services) emphasizes the importance of organizing public transportation services that prioritize comfort, safety, affordability, and ease of access for all levels of society. In this context, the provision of informative and easy-to-understand wayfinding elements is an integral part of service quality, especially in economy class stations that serve large numbers of passengers and diverse backgrounds. This regulation reinforces the urgency of implementing universal design in

station interior navigation systems, so that every user-including people with disabilities, the elderly, and new users-can perform orientation and mobility independently without confusion or dependence on the assistance of others.

In designing wayfinding systems at high-speed rail stations, both in Indonesia and in other countries, a number of national and international standards are used to ensure the comfort, accessibility, and safety of all users, including people with disabilities. At the national level, the main references used are SNI (Indonesian National Standard), specifically SNI 8152:2015 on infrastructure and facilities for persons with disabilities in public facilities, and SNI 1721:2019 on accessibility planning in buildings and the environment. These standards regulate important elements such as the height and size of information boards, the use of easily recognizable symbols, color contrast, lighting, and the presence of guideways for the visually impaired.

Meanwhile, at the international level, wayfinding design generally refers to guidelines from organizations such as ISO (International Organization for Standardization), specifically ISO 21542:2021 which discusses the accessibility of the built environment, as well as Universal Design standards developed in various developed countries. Universal design principles encourage the creation of signage systems that are intuitive, consistent, and can be used by everyone without requiring additional adaptations. In addition, many global public transportation projects

Wayfinding Standardization in Stations

The process of designing wayfinding in stations begins with analyzing the flow of movement, mapping decision points, and determining where to place signs at these points. Simultaneously, the user journey and the type of information they need are identified and mapped into the space. At this stage, the message content of each sign should be carefully planned. In planning, the principle of progressive disclosure needs to be applied, i.e. only providing relevant information as needed at each decision point, to avoid information overload for users.

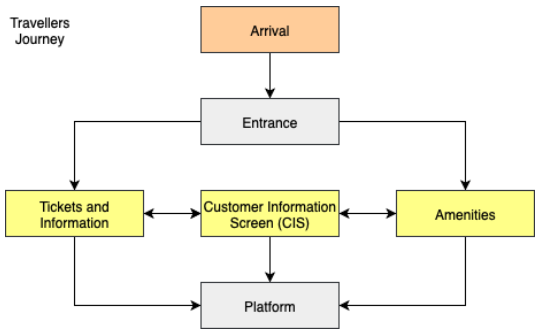

Figure 3. Consumer Journey at Station
(Source: Dewar & Anatole, 2022)

Guidelines for Railway Station Standardization in Indonesia based on the type of information media and its purpose, in accordance with the 2020 Station Standardization Guidebook.

Table 2. Types of Media Based on the Purpose of Information Services

Information Media	Description	Sample Information
Locator	Provides information on the location of rooms and facilities at the station.	Building plans, names of operational spaces, services
Directions	Provides direction to a particular space or facility.	Direction to waiting room, train track, toilet, prayer room
Timekeeping	Provides timing information to help with trip planning.	Digital/analog clock, departure and arrival schedules
Railway Services	Make it easier for passengers to access information related to train travel.	Train schedule, fares, train name/number, circuit location, class of service, track network, travel disruptions
Warnings & Restrictions	Ensure the safety, security and comfort of passengers at the station.	Prohibition of crossing the track, warning when boarding/disembarking the train, prioritizing passengers disembarking

(Source: KAI, 2020)

Table 3. Standardization of Information Media at Railway Stations

Media Type	Station Class		
	Great	**Medium**	**Small**
Visual			
Led Display	There is	##	##
Monitor	Available	Available	##
Neon Box	Available	Available	Available
Information Board/Board	Available	Available	Available
Media Type	**Station Class**		
	Great	**Medium**	**Small**
Audio	Available	Available	Available
Audio Visual			
LCD Monitor + Speaker	There is	There is	##
LCD TV	There is	There is	##

(Source: KAI, 2020)

The design of information media at the station must pay attention to the clarity and readability of writing, suitability and consistency of symbols, placement that does not interfere with operations and remains comfortable for users, proportional and aesthetic size, and energy efficiency when using electronic media.

