

# Evaluation of Age-Friendly Requirements and Renovation Strategies for Public Spaces in Historic Cultural Districts

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**Abstract:** As China's population ages rapidly, adapting urban public spaces to meet the needs of older adults has become a critical issue in urban planning and community development. The Moshikou Historic Cultural District, a significant cultural landmark in Beijing's Shijingshan District, faces the challenge of serving its aging population while preserving its historical and cultural heritage. Through field surveys, questionnaire research, in-depth interviews, and literature review, this paper systematically analyzes the current state and existing issues of age-friendly adaptation in Moshikou's public spaces. It delves into the spatial needs of the neighborhood's elderly residents and proposes targeted renovation strategies across five dimensions: barrier-free environments, rest facilities, supporting services, safety perception, and cultural integration. These findings offer design insights for the renewal of public spaces in similarly situated historic districts.

**Keywords:** Historic Cultural District; Public Space; Age-friendly Design; Renovation Strategies; Moshikou

## 1. Research Background and Significance

China is entering a phase of deep aging. According to data released by the National Bureau of Statistics on January 17, 2020, individuals aged 60 and above account for 18.1% of the total population, making China the country with the largest elderly population globally [1]. As the capital, Beijing faces particularly severe aging challenges. Urban public spaces serve as primary venues for the elderly to engage in daily social interactions, recreational activities, fitness, and community participation. Their level of age-friendliness directly impacts the quality of life and well-being of the senior population. Historic cultural districts, as repositories of urban

memory, hold unique cultural value. However, their built environments often struggle to meet the contemporary needs of older adults due to historical limitations in barrier-free design and facility configuration.

The Moshikou Historic and Cultural District, with its profound cultural heritage and rich material remains, stands as a vital node in the West Beijing Cultural Corridor. Through conservation and renewal efforts, the quality of its public spaces has improved, attracting large numbers of residents and tourists. However, against the backdrop of an aging population, both the district's resident seniors and visiting elderly tourists have raised higher expectations for the safety, comfort, and convenience of public spaces. Therefore, conducting research on age-friendly public spaces in the Moshikou district not only helps improve the quality of life for local elderly residents and achieve the goals of "active aging" and "aging in place", but also represents an important exploration for the inclusive and sustainable development of historic cultural districts, holding significant practical and theoretical value.

## 2. Current Issues in Research on Age-Friendly Adaptation of Historic Districts

In recent years, age-friendly retrofitting of outdoor spaces in historic districts has emerged as a significant research focus. However, substantial systemic challenges persist in both theoretical exploration and practical implementation.

A fundamental contradiction exists between the physical spatial environment of historic districts and the basic mobility needs of older adults. Inherent constraints such as narrow alleys, pronounced elevation differences, and uneven paving severely impede barrier-free access. For instance, studies indicate that the accessibility of internal spaces and the rationality of public facilities within these districts conflict markedly with the behavioral patterns of older adults [2].

Facility configurations exhibit systemic deficiencies; an assessment of a specific historic cultural district revealed shortcomings in safety, comfort, and the fulfillment of social diversity needs [3]. Furthermore, traditional spatial patterns struggle to accommodate modern transportation modes, leading to issues like mixed pedestrian-vehicle traffic and noise disturbance that directly threaten the safety and health of older adults.

Existing research exhibits limitations in both theoretical perspectives and methodologies. Most studies focus on physical spatial modifications while neglecting softer dimensions such as psychological needs and social integration among the elderly. Although concepts like “aging in place” have been proposed [4], systematic integration into historic district renewal remains under-explored. Research perspectives also predominantly concentrate on macro-level public spaces, with insufficient attention to micro-level gray spaces like courtyards and street corners frequently used by the elderly [5]. Methodologically, quantitative evaluation systems remain immature; while some studies attempt to develop evaluation frameworks for elderly-friendly environments in residential historic districts, few address both “historic preservation” and “elderly-friendly functionality” simultaneously. [5]. Methodologically, quantitative evaluation systems remain underdeveloped. While some studies have attempted to construct age-friendly environmental assessment frameworks for residential historic districts, a comprehensive framework that simultaneously addresses the dual objectives of “historic preservation” and “age-friendly functionality” still requires refinement.

