

Research on Using Soundscape Design in Historical Area



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Faculty: III FACOLTA DI DESIGN BV

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Supervisor: Piccinno Giovanna

Student: Zhang Xuejuan

Student ID number: 805694

Track: I_3 Interni 3

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Abstract

The location of this graduation design is at Beijing Drum Tower historic district. In the process of landscape transformation, attempting to fully consider the auditory perception, and take use of it to guide landscape design.

'Sound' is an important presence of space which should not be ignored. It generates, transmits and disappears, by virtue of its loudness, frequency and timbre to interfere with people's emotions. Auditory perception, the same with visual perception, dominates people's subjective impression of space. However, in the current landscape design, the majority of designers are pay more attention to visual perception. When they consider the relationship between human and space, they attach importance to the visual elements' sense of beauty, thus creating high quality landscape. But to a certain extent, the sound effects on atmosphere are ignored. The aura created by the sound in space can has a positive role in promoting visual perception, but also can has a weakening effect on contrary, and therefore it should not be ignored in the overall design, sound effects needed to be considered together with visual effects.

In urban design, soundscape should be designed step by step. In this study, taking Drum Tower historic district for instance, using the sound as a clue to rearrange the space, set step goals of soundscape design in the area, so as to carry out targeted transformation: first of all, starting from urban planning level, should pay more attention to the diversity and uniqueness of overall soundscape in the area, based on the existing sound environment conditions, protect and promote the sounds which has regional characteristics; and on regional levels, considering characteristics of the soundscape environment within blocks as well as the interaction between adjacent acoustic space. Mutual penetration, influence and interference of the adjacent field must be treasured; Next is independent environmental space level. In this level should focusing on the fidelity of sound environmental effects as well as superposition effects generated by the different sound elements; finally on the level of a single soundscape, should considering the vocal elements one by one, dealing with the interaction of human and sound, psychological feeling should be focused.

In this study, I do the investigate and survey in the whole site, and then choose 4 point which have different kind of atmosphere to do the soundscape design. The main content of this study is divided into the following sections:

1. First of all investigate the detailed data of sound decibel, master the sound status and determine every sound noisy point position of the environment. In order to guarantee the quality of each acoustic environment, I try to take use of sound barriers to control the noise. Using sound barriers in the site can weaken the negative effect of the discordant sounds and ensure the fidelity of sound. In terms of noise reduction approach, parameterization is used in sound barriers design. Sound permeability of the wall is set in strict accordance with the actual sound noise level, and combined with the study of materials, to achieve the right effect of noise reduction.

2. After ensuring the overall acoustic environment without interference of noise, I turn to concentrate on thinking how to take acoustic area as unit during soundscape design. In the process of regional planning and design, the impact of sound must be full considered. Through transforming the space, meaningful sounds' transmission is enhanced and historic hosts also humanistic sound are restored and protected. Meanwhile, taking fully into account the time principle of vocal activities, through spatial planning, the place for vocal activities is reasonably arranged. In this way, can take use of planning vocal activity and spatial organization to control the overall sound environment.

3. Finally, from an aesthetic point of view, 'scenery' value is given to the sound environment. Through designing the combination and the surrounding forms of the space, and also plants matches and other related elements of landscape design, can create a good soundscape environment. The emotional atmosphere generated by the sound environment can be visually expressed.

Keywords: Soundscape; Historic area; Regional feature; Noise reduction,; Atmosphere

Contents

Chapter 1 Introduction.....	1
1.1 Research Object	2
1.2 Range of study	6
1.3 Research contents	8
1.4 Research methods	10
Chapter 2 Basis research of soundscape.....	12
2.1 Theory and resolution of soundscape	12
2.2 Research background of soundscape design.....	15
2.2.1 Development of research on soundscape abraod.....	16
2.2.2 Development of research on soundscape in China.....	22
2.3 Voice and emotion artistic conception.....	23
2.3.1 Aesthetic artistic conception of sound and emotional associations	23
2.3.2 The history of sound bearing and spatial memory	24
2.3.3 The history of sound bearing and spatial memory	27
2.4 Sound and space environment	28
Chapter 3 Method of build and control acoustic atmosphere	
.....	30
3.1 The hierarchy of soundscape design	31
3.2 Noise interference and shielding.....	32
3.2.1 Sound-absorbing by mute wall	33
3.2.2 Isolate noise by greenbelts	35
3.2.3 The frequency interference censored	38
3.3 Different control technique for acoustic elements.....	41
3.3.1 The maximum use of sound natural	41
3.3.2 Control sounds from daily life	43
3.3.3 Reproduce historical sounds.....	44
3.4 Create “sound landscape” atmosphere	45
Chapter 4 Investigation and analytical for soundscape in	

Drum Tower area	47
4.1 The change history of soundscape in Beijing hutong.....	47
4.1.1 Soundscape of Beijing Hutong from 1949-1978	50
4.1.2 Soundscape of Beijing Hutong after 1978	48
4.2 Soundscape element in Drum Tower area.....	52
4.3 Sound level's data records.....	55
4.4 Subjective assessment in Hutong soundscape	69
4.4.1 Subjective impression of all soundscape element.....	70
4.4.2 Mental map of all soundscape elements	79
4.5 Sound field partition in the site.....	81
Chapter 5 Using soundscape in historical area landscape design	86
5.1 Design partition and positioning	86
5.2 Noise reduction processing Based on parameters of loudness	93
5.3 Acoustic area space planning.....	97
5.4 Analytic hierachy process for soundscape elements design	106
5.5 Method of creating soundscape atmosphere.....	108
Chapter 6 Epilogue	122
Bibliography.....	125

List of Figure

1-1 The scope of study object	2
1-2 Texture and the road system	3
1-3 The historical changes of central axis in Beijing	4
1-4 Road situation of Drum tower area	5
1-5 The traffic situation	6
1-6 Concept picture of soundscape design.....	7
1-7 Sound level of Old Beijing hutong.....	8
2-1 Japan's regional characteristic landscape pattern ①	26
3-1 Sound propagation distance in different materials are compared ②	33
3-2 Various materials of sound effects ③	34
3-3 Different surface resistance wall sounds.....	35
3-4 Green sound isolation resistance plane	36
3-5 Green sound isolation resistance section.....	36
3-6 Frequency interference sound profile	39
3-7 Isolated afforestation and comprehensive utilization of sound attenuation wall case - Musée du Quai Branly	32
3-8 On the section show the natural sound of country environment ④	42
3-9 On the section show the natural sound of city environment.....	43
4-1 The number change of Beijing Hutong	48
4-2 Scenery of Beijing Hutong ⑤	50
4-3 Soundscape elements' location.....	53
4-4 Soundscape level	54
4-5 Main elements of site's soundscape	55
4-6-6 Sound level's data records.....	56
4-7 Sound change's data records	57
4-8 Sound level change trend in Drum Tower area	58