The following is a tabular version of the visual media specifications at the station (Table 4).

Figure 4. Color and Signing
(Source: Lazuardini et al., 2021)

Table 4. Detailed Station Signage Specifications

Category	Component	Specification
Main Identity Signage	**Station Name (Exterior/Wall Identity)**	Letter height 15–20 cm; minimum panel height 60 cm; placed on exterior façade; font *Circular Std Bold*; background dark blue, text/pictogram white.
	Totem / Pylon Sign	Height 3–5 m depending on station size; illuminated with LED; placed at main entrances for visibility within 50–100 m.
Circulation Signage	**Directional Signs (Concourse, Platform)**	Letter height 7–10 cm; installed every 20–25 m; overhead placement 200–220 cm above floor; order of elements: arrow → pictogram → Indonesian text → foreign text.
	Wayfinding Maps ("You Are Here")	Installed at major nodes (entrance, concourse, platform transition); positioned at 140–160 cm (eye-level); map orientation aligned with real-world direction.
Facility Signage	**Room/Facility Signs**	Letter height ≥5 cm; installed at 140–160 cm above floor (eye-level); icons standardized; background colors: dark blue for general, yellow for services, red for warnings.
	Accessibility Signs	Must comply with SNI 8152:2015 and ISO 21542:2021; tactile letters for visually impaired; Braille at 90–120 cm height; guiding blocks leading to entrances/exits.
Exit & Emergency Signage	**Exit Signs**	Letter height 10–15 cm; green background with white text (international standard ISO 7010); illuminated, visible within 30 m.
	Emergency Evacuation Plan	Installed in public zones (waiting room, concourse); mounted at 140–160 cm; minimum A2 size with pictogram-based instructions.
	Fire & Safety Signs	Red background with white pictogram; placed at every 100 m² area; positioned at 140–160 cm; durable and photoluminescent.
Warning & Prohibition Signage	**Safety Warnings**	Yellow/black for caution; red/white for prohibition; positioned at eye-level (140–160 cm) or ground if floor marking; must follow contrast ratio ≥70%.
Technical Specifications (General)	**Materials**	Acrylic/PMMA panels (5 mm); aluminium composite panels for large signs; galvanised hollow steel frames ≥2 mm.
	Lighting	Internal LED preferred (energy efficient, uniform brightness).
	Contrast Ratio	Minimum 70% between text/pictogram and background.
	Placement Spacing	Directional signage every 20–25 m; major directional sign at every intersection/decision point.
	Viewing Distance	Signage must be legible from ≥21 m (main concourse & platform areas).

(Source: KAI, 2020)

At the station, the signage consists of main circulation signage (yellow on blue) to indicate the direction for passengers entering the train/platform, exit signage (black on yellow) for the direction out of the station and to other modes of transportation, and signage to facilities (white on blue) to indicate the direction to station facilities. These three types of signage serve to ensure that passenger orientation is clearer, more consistent, and easily accessible to all users.

(a) (b) (c)

Figure 5. (a) main circulation signage (b) exit signage (c) signage to the facility (Source: KAI, 2020)