In summary, existing research on aging-in-place in historic districts exhibits several shortcomings. Distinct from single-function or appearance-based evaluations, this study focuses on the dual objectives of “historical preservation” and “age-friendly functionality.” Based on empirical research in the Moshikou Historic Cultural District, it aims to construct a comprehensive evaluation system integrating safety assurance, functional adaptation, spatial environment, supporting services, and cultural integration. Accordingly, it proposes tiered renewal strategies to provide references for resolving the dichotomy between ‘preservation’

and “age-friendliness” in historic districts.

### 3. Research Subject and Methodology

The research subject selected for this study is the Moshikou Historical and Cultural Block, located in Shijingshan District, Beijing (Figure 1). This traditional neighborhood boasts rich historical relics and cultural characteristics. The study focuses on the district's public spaces, specifically areas where older adults frequently engage in daily activities, including alleyways, plazas, green nodes, and key entrances to public buildings. A multi-method approach was employed, combining field surveys, questionnaire research, in-depth interviews, literature review, and statistical data analysis. First, systematic field surveys were conducted to examine the neighborhood's public spaces. Second, structured questionnaires were distributed to residents and visitors aged 60 and above to understand their activity patterns, spatial needs, and satisfaction with existing public spaces. Semi-structured interviews were then conducted with representative elderly residents, community workers, and management representatives to uncover deeper issues and personalized needs not captured by the questionnaires. Subsequently, the study reviewed relevant domestic and international literature on age-friendly environments, the preservation and renewal of historic cultural districts, and public space design. Finally, questionnaire data and interview findings were organized and analyzed to construct an evaluation framework. This framework quantified the preference patterns of the elderly population. Based on the evaluation outcomes, an exploratory approach to age-friendly renovations for the neighborhood's internal public activity spaces was developed.

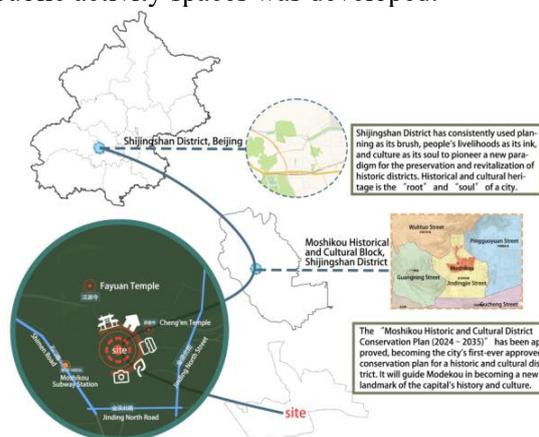


Figure 1. Moshikou Location Map

## 4. Current Issues Regarding Aging-Friendly Public Spaces in the Moshikou Historic District

### 4.1 Insufficient Public Spaces

The existing public spaces within the Moshikou Historic District fail to meet the recreational needs of the elderly, such as socializing, fitness, and entertainment. The only large, centralized public activity space is Moshikou Park, which is located far away and inaccessible for many seniors. The types of public spaces are limited, lacking dedicated areas for fitness, reading, and other activities [6]. Individual activity spaces are small and cramped (Figure 2), failing to fully meet the needs of older adults and negatively impacting their user experience.



Figure 2. Limited Activity Space

### 4.2 Complex Surroundings and Poor Accessibility of Public Spaces

Most public spaces are located alongside roads where vehicles and pedestrians intermingle. Narrow streets accommodate heavy traffic and pedestrian flow, often resulting in chaotic conditions (Figure 3). Due to declining physical abilities, older adults move more slowly and have limited capacity to avoid vehicles. Therefore, mixed pedestrian-vehicle traffic patterns should be minimized within outdoor activity spaces for older adults. Furthermore, since activity areas are often adjacent to roads, harmful gases such as vehicle exhaust pose health risks to older adults [7].