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4-9 Sound level of the Baochao hutong	59
4-10 Sound level of the Zhaofujie hutong	60
4-11 Sound level of the Langjia hutong	61
4-12 Sound level of the Guowang hutong	62
4-13 Sound level of the Zhangwang hutong	63
4-14 Sound level of the Doufuchi hutong	64
4-15 Sound level of the Caochang hutong.....	65
4-16 Sound level of the Gulouwan hutong.....	66
4-17 Sound level of the Gulou street	67
4-18 Sound level of the Old Drum Tower street	68
4-19 Mental map of all soundscape elements	80
4-20 Sound environment division by SPSS	84
4-21 Sound field partition in Drum Tower area	84
5-1 Scope of design	87
5-2 Axonometric of Design point status.....	88
5-3 Design point A's status and design orientation	88
5-4 Design point B's s status and design orientation	89
5-5 Design point C1's status and design orientation.....	90
5-6 Design point C2'1 s status and design orientation	90
5-7 Design point C2'2 s status and design orientation	91
5-8 Design point D1's status and design orientation.....	92
5-9 Design point D2's status and design orientation.....	92
5-10 Hearing threshold for human ^①	93
5-11 Space arrangement for different level's noise	94
5-12 Example of using grasshopper for wall	95
5-13 Grasshopper wall analysis.....	96
5-14 Grasshopper wall changing analysis	96
5-15 Grasshopper wall model	97
5-16 Design point A Sound law.....	99
5-17 Space arrangement of A point	99
5-18 Space arrangement of B point.....	100

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5-19 Space arrangement of B point.....	100
5-20 Design point C1 Sound law	101
5-21 Space arrangement of C1 point.....	101
5-22 Design point C2`1 Sound law.....	102
5-23 Space arrangement of C2`1 point	102
5-24 Design point C2`2 Sound law.....	103
5-25 Space arrangement of C2`2 point	103
5-26 Design point D1 Sound law	104
5-27 Space arrangement of D1 point.....	104
5-28 Design point D2 Sound law	105
5-29 Space arrangement of D2 point.....	105
5-30 Concept of grasshopper pavement	110
5-31 Point A,B,C1 plam.....	111
5-32 Point A,B,C1 section	112
5-33 Point A section	113
5-34 Point C1 section	113
5-35 Point C2 1 plan and section.....	114
5-36 Point C2 2 plan and section.....	115
5-37 Point D1 plan and section	116
5-38 Point D2 plan and section	117
5-39 Point A rendering	118
5-40 Point C1 rendering.....	119
5-41 Details of point B	120
5-42 Rendering of Grasshopper wall	121

List of Table

Table 2-1 History of research on soundscape design out of China	14
Table 3-1 The sound attenuation coefficient of different types of trees green belt(β , dB m ⁻¹) ^①	37
Table 3-2 Different types of sound attenuation on the surface of the earth ^②	38
Table 4-1 Questionnaire of subjective impression for all soundscape element ..	71

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Chapter 1 Introduction

Voice of sensory experience, can be more touching than visual images of the impact, stimulate the nerve, wake up the special memory, produce special atmosphere and emotional space. Rice knife before vendor's shouts in childhood, in the summer afternoon out of the window to the whispering leaves were, merchants pushing a bicycle hawk, full of popsicles and faint sound of the train wheel over the tracks in the distance, and so on, constituted the most vivid in my childhood memory, now hear, also can make the scene in your mind the moment fresh rise. Visible sound generated by the memories are vivid and profound, it with visual images, stereo set stored in the memory, vivid and fullness. When the voice again, will be combined with sensei in mind, visual images, even the real-time scene of the weather, temperature reduction, environment and mood. Space of emotional appeal and meaning can be conveyed by the sound, that is the beauty of sound.

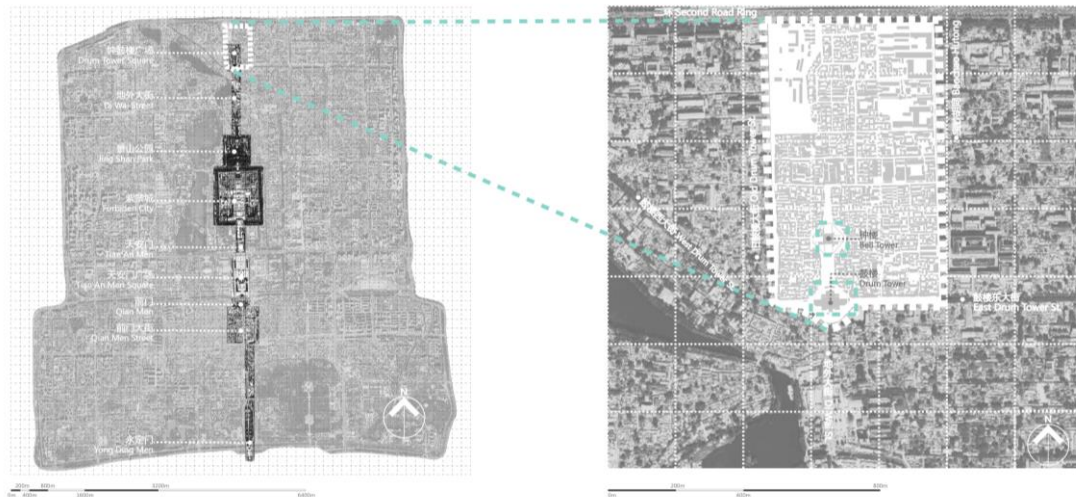
We live in a world filled with all sorts of voice, the voice of the animals and plants in the nature, with the life in the city of the voice of the humanities, and the sound in mind the memory..... But, because of the rapid development of modern society and the fast pace of city life, people take the initiative to "listen" consciousness is becoming more and more weak, it is in the face of noise pollution to protect themselves, but also let us always in inadvertently overlooked a lot of beautiful and meaningful sounds. Auditory sensory degeneration, also a negative impact on visual sense, eventually leading to disregard for environment and free state, thus let the life become boring. At the same time, the development of globalization also has negative impact on the regional characteristics of sound, some with local characteristics of voice gradually damaged by tending to the same development pattern, spatial form and change the way of activities together lead to the deterioration of the acoustic environment.

The sound environment is deteriorating, we should not be in a negative attitude to face, let the auditory acuity to avoid noise and lower, and should use the positive attitude, from the perspective of history, society, culture and environment, take the initiative to improve the sound environment, reduce the effects of noise, make full use

of synesthesia auditory and visual effect, to rethink the sound environment planning and design, to restore and protect some historic and the voice of humanity, from the perspective of aesthetics, give meaningful sound environment gives the value of "landscape", let us be able to keen perception of the sound environment of regional characteristics.