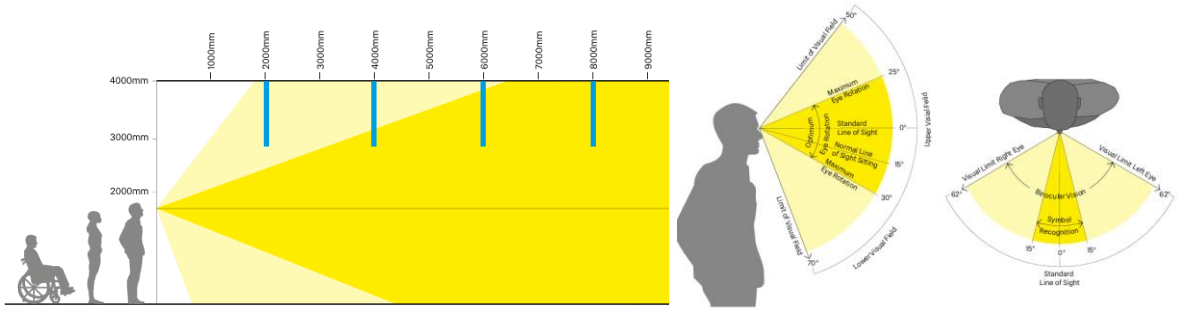

Figure 6. Sight Lines and Legibility (Source: Dewar & Anatole, 2022)

Aspects to consider in wayfinding are *sight lines* and legibility. To function optimally, signage must be clearly readable. Understanding legibility starts from recognizing the human field *of view*. In general, the horizontal field of view of a human with full binocular vision is about 160 degrees, and 120 degrees vertically without moving the head. However, part of the field of view is peripheral vision which is less effective for recognizing letters or symbols. Since the maximum reading distance reaches 21 meters, directional signage should be installed every 20 to 25 meters to facilitate navigation for passengers (Lazuardini et al., 2021) .

Table 5. Mechanical Installation at the Station

Mechanical Components	Specifications/Requirements
Escalators	1. Vertical transportation in the form of conveyors for passengers. 2. Mandatory at large stations with ≥2 floors. 3. Must have 2 lanes (up & down). 4. Minimum width enough for 2 people.
Elevator	
Usage & Placement	1. There must be at least 1 accessible elevator in buildings ≥3 floors. 2. Tolerance of floor level difference is 1.25 mm maximum.
Corridor/Lobby Elevator	1. Minimum width 185 cm. 2. Buttons & screen are easy to reach & see. 3. Outer panel: 90-110 cm from the floor. 4. Inner panel: 90-120 cm from the floor. 5. Braille is included. 6. Audible & visual indicators of elevator position inside & out.
Elevator Room	1. Minimum size 140 cm x 140 cm. 2. Must fit wheelchairs & have handrails on three sides.
Elevator Door	1. Minimum open time of 3 seconds. 2. The door mechanism supports accessibility. 3. Equipped with a photo-electric sensor.

(Source: KAI, 2020)

Electrical energy from PLN to operate electrical equipment. In the event of a PLN power outage, the station must have a backup power source in the form of a generator. The generator set installation must meet several criteria, including adjusting to the installed power, having a good foundation and vibration dampening, low noise level (recommended using silent type generator sets), low exhaust emissions, easy installation, and easy maintenance and having services and service locations available. In addition, the generator should be fuel efficient, have good engine performance, be resistant to corrosion due to humid air, be equipped with an indicating panel and safety system, and have a long service time span based on working hours.

The generator set should also be equipped with earthquake vibration dampers, fire alarms, oil temperature, fuel, water and pressure sensors. Placement of generators needs to consider the noise level so that it must be separated from the main building by taking into account the availability of station land. Station lighting requirements are calculated based on the area and lamp strength standards, for example, operational and public spaces require 200 lux, halls and public waiting rooms 250 lux, and emplacements and parking lots 200 lux. In large and medium class stations, air conditioning is required in several rooms such as the Station Head room, VIP and executive waiting rooms, counter and operator rooms, customer service rooms, and storage rooms for certain electrical equipment such as signal and telecommunications equipment rooms.

In addition, each station building must be equipped with a fire extinguisher that is placed at least one for every 100 square meters of area to ensure preparedness in dealing with potential fires. CCTV devices are also mandatory facilities that must be available at all large and medium stations to support security systems and activity monitoring, while at small stations, CCTV installation is required especially if the station functions as a commuter station that has a high frequency of service and dense passenger flow.