Figure 3. Traffic Congestion Issues

### 4.3 Lack of Age-Friendly Design in Public Spaces

Due to elevation differences within the historic district, public spaces are fragmented and scattered, featuring numerous steps with insufficient ramps or excessively steep inclines. Traditional paving stones become slippery during rain or snow and feature uneven surfaces (Figure 4), creating difficulties for elderly pedestrians. These surfaces fail to accommodate seniors requiring wheelchair access, significantly reducing their willingness to use public spaces. Public seating is insufficient, and some benches lack backrests and armrests. Inadequate nighttime lighting in certain areas compromises seniors' sense of security during evening outings, indicating a need for enhanced safety perceptions.



Figure 4. Issues with Steep and Uneven Road Surface Gradient

Some existing accessibility issues in the public spaces of the above historic districts fail to meet the needs of older adults, unable to provide convenience and protection for their daily activities.

## 5. Analysis of Elderly Residents' Needs for Public Spaces in the Moshikou Historic District

### 5.1 Evaluation Indicator Selection

Considering the dual attributes of “historic preservation + elderly accessibility” in the Moshikou Historic District, this study establishes an age-friendly evaluation framework comprising 5 primary indicators and 15 secondary indicators. This framework is grounded in primary data from field surveys, in-depth interviews, and questionnaire research, guided by the principles of “problem-oriented approach, prioritizing needs, and balancing

preservation”. It references technical and “Accessibility Design Code” (Table 1). The requirements for age-friendly design from the specific indicator selection process and rationale “Urban Public Facilities Planning Standards” are as follows:

**Table 1. Grading Explanation for Evaluation Indicators**

Primary Indicator	Secondary Indicator	Indicator Description	Data Source
Security Assurance (Weighting: 30%)	Accessibility Facility Coverage Rate	Proportion of activity space occupied by curbside ramps, tactile paving, wheelchair access zones, and related pathways	Field survey, ArcGIS data
	Safety Facility Completeness	Number and operational integrity of first-aid equipment, surveillance systems, anti-slip surfaces, and emergency call devices	Field surveys and questionnaire research
	Accessibility	Whether pedestrian crossing green light duration accommodates elderly walking speed (0.6-0.8 m/s) and pavement smoothness	Field surveys and in-depth interviews
Functional Adaptation (Weight: 25%)	Equipment Availability Rate	Number of social amenities like handrail-equipped seating, game tables, calligraphy desks, and discussion areas	Field surveys and questionnaire research
	Activity Space Gradation Suitability	Separation of “active zones” (fitness, opera exchange) and “quiet zones” (rest areas, leisure paths)	Field surveys and in-depth interviews
	Facility Size Rationality	Seat height (45-50cm), barrier-free stall width ( $\geq 1.5$ m) compliance with national standards	Field surveys and national standard comparison
Space Environment (Weight: 20%)	Degree of Spatial Concentration	Average activity space area ( $\geq 15$ m <sup>2</sup> ), mutual accessibility	Field survey, Two-Step Road app data
	Environmental Comfort	Shade/rain shelter coverage, noise levels, sanitation, greenery configuration	Field surveys and questionnaire research
	Space Utilization Rate	Daily average number of elderly users and usage duration	Questionnaire surveys, field observations
Supporting Services (Weighting: 15%)	Proximity to Amenities	Accessibility ratio of nearby convenience stores, pharmacies, and health service centers (within 15 minutes walking distance)	Baidu Maps POI, Questionnaire Survey
	Management and maintenance level	Facility integrity rate ( $\geq 72\%$ baseline), regular cleaning frequency, activity organization frequency	Questionnaire surveys and community interviews
	Label clarity	Signage text size ( $\geq 50$ mm), contrast ratio, audio announcement coverage range	Field surveys and questionnaire research
Cultural Integration (Weight: 10%)	Cultural Element Integration	Number of cultural symbols displayed within activity spaces (e.g., camel bell motifs, mural patterns)	Field surveys and in-depth interviews
	Cultural Activity Integration	Whether social activities incorporate cultural elements (e.g., ancient trail cultural sharing sessions)	Questionnaire surveys and community interviews
	Historical Character Coordination	Whether senior-friendly facilities disrupt traditional street layout or architectural character	Site inspection and comparison with planning documents

## 5.2 Scoring Methodology

This evaluation employs a combined approach of quantitative scoring and qualitative corroboration, presenting final results on a percentage scale. Data sources encompass field

measurements, questionnaire statistics, and in-depth interview records to ensure comprehensive and objective assessment foundations.