•1.1 Research Object

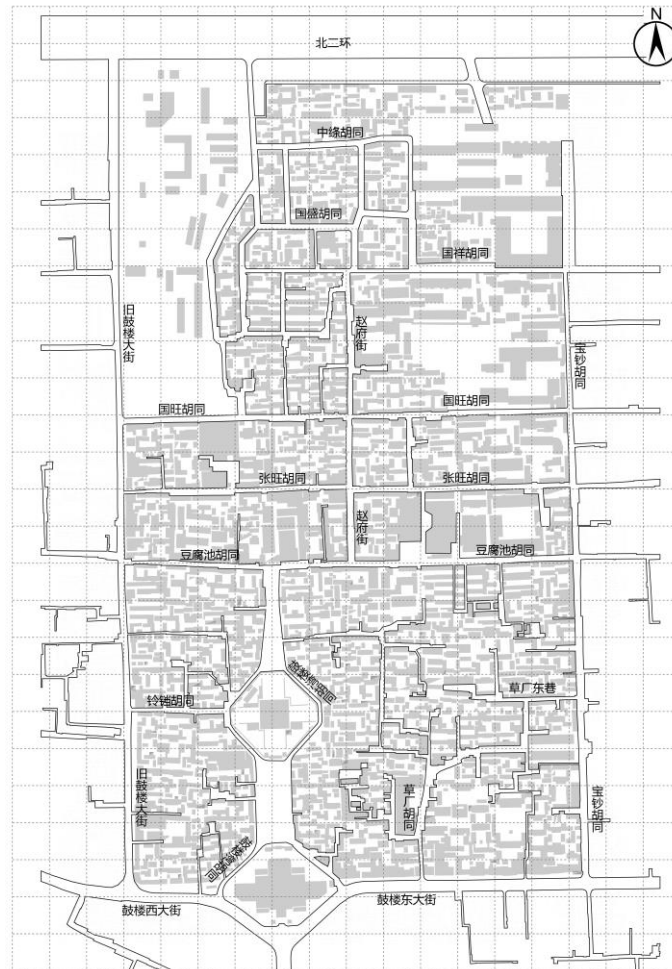
The study in Beijing drum tower area, for example, to the voice of the old Beijing historical block landscape system of investigation and research (see figure 1-1), and based on it, according to different acoustic area corresponding retrofit design of the acoustic environment.



1-1 The scope of study object

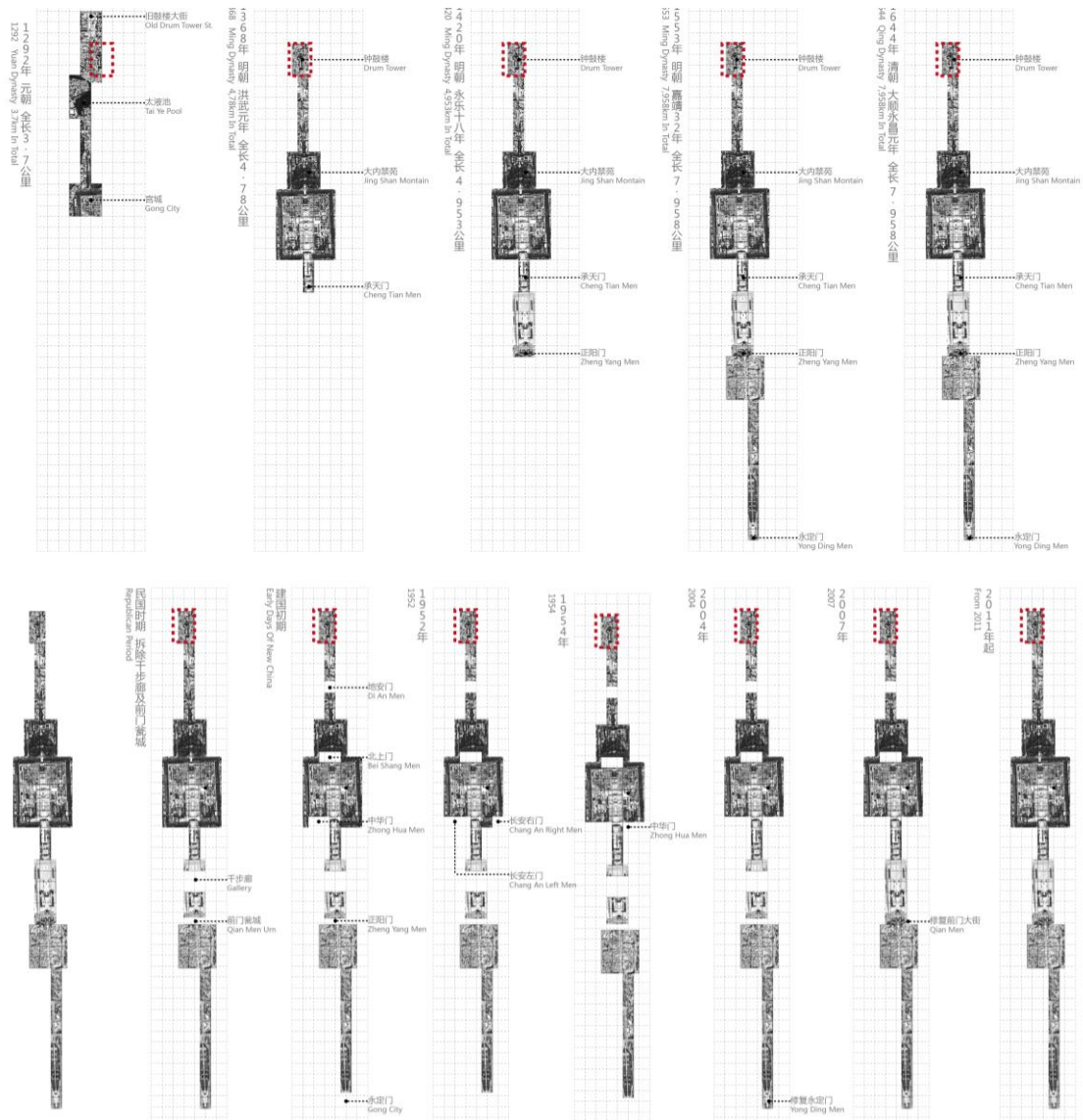
Drum tower is located in the extreme north of the old Beijing central axis, it is a place with profound history and culture. The research area of the distance from the north sea after the south along the drum tower street, difficult to the north, the east by a bao chao hutong, west to the old drum tower street, covers an area of about 40 hectares. Within the region, north and south to the main road from east to west for bao chao hutong, grass factory hutong alley, Zhao Fu street, drum tower bay, jade pavilion lane 2, the prosperous west lane and old drum tower street, east-west main road from north to south is north, taeniasis in hutong, prosperous countries sheng hutong, our hutong,

hutong, Zhang Wang hutongs hutongs, tofu, pool, bell hutong, grass factory east lane and drum tower street (see figure 1-2)



1-2 Texture and the road system

One thousand years of history changes make great changes have taken place in Beijing. And after the founding of new China, walls demolished, hutong area reducing, Beijing city texture is no longer a homogeneous close state, spatial pattern of great change have taken place. But as embodied the spirit of the central axis of Beijing city has been preserved more complete, the development of every age has left its mark on this, it has become the symbol of the ancient city of Beijing (see figure 1-3).