How to Evaluate Interior Wayfinding on Station

The evaluation of interior wayfinding elements in stations is an important process to assess the extent to which spatial designs-such as wayfinding, lighting, color use, floor patterns, and architectural elements-are able to guide users in navigating station areas efficiently and independently. This evaluation includes indicators such as ease of orientation, clarity of direction, visual consistency, and overall level of accessibility. The evaluative approach can be done through user surveys, direct observation, and simulation of user movement in the space. Interior wayfinding evaluation is a strategic step in ensuring smooth mobility, reducing cognitive load, and improving safety and comfort in the station environment.

In a study conducted by (Nisa & Martiningrum, 2022) which evaluates architectural elements of wayfinding through user surveys with questionnaires stated that the quality index value of architectural elements supporting wayfinding in the Cisauk Station Interior is very high. The visibility characteristic is the dominating characteristic and the imageability characteristic is the less prominent characteristic than other characteristics. In addition, Nugraha & Zuhri (2022) in their study that explored the wayfinding of the Sound Transit U District Station, Washington was carried out by observation and resulted in that this transit station has covered all 5 elements of wayfinding formulated by Kevin Linch.

In addition, Aurelia et al. (2020) in his development study related to wayfinding at Bundaran HI MRT Station which was obtained based on the evaluation of his observations stated that the platform, concourse, entrance, and faregate have their own guidelines tailored to the function of each area. The wayfinding system applied aims to arrange the facility area in an integrated manner to make it easier for passengers to find directions. In addition, station design also plays an important role in improving the quality of the surrounding urban area. Research Agusta & Tafridj (2022) analyzed the navigation process at Cisauk Station through a wayfinding system approach and evaluated it by direct observation based on the elements contained in the system. From the observation results, it is known that Cisauk Station has fulfilled 11 out of 16 wayfinding elements, which means about 68% of the elements have been implemented, while the remaining 32% have not been fulfilled.

Mangkuluhur et al. (2024) in their design research on Cisauk station, conducted an evaluation by means of observations that included analysis of interior elements, atmosphere, lighting, ventilation, security, accessibility, and minimum services at the station. While a study by Zheng & Chang (2021) which used surveys and experiments in its evaluation mentioned escalators and stairs are often used as navigation references. The use of new maps improves wayfinding performance, speeds up navigation time, equalizes route strategies, and helps form more effective spatial knowledge. Zahrah et al. (2021) mentioned that wayfinding methods are applied based on post-occupancy evaluation, focusing on spatial organization, movement flow, and signage placement.

In contrast, a study Yossa et al. (2024) compared Seoul Metro and Jakarta MRT using literature without conducting surveys or interviews and found that both subway systems have the

potential to meet Universal Design standards. The audit protocol developed can be used periodically to monitor other subway systems in Asia. Ghamdi et al. (2025) evaluated the effectiveness of the visual identification component at Muzdalifah station using a mixed approach that included field observations, visual modeling, and questionnaires.

Nida & Ardiani (2021) evaluated and developed the design of Tanah Abang Station based on a survey obtained from passengers who said there were many problems. Twelve circulation components in the architectural wayfinding system are solutions to overcome orientation and navigation problems in a space, but Tanah Abang Station has only implemented 4 of the 12 components. Meanwhile, in contrast to the research Bianconi et al. (2022) which introduces a digital evaluation approach in navigation analysis in immersive reality, integrated with biosensors for the interpretation of the collected data.

So based on the results of the literature both related to standardization and literature, audits can be carried out using direct observation, passenger questionnaires, and the use of technology. The following shows an example of an evaluation table that can be used.