The weighting determination process integrated expert opinions with the actual needs of the

elderly. The weights for primary indicators were established through a combination of expert scoring and participatory assessment by the elderly. Based on the survey findings—where safety needs were mentioned most frequently by the elderly, followed by functional needs—the final weight distribution was set as follows: Safety Assurance (30%), Functional Adaptation (25%), Spatial Environment (20%), Supporting Services (15%), and Cultural Integration (10%). The scoring criteria classify secondary indicators into four levels based on compliance and demand fulfillment rates: Excellent (80–100 points), Good (60–79 points), Fair (40–59 points), and Poor (0–39 points). Specific scoring criteria are developed by integrating field survey data with national regulatory requirements. For instance, facility coverage is directly assessed based on on-site measurement data, while subjective perception indicators are converted into scores using satisfaction rates from senior questionnaires. The final score is calculated through weighted averaging using the formula: Final Score =  $\Sigma$  (Primary Indicator Weight  $\times$  Average Score of Secondary Indicators Under That Primary Indicator)

**5.3 Evaluation Results**

Based on the assessment of aging-friendly requirements for public spaces in the Mode Mouth Historic and Cultural District, the overall satisfaction score was 58.2 points (Figure 5), indicating a “fair” level. Scores across individual indicators revealed insufficient safety measures, generally adequate functional suitability, and room for improvement in spatial environments.

**5.3.1 Insufficient safety measures**

Safety measures received the lowest overall score at 49.5 points, with the core issue being an accessibility facility coverage rate of only 30% (Figure 6). Side alleys lack accessible pathways, and some road surfaces have gradients exceeding 12%, surpassing national standards. Safety facility completeness scored low at 45 points, with approximately 50% of evaluations falling into the average or below category (Figure 7). Insufficient provision of first-aid equipment, surveillance systems, and emergency call devices undermines seniors' sense of security during outdoor activities.

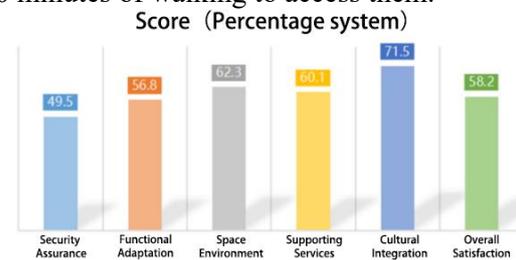
**5.3.2 Functional adaptability: average**

Functional adaptability achieved a final score of 56.8 points, primarily due to inadequate social

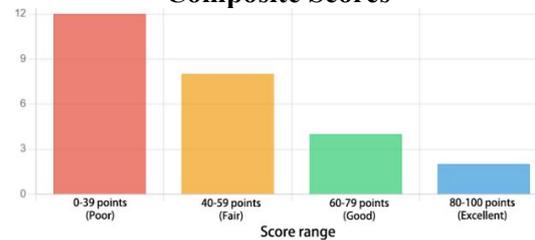
interaction facilities (42 points) (Figure 8). Statistics show only 12 handrail-equipped seats across the entire neighborhood, failing to establish tiered activity spaces that cater to the differing needs of active and non-active seniors. The tiered activity space adaptation score was 55 points (Figure 9), indicating ineffective differentiation between “active zones” and “rest zones”, thus failing to meet the diverse needs of seniors with varying physical conditions. Facility dimension rationality scored 68 points (Figure 10), with most facilities meeting national standards, though details require refinement.