1-3 The historical changes of central axis in Beijing

And in this among them, as the end of the old central axis, drum tower district space basic no major damage to skin texture, architecture form and function pattern basic preserved the traditional style, each dimension of hutongs also maintained in the original state (see figure 1-4)



1-4 Road situation of Drum tower area

Restricted by right and history to protect regional planning principle, whole block of motor vehicles is forbidden, the vast majority of public space for walking places (see figure 1-5)。



1-5 The traffic situation

Drum tower street life area has a lively, local-style dwelling houses building relatively intact, the area of the bell tower and drum tower the state-level cultural relic preservation building since the yuan dynasty period, up until the end of the qing dynasty last emperor pu yi leave the Forbidden City, is the time of the city center, the People's Daily life work and rest are in accordance with the and the Forbidden City gate opening and closing is to according to. In terms of personnel, most of the local residents in Beijing, and give priority to with the elderly, to have a strong regional emotional old Beijing. All of these investigations and studies in this area provides a good foundation.

•1.2 Range of study

This study is divided into "acoustic area planning" and "environmental noise" and "sound field atmosphere build" three parts, in order to to create sound environment with the regional characteristics.

Sound landscape reflected the face of the city, carrying a large amount of residents' activity and natural change of information, so the voice of the historical block landscape has a strong historical research value. It is a long life habits and the crystallization of the model, it is important to the urban context, record the history of the city. (see figure 1-6)



1-6 Concept picture of soundscape design

In this study, trying to drum tower in Beijing area as an example, the history and status quo of the landscape of the region's voice a comprehensive analysis and redesign, to restore the historical block style geographical uniqueness, and the voice of the historical block landscape restoration and protection for the future play a certain reference function.

Beijing drum tower area is relatively intact, in the form of hutong has rich sound environment, diverse level (FIG. 1-7), it is to restore the traditional old Beijing sound scene provides a good foundation.



1-7 Sound level of Old Beijing hutong

However, in today's era background, the drum tower area tourism development is rapid, the surrounding commercial, at the same time, close to the city's main traffic trunk road north, so the noise pollution is serious, have done great damage to the original sound environment, the landscape of the acoustic region is weakened, acoustic landscape quality did not match with the quality of the space form.

To redesign the film OuDeSheng environment, therefore, will be mainly from the following three aspects: the first is a positive attitude, consciously of acoustic environment planning and design, in order to "voice" as a basis for the partition design, to comb "acoustic area" as the unit to "hear" the content of the maintenance of voice, to restore the original sound system to the drum tower area; Then is to protect the acoustic environmental quality of vocal register, acoustic area environment according to the different requirements for different levels of noise reduction processing, ensure the fidelity of the voice inside each area; Finally, consider how to auditory and visual design combined with the use, adjust the spatial hierarchy, produce regional characteristic of the emotional atmosphere.

•1. 3 Research contents

The sound in historical block landscape design practice, the research is on the basis of the traditional landscape, in the environmental design meet the visual aesthetic demand at the same time, the influence of sound into account (including natural and human voice), the voice of the hierarchical level of regional environmental system

planning and design, the auditory and visual aesthetic aesthetic to cooperate, given the value of "landscape" to sound environment, build an atmosphere of a specified in the overall environment, meet the match the multi-sensory experience.

Field survey research started in the field of acoustic environment, through the rational data record and perceptual psychological assessment, determine the different acoustic elements using different types of processing technique, create the basis of acoustic landscape design. An important content in this link, from the perspective of cultural studies in the environment. In many cases, some special voice embodies the culture of a specific geographical, historical, or social attribute, is a voice of connotation. Like people already do not rely on the clock tower of the time to work and rest, but regular rang the bell but it can make people have a strong sense of belonging and identity; W "to your" owner let hotel appear noisy noisy, but it can make people feel the real authentic Beijing flavor. These along with the voice of the human environment and exist, often let a regional geographical features more stereo and vivid. Sound is contains the cultural background, the development of sound in the cultural heritage of the role of, make full use of voice to emphasize the regional customs is an important stage of the research direction.

In the design of acoustic environment, "noise" is the premise and foundation of ambience. Here involves to explore the means of noise reduction, and from different environmental noise level, consideration of different coping strategies under different noise level requirements. The specific noise reduction technique is divided into plant noise reduction and frequency interference noise reduction and several space fit resistance around the sound noise level, so in this part, need to study different plant morphology on the reduction functions of voice, the concrete measures of frequency interference and the resistance sound properties of different materials, etc.

Guaranteed, acoustic environmental basis is the study of acoustic field space atmosphere build technique. People's perceptions of the sound, not only by physical factors such as loudness, timbre, frequency effect, but also to a large extent affected by the presence of environment. Professor you-guo qin in the category of acoustic landscape science, vividly illustrates the "present" the influence of environment on voice: heard the piper played in the concert hall, listening to the CD audio equipment before playing the flute, and in the moonlight through a Wang Chishui listen to the

sound of the flute from the flower bush (a dream of red mansions 76 back: "convex brigitte hall flute feeling lonely"), and in the countryside shelf-space listen back of a bull boy blowing a flute, feel obviously different. This is the role of the acoustic field. How to build the environment atmosphere of the sound field, let a space atmosphere to proper foil emotion, to "see" and "hear" feeling promote each other, is the core content of research.

In conclusion, the drum tower area landscape design process, the core is through the guidance of the space, to reasonable set of sound, the sound scene combined with traditional visual landscape, through the present environment to foil atmosphere, and strengthen the cultural meaning of the processing of voice, so that the sound to reshape space, foil atmosphere, to create a with local characteristics to arouse the rich environment of spatial memory.

•1.4 Research method

The whole study is divided into three stages: the first is research of relevant information collection, to understand the research background and theory of acoustic landscape design related basis; Then visit, sound within the field view about the history and present situation of collection and research; Finally based on survey data, the site to activate the spatial memory as a target for landscape design.