Table 6. Indicator and analysis of Architectural Wayfinding Interior Elements with Universal Design

Wayfinding Components	Wayfinding Elements	Types of Information Media	Technical & Accessibility Standards
Legibility	Design concept	Locator	Building plan according to layout
	Approach from street	Directions	Visible from the main entrance
	Parking	Locator	Parking lot signage available
	Sidewalks	Directions	Secure & connected to train boarding points
	Entrances and exits	Signage/Directional	Entry-exit lane information available & clear
	Connection to mass transportation	Directions	Directions to busway/transportation available
Leveling (Level change tool)	Elevators, Staircases	Visual / Direction	Elevators & escalators meet dimensions & accessibility
Inclusive Design	Ramps, tactile strips	Warnings & symbols	Ramps & guiding blocks available
	People movers	-	Not relevant if not available
	Fixed rail system	Train Service	Schedules, routes, fares available digitally/analogically
Decision Points	Drop-off point	Locator	Clear zones, drop/pick area signage
	Entrance and exit	Directions	Directional & door signage as per layout
Content (Readable information)	Environmental graphics	All types of media	Uniform colors, fonts, and symbols (Arial/Calibri)
	Signage to scale	Neon Box/Name Board	Proportional size, acrylic/stainless material
	"You are here" map	Site Plan	Available & as per user's actual position
	Departure & departure	LCD Monitor, LED, Speaker	Real-time train schedule available
Visibility	-	General Lighting	200-250 lux (public area), platform, waiting room
	-	Symbol/writing contrast	Oracal 051 blue + white lettering
	-	Signage position	Within field of view (≤ 21 m), unobstructed
	-	Voice announcement	Speakers are clear & evenly distributed

These indicators can be used as the basis for analyzing and evaluating the effectiveness of wayfinding elements, especially at KCJB (Padalarang-Cimahi-Bandung) feeder stations. By referring to universal design components and standardized wayfinding principles, the evaluation can be conducted thoroughly through a direct observation approach in the field. This includes observing the positioning, legibility, lighting, and accessibility of elements such as signage, "you are here" plans, guiding blocks, and general lighting in circulation areas. The data collected from these observations provide a real Figure of how passengers interact with navigation elements in the station and whether wayfinding has been able to optimally support user orientation and comfort.

Based on a review of academic and grey literature, it can be concluded that the implementation of wayfinding in public transport stations plays a central role in shaping user experience, strengthening accessibility, and ensuring travel efficiency. Academic literature generally emphasizes

the importance of design aspects based on universal principles, while grey literature such as technical standards, regulatory guidelines, and best practice reports highlight practical applications and implementation strategies in the field. The two complement each other: scientific articles provide a conceptual basis and research-based evaluation, while grey literature presents more concrete operational standards.

Academic reviews show consistency regarding the five main components of wayfinding: legibility, visibility, decision points, symbol consistency, and inclusive support for users with special needs. For example, research by Nugraha & Zuhri (2022) on the Sound Transit U District Station confirms that fulfilling the elements of wayfinding based on Kevin Lynch's theory can improve user navigation and reduce confusion. This is parallel to the findings of Aurelia et al. (2020) at the MRT Bundaran HI, where signage mapping according to area function (platform, concourse, entrance) strengthens passenger spatial orientation. Thus, the success of wayfinding implementation is determined more by the consistency of applying these elements, not merely their availability.

Meanwhile, grey literature—such as the Station Standardization Guidebook (KAI, 2020) and the international guideline ISO 21542:2021—provides technical details regarding the size, material, color contrast, and position of signage so that it can be read optimally within the human viewing radius (≤ 21 m). This guide emphasizes progressive disclosure, which is the gradual delivery of information according to travel decision points, so that users are not overwhelmed by excessive information. This principle is especially important at KCJB–Feeder connecting stations, where passenger travel involves several transfer points (Padalarang–Cimahi–Bandung).

When compared directly, academic literature focuses more on evaluative aspects through user surveys or observations (e.g., Nisa & Martiningrum, 2022; Agusta & Tafridj, 2022), while grey literature focuses on technical prescriptions and minimum standards. The integration of the two produces a more comprehensive understanding: what should be designed (prescriptive) and how effective it is for users (evaluative). Thus, recommendations for implementing wayfinding on the KCJB Feeder should not only comply with KAI and ISO technical standards, but also be continuously evaluated through user satisfaction surveys, post-occupancy audits, and design adaptations based on feedback.