**5.3.3 Spatial environment requires improvement**

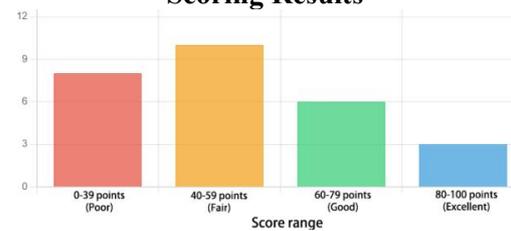
The spatial environment achieved a final score of 62.3 points, primarily due to low coverage of sun/rain protection facilities, excessive noise in some areas, and suboptimal sanitation. The space utilization rate scored 64 points (Figure 11), indicating limited daily usage time by seniors and reflecting insufficient spatial appeal. The proximity of daily-life facilities scored extremely low at 30 points (Figure 12), with only 30% of activity spaces located near such facilities. Twenty percent of seniors require over 20 minutes of walking to access them.



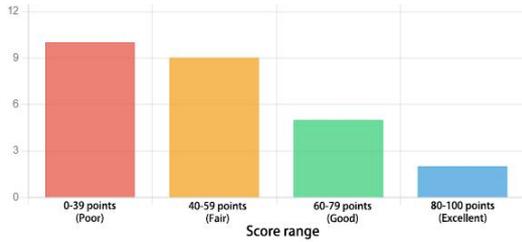
**Figure 5. Bar Chart of Demand Evaluation Composite Scores**



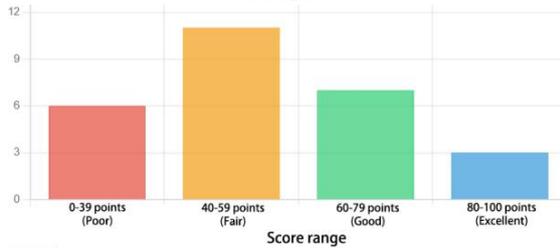
**Figure 6. Bar Chart of Accessibility Facility Scoring Results**



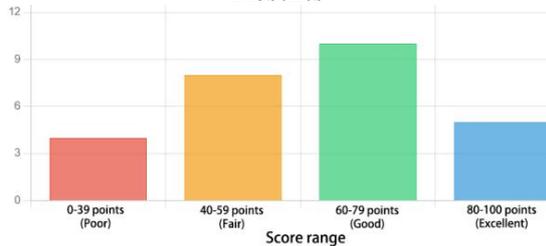
**Figure 7. Bar Chart of Safety Facility Scoring Results**



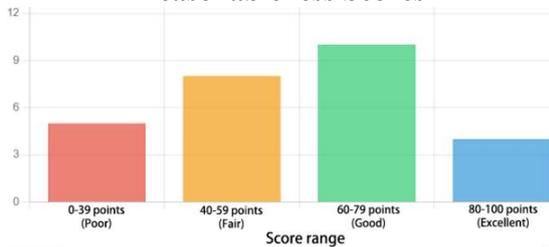
**Figure 8. Bar Chart of Interaction Facility Scores**



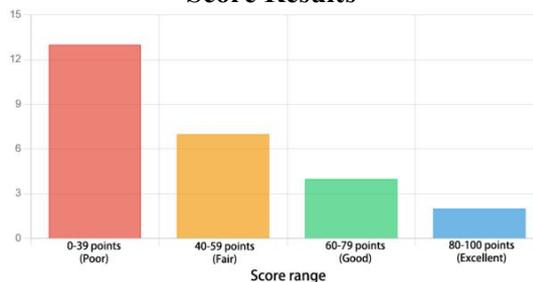
**Figure 9. Bar Chart of Activity Space Score Results**