Data gathering phase: the first is through reading literature and data access, complete soundscape sound landscape basic research, master the development history of sound landscape and sorting by the origin as the development status of both at home and abroad; Then collect and read the architectural acoustics and sound ecology research material, learning how to through the plant morphology, material properties, frequency interference band, space form to control the effect of sound.

Field investigation stage: the field sound environment research into history and status quo part. History section is based on the related history books, novels, poems, essays, diaries, folk paintings and other works of art of reading and viewing of film and television comedy, the museum collection, collection of old Beijing hutong area traditional voice, voice and understand venues and law; Status quo part research by many field visits to record sound of drum tower district environment present situation.

Site investigation by several times in the following steps: (1) the field source collection: to record all sound within the field to determine the site within the natural and artificial acoustic source number, location, and in the drawings of all the influence of sound source; Sound environment mapping: the area for grid, every 40 m doing a survey points, in the field with high precision decibel meter measuring the coordinates of the dB value, record is made after the dB value change map of each hutong. Three, holidays and ordinary day, morning and evening peak and leisure time, day and night, to research of the above two, at different times of the record field acoustic environmental conditions; Fourth, making questionnaire; Will the film history and the present stage of the sound to make subjective impression evaluation form, extend to local residents have to fill in, liking to examine the sound and the degree of coordination and analysis the weight, and basis for later use in the design of specific gravity.

Stage design practice: on the basis of sound field environment research, according to research records each point of the intensity of the sound data, according to "city regional environmental noise standards" (GB3096-93) regulation of residential sound environment maximum intensity (55 db) in the day, and the different levels of noise reduction for different areas; Then is to reorganize and field of acoustic environment planning, in order to consider the city level, regional level, the independent environmental space hierarchy to a single sound scene hierarchy for landscape design, created to build corresponding environment atmosphere of the sound field.

Chapter 2 Basis research of soundscape

Soundscape sound landscape concept put forward by the first Canadian musician R Murray Schafer has experienced more than 40 years of development, it is an interdisciplinary subject, the research involves the acoustic, ecology, landscape architecture, and related fields, at the same time need to psychology, sociology and other disciplines relevant theory as the support, the overall research goal is to create a good sound system - scene of meaningful, a voice of appreciation value, to control the voice of the negative and harmful, to create a good sound system, promoting and the sustainable development of environment of symphony.

•2.1 Theory and resolution of soundscape

Soundscape by sound (sound) and scape (view), as well as landscape is a typical words here. As a traditional subject in the field of landscape, in the Chinese translated into "landscape" or literal translation into "landscape", landscape architecture in Chinese translated into "landscape" or "landscape architecture", "landscape architecture". Therefore soundscape can be translated as "landscape", hereinafter referred to as "scene", as a discipline, can be referred to as the "sound" scene.

Scene study is sound relationship with the environment, is different from traditional architectural acoustics and acoustic environment. Architecture/environmental acoustics research focuses on the source and receptor, is a pure rational science, it does not involve aesthetic artistic conception, no will consider the visual properties (landscape), from the perspective of culture and aesthetic study. Sound JingXueZe made up for it, at the same time in the study of sound source and receptor, emphasized the coordination, and visual attention environment, present in large part, general aesthetic thinking is blended in among them, fully using the psychological zhonglian role, at the same time, we should use the sociology thought, create a harmonious sound field. Make one of the most simple example, for the building/environmental acoustics, below 30 dB is only "quiet" sound environment, and at the time of the peak cicadas and birds will exceed 50 dB values, even as high as 80,

once the environment with their calls, is apparently is no longer a "quiet" environment. But for the audience, "cicada noise Lin Yu static, birdsong more deep and remote mountains," cicadas in the ear bird company more let a person feel quiet and comfortable. Sound scene cultured is "sound" and "scene", this is the landscape of the sound wonderful experience.

After statistical research, there are four methods to classify the sound, each kind of classification method has its corresponding logical rules. Sound learning method is the most rational, but in many cases, the physical and psychological feeling is not necessarily a one-to-one correspondence. Compared with the method of sound mind to learn more perceptual, of the subjective and the objective factors of sound integration of sound reflects the first feeling of sound produced by the inner reflection. Statistical method is the simplest way of classification, but ignores the same kind of sound is different because the region and time difference. Compared the aesthetic method is the most interesting, largely considered the feelings of color, so for acoustic landscape design have the greatest research value.

In the field of acoustic landscape design, often the landscape elements are divided into three categories: your voice tone of voice (keynote sound), sound outlook or signal sound (foreground sound or sound signal), mark (soundmark). Tone sound the word by the relevant concepts on music, such as wind, water, sound of birds or traffic noise, etc., it established the fundamental key the voice of the living environment; Prospects or the signal is the voice of the warning role, it because of its special timbre and frequency to the listener's attention, such as the siren, horn, bell and drum sound, alarm, etc; Logo is unique regional characteristics of the sound, the sound can be artificial, can also be a natural sound, such as special bells, the voice of tradition, the noise of a waterfall, etc., it is the most need to pay attention to in the design of acoustic landscape and the use of voice.

Acoustic landscape design in the process of spatial shape the pursuit of sound quality are mainly concentrated in the following aspects: the uniqueness of sound, with strong regional characteristics, reflect the local details of life, in line with the local habits and human feelings, let the listener a sense of belonging; Sound coordination degree and degree of pleasure - can make the listener produce feeling happy and harmonious; The overall environment of high fidelity - prospects sound background

distinct, voice clear and perspective, the voice is not be noise masking. So in the process of design of acoustic landscape, need to deal with the relationship between the voice and try to create a high-fidelity sound environment, let the sound level is rich, can bring the listener to be able to reflect regional culture and the enjoyment of pleasure.

Sound learning study is a complicated process, is not a simple to prevention and control of noise noise reduction processing, as well as to the wonderful sound unlimited replication can create a good sound environment. The following can illustrate this point: in a case study in the consciousness of common people, the noise of the street are intolerable, serious impact to the rest of the residents along the quality, however, researchers in Britain from the European cities in scene investigation found that for people living in the historical block, for a long time to form the street of "noise" has long been an integral part of their life and let them have a strong sense of belonging and a sense of security, if the "noise" disappear, it will make people feel frustrated and anxious. This illustrates the experience of sound is a complex process, social material and cultural background, time and space, individual experience can affect people's perceptions of the acoustic environment.