The context of the KCJB Feeder requires special attention to inclusivity and sustainability. In terms of inclusivity, the literature emphasizes that vulnerable groups—such as people with disabilities, the elderly, and new users—require additional support in the form of tactile paving, Braille signage, high color contrast, and clear and consistent audio announcements. This is in line with research by Zahrah et al. (2021) and Nida & Ardiani (2021), which shows that there is still a significant gap in the implementation of 12 architectural circulation components at Tanah Abang Station. In other words, even though national regulations (Permenhub No. 98/2017 and SNI 8152:2015) have stipulated accessibility requirements, practices in the field often do not fully accommodate user needs.

In addition, the aspect of sustainability is also an important highlight. Several studies have introduced evaluation methods based on immersive technologies such as virtual reality integrated with biometric sensors. This approach can be an innovative reference for evaluating the effectiveness of wayfinding at KCJB Feeder in a sustainable manner without waiting for user complaints. However, grey literature encourages the use of energy-friendly technology in information media, such as high-efficiency LEDs, solar panels, or integration with application-based digital information systems. This combination supports the direction of sustainable transportation development as outlined in Indonesia's RPJMN.

When viewed as a whole, there are three main aspects relevant to the KCJB Feeder context: (1) consistency of symbols and information across all modes of transportation; (2) ease of orientation through progressive mapping at decision points; and (3) ensuring inclusivity for all user groups. In this case, symbol consistency is very important because the KCJB Feeder serves as an intermediary between high-speed trains and local trains as well as other modes of transportation (public transportation, buses, online taxis). In addition, the principle of gradual disclosure requires the presentation of information in stages: starting from a macro map at the entrance, directions to the platform, to detailed information about supporting facilities. Inclusivity must also be applied not only in physical form (accessibility for people with disabilities), but also in cross-language communication, considering that KCJB is also intended for foreign tourists.

Therefore, it can be concluded that the success of a signage system cannot be measured solely based on compliance with technical standards, but also based on user satisfaction in spatial orientation and reduced cognitive load when transferring modes. Comprehensive evaluation through field observations, user surveys, and the use of digital technology are important strategies to ensure that the signage system at KCJB Feeder truly complies with universal design principles. This implementation is not just a matter of aesthetics or regulations, but also the key to creating a smooth, inclusive, and sustainable travel experience,

in line with the vision of modern public transportation in the Greater Bandung metropolitan area.

Additionally, this evaluation can be strengthened by distributing questionnaires to passengers as the primary users of station facilities. Through this quantitative method, passenger satisfaction and understanding of the existing directional signage system can be measured, including the ease of finding entry/exit points, waiting areas, supporting facilities, and access to connecting transportation. The combination of observational data and user perceptions will produce a more comprehensive analysis, which can be used as a basis for decision-making in improving the design of spaces and visual information systems at stations. Thus, wayfinding indicators are not only theoretical but can also be applied in the context of developing inclusive and sustainable public transportation infrastructure.

CONCLUSION

The analysis of academic studies and technical documents confirms that wayfinding plays a decisive role in shaping user experience, safety, and efficiency in public transport. Empirical findings highlight that signage clarity, visual consistency, and digital navigation support directly influence passenger orientation and intermodal transfers. In the KCJB feeder train context, effective wayfinding reduces uncertainty, shortens travel time, and strengthens connectivity between metropolitan areas, showing that its impact extends beyond aesthetics to measurable improvements in urban mobility.

For practice, this implies that transportation operators and policymakers must treat wayfinding as a strategic priority. Aligning national standards (SNI) with international frameworks (ISO, universal design) ensures inclusivity for diverse users, while the integration of digital solutions—such as real-time apps and dynamic signage—can complement physical elements to enhance accessibility and crowd management. Future research should build on this foundation by exploring comparative evaluations of feeder stations, adopting advanced methods such as behavioral mapping or eye-tracking, and addressing the needs of vulnerable passenger groups. These directions will not only deepen the academic understanding of wayfinding but also provide actionable insights for the design of inclusive and adaptive transport systems.

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