**Figure 10. Bar Chart of Facility Size Reasonableness Scores**



**Figure 11. Bar Chart of Space Utilization Score Results**

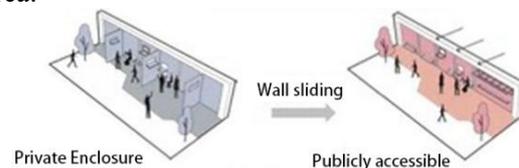


**Figure 12. Bar Chart of Amenity Proximity Scores**

## 6. Strategies for Age-Friendly Adaptation of Public Spaces in the Mode Port Historic Cultural District

### 6.1 Holistic Age-Friendly Adaptation of Fragmented Public Activity Spaces

The drawbacks of fragmented activity spaces include limited accessibility and poor convenience. Considering the mobility constraints of the elderly, each activity site should enhance spatial accessibility. Public activity interfaces should be adjusted, transforming semi-enclosed spaces into open areas. This allows seniors to enter from multiple directions, reducing travel time and energy expenditure while increasing their willingness to visit public activity spaces (Figure 13). Connecting proximate activity spaces fosters communication and forms small social activity groups. For more distant zones, maintain independence while ensuring each activity space possesses complete supporting facilities to meet the activity needs of seniors within its service area.

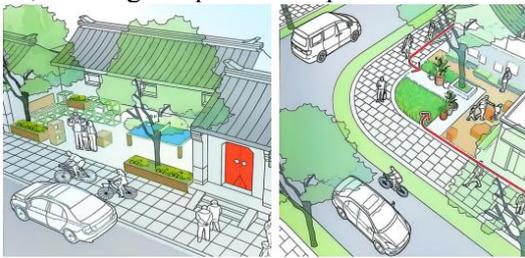


**Figure 13. Schematic Diagram of Public Space Interface Adjustment**

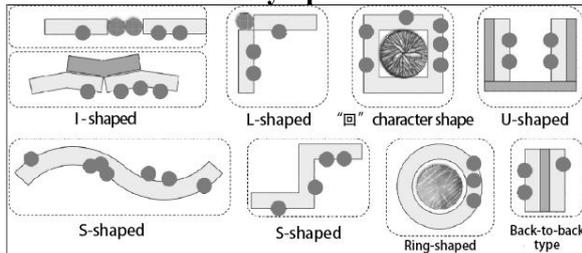
### 6.2 Organic Weaving of Alley Spaces

Historical districts feature numerous courtyard houses with predominantly small-scale activity spaces. Without compromising the district's historical character, micro-spaces can be added within alleys at activity hubs to complement public spaces and create diverse activity types (Figure 14). By reorganizing micro-spaces in front of and behind buildings or at street corners, or utilizing semi-enclosed spaces formed by courtyards, enclosed seating or sets of fitness equipment can be installed. Paired with neighborhood cultural installations, planters, or bonsai, these spaces accommodate 1–4 people for casual seating or light exercise, providing small-scale rest areas for the elderly and facilitating small-group gatherings among residents [8] (Figure 15). Renovation efforts should also preserve spatial textures and maintain original characteristics, such as lifestyle patterns and spiritual venues [9]. For age-friendly upgrades in the Moshikou neighborhood, the traditional spatial form should be sustained, protecting alley textures and historical context. Each hutong should be developed with distinctive features reflecting local Moshikou culture and its fusion with regional influences from the ancient Camel Bell

Trail, creating unique landscapes.



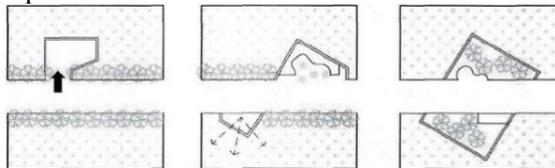
**Figure 14. Schematic Diagram of Street and Alley Spaces**



**Figure 15. Resting Seat Arrangement**

**6.3 Optimizing the Relationship between Surrounding Roads and Public Activity Spaces**

Given the proximity of public activity spaces to roads along Moshikou Street and the inability to fully separate pedestrians and vehicles due to existing block constraints, the safety and experience of elderly travelers must be prioritized. Speed bumps should be installed in the roadway center to regulate traffic flow and create a pedestrian-friendly environment. Landscaping and greenery should be arranged between pedestrian and vehicular lanes to minimize conflicts between pedestrians and vehicles. Considering the physical limitations of the elderly, adequate resting facilities should be added along both sides of the road (Figure 16). This allows seniors to take brief breaks during their journeys, further enhancing the neighborhood's age-friendly mobility experience.