Scene study research on acoustic field environment, also pay attention to the sound source itself. Sound, there is a culture and history of environment determines its has a strong regional. In soundscape design, there is a concept called "heritage" voice, research goal is to those who have special significance, the voice of culture. In this concept, focus on not only the body itself, but also the occurrence and spread and accepted the whole natural environment and humane environment. This kind of "legacy" protection not through audio equipment will be stored in the museum, but to protect the acoustic environment. Japan has pioneered the voice of heritage protection, it is the first to realize the cultural attributes of sound and regional characteristics, and thus for the conscious on overall sound environment protection. As early as in 1993, Japan was conducted a nationwide "selection Japan sound scene 100" activities, selected by a referendum in most Japanese characteristic and regional representation and most worth keeping and live on for their own protection. In the selected voice, both can reflect the humanity temple bell, ports, whistle, etc., have to be able to reflect the natural charm of spring ding-dong, forest birds and so on. This activity is within

the scope of the universal awakening people's awareness to protect the acoustic environment are increasingly serious noise pollution in a timely manner to the voice of the precious heritage protection.

Therefore, sound scene to learn everything, involving disciplines and fields extensively. Good acoustic landscape design should be from the sound source at different levels have wonderful content, on the level of the city should reflect the diversity and harmony, at the regional level should pay attention to uniqueness and do not consider the interaction of adjacent acoustic space, the independent environment space among the voice of the need to deal with each other, and for the occurrence of a single body, and can consider the landscape of the sound interactivity.

•2.2 Research background of soundscape design

Voice of landscape research, the overall experience of acoustic environment from cognition, management, to advance planning design stage.

In this research field, Canada play a decisive role, is the proud of quiet country in the late 1960 s to early 70 s first noticed the sound environment deteriorating phenomenon with the social development, thus proposed the concept of soundscape sound landscape and made a series of related research. The research work of Canada, as in the domestic, and then expanded to Europe for related research, thus promote the exploration in the field of sound landscape of Europe, so the whole western countries in the field of study to earlier than any Asian countries, Europe at this stage of research is focused on the prevention and control of noise. Sound learning scene in Asia development lagging behind western countries for more than 20 years, is the earliest in the early 1990 s from Japan, but Japan's research results in less than 10 years' time went quickly to the front row, the entire field of research on the protection of sound heritage has made considerable achievements. While China the focus of sound landscape and working on is relatively mature in the related fields of Japan, also is the end of the 20th century to the early 21st century gradually begin to, study earlier in the mainland and the Taiwan region, the earliest of acoustic landscape under the influence of urban expression, and the researchers of the mainland, as is the voice of the living environment landscape. Overall from the concept of soundscape sound landscape has

experienced more than 40 years of development, from the western countries to Asian countries from different angles to obtain a lot of related fields to explore, and to focus on this area from all over the world now, sound landscape in the future by the big research space and research value. And for China, sound landscape research started later, has so far been only experienced more than 10 years of history, although considerable achievements, but China is humongous, to protect and create their own characteristics of landscape research and considerable development space.

•2. 2. 1 Development of research on soundscape design out of China

Sound landscape study abroad started earlier, development has been relatively mature, has formed a fixed system of development, there are a lot of researchers and organizations involved in related research, and has deep into the more meticulous, concerns also gradually into a diversified and specific, so not a fine, in the first list is important in the history of the development of foreign sound landscape landmark events, listed in table 2-1:

Table 2-1 History of research on soundscape design out of China ^①

Time	Country	Organization /personnel	Incident	Achievement
1965– 1975	Canada	R Murray Schafer	Put forward the concept of soundscape sound landscape and for	Published 《The New Soundscape》 and 《The Book of Noise》

① 表 2-1 中所有资料数据来源如下:

Granoë. G.Reine geographie. Acta Geographica 2,1-202, 1929

Porteous,J.D,&Mastin,J.F.. Soundscape Journal of Architectural and Planning Research. 2(3), 169-186, 1985

Schafer,M.R. The turning of the world, Toronto: McClelland and Stewart. 1977

Wrightsom.K. An introduction to acoustic ecology. Soundscape: The journal of acoustic ecology, 1(1),10, 2000

Schafer.M.R. ed. Five village soundscape. Vancouver: A.R.C. Publications. 1977

Hiramatsu,K. Acoustivities and impacts of soundscape association of Japan. Proceeding of iner-noise 99.1357-1362, 1999

			the purpose of education and research the sound environment to create a "world soundscape project" referred to as "WSP"	
Early 1970' s	Canada	WSP members	Was the study of the voice of the Canadian landscape environment, collection and storage in some parts of sound effects, and to establish a sound database, this is the world's first sound database, analysis and research on the sound's actual living conditions	Published 《The Vancouver Soundscape》, For the first time in the book to discuss sound interaction between landscape and living environment and function
1973	Canada	WSP member Bruce Davis and Peter Huse	On a trip across Canada recording activities	Collect and record in different parts of the sound, Canada and is now Canada CBCIdeas radio kind of landscape of Canada's voice program creation

				foundation
1975	Sweden, Germany Italy France Scotland	R Murray Schafer and other members	In Sweden, Germany, Italy, France, Scotland, the main city of academic report and acoustic workshop, and in five countries choose sound landscape is a village survey	First, the sound landscape concept into Europe, promoted the sound study scene in the European enlightenment, Second, collected five village voice as material WSP analog tape databases, library preserved more than 300 kinds of tapes, Canada and Europe voice for the first time will sound effects are collected for sound scene in life science research
1975	Canada	R Murray Schafer and other members	Academic research with five European countries for recording and finishing at the same time, research and detailed analysis of five rural acquisition of acoustic	Published 《European Sound Diary》and《Five Village Soundscape》

			landscape material	
1977	Canada	R Murray Schafer	The five countries in Europe further summarized of scientific research achievement of academic research	Published the first representative of the molding of soundscape materials 《The Tuning of the World》
1978	Canada	WSP member Barry Truax	Relevant research in the field of acoustics and soundscape acoustic landscape description of the term	Published 《Handbook for Acoustic Ecology》
1981	France	COMPIEGNE seminar	Put forward the concept of "environment"	More comprehensive noise is expounded and the connotation of the negative meaning, promote sound environment of urban sociology
1982	England	British soundscape research pioneer	Set up to control noise protect Quiet environment, a nonprofit group of thought The Right of	Some columns for prevention and control of noise pollution, the attention of the domestic for a sound

			The -quiet Society	environment
1984	Canada	WSP member Barry Truax	The study of sound and voice technology processing to make a summary	Published 《Acoustic Communication》
1990	France	CSTB lab	Formulate the CSTB sound environmental quality assessment standard	
1993	Germany	Hildegard Westerkamp	Creative musicSoundscape Newsleter, and help to build World Forum for Acoustic Ecology (WFAE)	The agency for the first time the world within the scope of individuals and organizations engaged in research on soundscape sound landscape closely linked together
1993	Japan	Sound environment scholars of Japanese	The Japanese association for the study of acoustic landscape creation of folk academic society	Organization awards 100 "Japanese landscape", cause citizen sound heritage protection and inheritance issues of mutual

				concern
1993	Japan	Shantian Liyefu	From the perspective of folklore study landscape throughout Japan's voice	Published "Japanese sound and wonders"
1995	Japan	Yangong Zhenyilang	From many aspects discusses Japanese sound landscape and landscape ecology thoughts	Published "acoustic landscape ecology"
1996 — 1997	Canada	WSP and Cambridge Street Records	Voice of landscape research back to vancouver and do record	Reissue the European Sound Diary "(European voice Diary tapes) and at the same time issued" Soundscape more than 1996 "double CD
1997	Canada	WSP member Barry Truax	Research on "City of Vancouver's Urban Noise Taskforce"	Finish with a profound education significance report the Urban Noise "

Thus can clearly see that Canada is a pioneer in the field of sound landscape studies, led to Europe until the world focus on voice landscape science, put forward a lot of guidance in the whole field, the theoretical basis of the focus on the uniqueness

of different regional voice scenery; Britain began under the drive of related research in Canada, the focus of attention lies in the influence of the noise problem for life, the study not only the noise problem of noise pollution area, also from the perspective of sociology and human feelings to consider the influence of different geographical and life background noise to adopt different methods to deal with noise. Japan is, on the sound heritage protection and inheritance, related research has set an example for other countries and benchmarking. In addition, many countries in the world are carried out in a large number of related to the landscape of the sound of the research and design practice, the European Union is funding the 12 academic institutions on a called "rediscovered urban areas and open space", is aimed at exploring the physical environment of city open public space, the project is the eu's "cultural heritage and tomorrow city" part of the research program, including voice of landscape research constitute an important part, trying to eight cities in Europe 17 public open space of the acoustic environment, field test and data analysis for the sound scene description, evaluation of public open space and landscape design to create a system framework.

•2.2.2 Development of research on soundscape design in China

Relative to foreign and domestic sound landscape research started relatively late, and research of acoustic landscape was the earliest researchers in Taiwan. Tsinghua university in 1998, Taiwan hsinchu jiunn-shiow wang took the lead in Taiwan's hsinchu city sound scene investigation, trying to sound through the point of view of environmental sociology to hsinchu and vancouver scene to do a detailed comparison, complete the soundscape urban expression - a tale of two cities of environmental sociology thought report, this paper discusses how to through sound landscape planning and design to form urban district unique representative significance expression. In the later time, jiunn-shiow wang continue from the perspective of sociology, has completed the environmental studies: hsinchu city sound scene investigation and analysis of the environment and the voice: urban expression of soundscape study, such as voice pioneered the domestic research of landscape.

And mainland area to sound landscape research began in 2000, is by the school of architecture, tsinghua university guo-qi li was the first to put forward a plan to carry

out research in sound scene in Beijing, in 2002 after started a group called "soundscape -- the research and application of sound landscape", by 2004, the task finished a paper entitled "the voice sound research and landscape design scene" study, its research content is in city planning, noise control, and community planning based on the idea of "sound scene design", in Beijing, for laboratory, improve the acoustic environment scene in Beijing. One of the research content of this report is to establish a sound museum, the other is by means of acoustic landscape design of residential area design practice.

After summarized the research achievements of predecessors, in this thesis, I try to study from the perspective of humanistic environment in the sound. In many cases, some special voice embodies the culture of a specific geographical, historical, or social attribute, is a voice of connotation. Selection of typical significance of historical block as the research object, trying to sound scene in the design combined with traditional visual landscape, through the present environment to foil atmosphere, and strengthen the cultural meaning of the processing of voice, so that the sound shape space, through the processing of space environment to stimulate the production of sound, to create a with local characteristics can provoke rich environment, spatial memory is the goal of the study and practice. That inspired the sound of the processing to create a with local characteristics can provoke rich environment, spatial memory is the goal of the study and practice.

•2.3 Voice and emotion artistic conception

Voice touches auditory reaction, thus cause emotional resonance. Sound is a part of the scenery, beautiful voice contains the humanities artistic conception, touch, hearing, or let a person feel relaxed and cheerful, or let a person feel safe, or let people experience rich regional culture, or let a person feel rich community life, or improve some memory, some rich lenovo. Acoustic landscape design in the space, just need to reasonable use of natural and artificial sounds, create a sound environment of sentimental artistic conception.

•2.3.1 The aesthetic artistic conception of sound and emotional associations

About the classification method of sound in mentioned above, the said method can be applied to the aesthetics, classifying voice according to emotional color, aesthetic evaluation result of different sound, it is for acoustic landscape design has a guiding significance. Beautiful voice its emergence and spread of site has some kind of artistic conception, can cause the listener emotional some resonance. In modern poems, there are a lot of works through the depiction of the sound to foil the artistic conception: the earliest in the book of songs, the use of onomatopoeia words at random "logging tintin, the singing of birds breaks down" "youyou life is music, and eat wild apple" "alive" river, north flow, DiaoTi life is music, the water tree and so on sound wonderful natural are written into the poem, let the mind lenovo vivid; And tang poetry, there are a lot of to foil the literary artistic conception with the sound of words, "gusu city hanshan temple, the midnight bell to the passenger ship" bell let lonely cold night in the suburbs have a sense of belonging, "toward the filled with clouds, Trinidad jangling also on the 1st. On both sides of the YuanSheng crow, boats already past thousands of mountains" faint from the jungle in the cheerful gibbon to canoe floating on the surface of the forward further embody the rhymers happy cheerful mood, "partial known ChunQi warm tonight, insect sound new green wire netting" in the hopping locust let nor a scene from the page revival, "said harvest rice fragrant flowers, listen to pre-pubescent" with the cheerful atmosphere frogs is let the joy of harvest more powerful. These words describe picture from now is too far away, but between the lines with the scene description is vivid and appropriate, gave the readers a great deal of lenovo's space, the role of synesthesia make real-time images with the voice in your head form of imagination, this wonderful experience with the understanding of the cultural connotation, lenovo is full of charm. These literary works depiction of acoustic landscape was of the old saying "the scene than listen to the scene" the best interpretation, but also the most apt to sound field aesthetic artistic conception.

•2.3.2 The regional characteristics of sound and emotional resonance

Sound sound compared to the natural landscape, artificial landscape, by participating in city life and has a unique cultural connotation, all-encompassing, constitute the artistic conception of the city, contains a lot of details information, make the city a unique expression of different from other cities. These sound scene corresponds with the regional characteristics of content and situation and emotional relationship, can cause the listener's emotional resonance, the formation of emotional attachment to a long-term living areas fixed voice. This is the spirit of city representative sound scene produced properties.