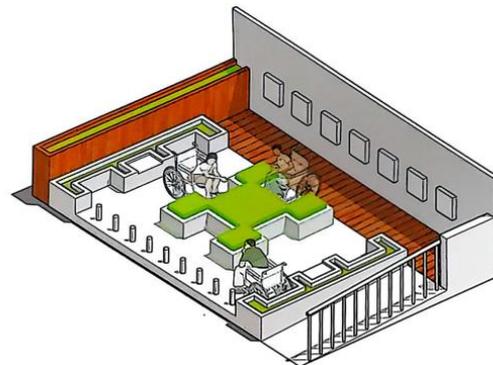


**Figure 16. Schematic Diagram of Interwoven Rest Areas along Roadsides**

**6.4 Age-Friendly Adaptation of Supporting Facilities**

Public activity spaces should feature barrier-free pathways and entrances. Adjusting the height of certain facilities, such as community planting

beds, is recommended to facilitate wheelchair access (Figure 17). Additional seating should be provided throughout public activity areas for elderly users to rest. Material selection should prioritize more natural, eco-friendly options that align with nature and promote physical well-being. Chair backs should incorporate ergonomic curves and angles to enhance comfort for elderly users. Public facilities should prioritize slip-resistant and impact-proof designs. High-traffic areas of activity equipment may feature anti-slip textures. For safety, handrails on activity equipment should be appropriately extended to facilitate gripping by the elderly. For paving and surface renewal, prioritize slip resistance by avoiding smooth materials while ensuring surface evenness. Maintain neighborhood roads promptly and clear street obstructions. Improve streetlight infrastructure to ensure nighttime walking safety. Key node spaces should feature covered facilities to provide shade from the sun and shelter from rain.



**Figure 17. Schematic Diagram of Accessible Activity Space**

**6.5 Legible Imprints of Historical Character**

Cultural memories of historic districts are imprinted on ground pavements and recreational facilities, incorporating elements such as historical patterns, representative architecture, and hutong names. This approach perpetuates cultural heritage, preserves the original character of historic neighborhoods, and establishes a cohesive character system. For instance, in the comprehensive renovation project of Xi'an's Small Wild Goose Pagoda Historical and Cultural District, the plaza paving bears engraved historical memories of the Tang Dynasty's 108 wards and preserved ancient wheel ruts, allowing users to perceive the cultural context through these details [10] (Figure 18).



**Figure 18. Paving Layout Diagram for the Small Wild Goose Pagoda Historic District**

## 7. Conclusion

With the acceleration of urbanization and the growing severity of aging populations, issues such as the deterioration of historic neighborhoods and inadequate community amenities have become increasingly prominent. The current state of poor neighborhood environments, low comfort levels, and lack of age-friendly facilities not only impacts the quality of life for the elderly but also hinders the sustained vitality of historic spaces. As witnesses and custodians of history, the elderly residents of these districts are central to enhancing their sense of well-being and belonging. Creating safe, comfortable environments for aging in place is not only the core objective of age-friendly design but also a crucial pathway to revitalizing neighborhoods and preserving historical continuity. While relevant research has made progress, significant gaps remain—particularly in addressing detailed aspects like age-friendly courtyards and indoor spaces within historic districts. It is crucial to emphasize that age-friendly design extends beyond meeting basic daily mobility and living needs. It must also address psychological activities and emotional demands, accommodating diverse requirements across different groups. Through in-depth analysis of the physiological, psychological, and behavioral characteristics of the elderly, it aims to achieve dual optimization of spatial functionality and emotional experience while preserving the authenticity of historical spaces. This creates a respectful and dignified living environment for the elderly, facilitating their better integration into social life. Moving forward, continuous exploration is needed to refine the age-friendly design system, address existing research gaps, and develop public spaces and community environments that more comprehensively meet the needs of older adults. This ongoing effort aims to provide more robust solutions.

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