In Japan's sound scene described above research started late but developed rapidly, and sound in the natural and humanistic landscape on the protection and inheritance of made outstanding achievements, thanks to the Japanese quiet listening habits, they sound of the nature of good instincts of admiration and respect. In the 1993 by the Japanese association for the study of acoustic landscape organization of Japanese scene in 100, by the Japanese people everywhere to vote for the most protection value of Japan's voice in the landscape, natural landscape of the 58, they both Hokkaido sound waves, aomori ten hotan, streams, Kyoto south Dan's the sound of water, aichi prefecture, the tide of the infrastructure, such as all kinds of sound of flowing water; And Tong _ village and the continent city wind sweep the tinkle of the two, akita county can generation city pneumatic pine swoosh and a series of sound from the wind; Ogawa former lake wild birds call on sichuan river, the white bird _, Hokkaido crane heming, etc all kinds of birds in the village voice; Have life is music on the nara spring field, tochigi, Victoria peak rain frog is called nature and all kinds of animals, such as Also have yamadera cicadas, yamagata city kumagaya barren hills of locust and other insects. And by the 100 sound scene on the map the distribution of the view (see figure 2-1), they are scattered in various places within the territory of Japan, has a strong regional features, unique represents the local natural and cultural characteristics. In the heart of the locals, the scene as well as other historical relics, is worthy of protection and inheritance of a culture.

2-1 Japan's regional characteristic landscape pattern ^①

The same sound in different places can produce different reaction, which is related to people's emotions. An example of their own, I grew up city claims to be the train to the city, and most people here work and railway construction, railway network distribution in the inner cities is also very intense, a lot of people at home can be heard the noise of the distant sound of the train operation. For people of many other places, it is can't stand the noise, but for the people in my hometown, which is the symbol of the city, away from it, life is less points, become incomplete. Close my eyes and in the family bed had been pressed the distance if if no train wheel tracks voice will make me feel is a sense of security, it is not sharp, not noisy, like Ann divine comedy to sleep with me. Similarly, sound scene in Japan in 100, there is also a very special sound scene, is on the streets of ding ding dang dang Tong feet bicycle bell, also not resident

① “日本最佳声景 100 处” 声景分布地图: <http://www-gis2.nies.go.jp/oto/>.

in the heart of the noise, but the city's unique scenery, worthy of protection and inheritance. Similarly there are a lot of, such as Hong Kong streets ding-ding, dalian street tram, in the era of the form should be eliminated, but it is the symbol of the city, carrying too much city memory, no one is willing to erase them from the city. From 2005 to 2006, the British hall of both culture and education in China carried out a research project, called voices "urban" in Beijing, Shanghai, guangzhou, chongqing four local residents interviewed record, asking them to describe in words the favorite in my heart the most urban noise can cause emotional resonance, the cable tower bell, pigeon whistle voice, distant ships on the band, and so on, surprisingly, there are also some people think the "noise" are also included in the ranks, such as night site construction, make some people feel safe. Operations such as overhead monorail, make some people feel a sense of belonging; And outdoor mahjong, make some people feel warm and happy. The wonders of this is the voice, it embodies the humanistic feelings and life artistic conception, the sound is part of the scenery, become the symbol of the city.

•2.3.3 The history of sound bearing and spatial memory

Mentioned about sound learning scene said in the content of the study, it is an important category of research has a rich history and regional culture connotation, from the perspective of history, culture, society, with the perspective of the humanities landscape to understand and analyze voice. Voice in addition to have a certain aesthetic artistic conception, as well as bearing and a particular period of history. When the voice sounded again, can make the listener stereo perception of space, appealing to a particular memory of space. French professor Jean Francois experts in the field of acoustic landscape studies in the book "culture and city artistic conception", puts forward the concept of "rope", think that drawing the listener to identify a local sound like an invisible rope, can cause the listener to produce collective memory.

In the southeast of Beijing dongcheng district has a historian hutongs, hutong have the first in the history of Beijing hutong museum, not only have the old Beijing 130 complete miniature recovery model siheyuan courtyard, is recorded and kept more than 10 kinds of old Beijing hutong unique sound, best friend, tiger maintain child, and so on some hutong today had not found traces of voice can be heard here. This is a

generation of miniature life, carrying the history of a particular period of time. It reflect the condition of social and economic model, residents' lifestyle and a series of information, the old Beijing is the city of memory, is precious. Voice, can cause in my mind a lot of pictures come alive, traditional Beijing hutong neighborhoods of resurrection life in the brain.

Contains details of all kinds of life activities in space, the sound, auditory sense stimulation with visual stimulation to keep in memory, even if the space is changed, the sound again, sound field to produce, can also will have accompanied by visual spatial memory images together back to the head, this is the voice of the collective memory.

•2.4 Sound and space environment

Sound field aesthetic artistic conception of tone to determine the first sound body itself, the frequency, volume and timbre of itself laid the foundation of sound field atmosphere; While overall emotional artistic conception is dependent on the impact of environment within the scope of state space, it serves the visual aesthetic feeling, and hearing, common experience of excitation has some kind of emotional atmosphere.

Mentioned above the cries of the historian hutongs in Beijing historical museum, in the commodity economy society now they can be recorded and retain valuable, has a strong historical research value, can make the listener feel and finish a special history, but, unfortunately, a recorded voice here is always not dynamic, it lacks the corresponding sound field, the lack of the atmosphere of the environment. This study to the voice of heritage protection problem, it also relates to the category of natural environment and humane environment, its protection and other protection of ideology is imminent. Sound heritage protection is a relationship to the problem of all levels, not just keep sound by machine record itself, but also need to sound system of the whole space, the life form to maximum protection.

Sound in the process of landscape design, through to the space form, interface material, space combination and other landscape elements, in the form of state control, can directly control the direction of propagation of sound, appear a gender, the degree of reflection and reverberation, the strength of comfort, to create different atmosphere

of the sound field environment, thus to a large extent, actively guide the listener's experience. This is the important role of space environment on the sound field. Natural sound, the sound field of daily life emotional atmosphere of artistic conception, historical acoustic field of regional culture requires corresponding space environment as the auxiliary, to complete the common shape of acoustic environment atmosphere.

Chapter 3 Method of build and control acoustic atmosphere

In the historical block for the ultimate goal of landscape design, is the sound generated by the environment atmosphere, which is the core of the design, to create a strong regional characteristic and humanity space environment, to create a sense of belonging and enjoy pleasant feelings. Sound, the listener and the environment are the three elements of the landscape design of present, any link requires careful consideration of many factors, to fully study the habits of the listener and the background, the choice of proper and sound processing, targeted to shaping of space, to create a voice of emotion and artistic conception of landscape.

In the sound environment construction, the sound quality is an important consideration, to ensure good sound voice, spread and acceptable quality is the main pursuit of space design. Sound quality, sound quality) research field developed in the 1980 s, the sound quality here mainly includes three aspects: first is the function of the voice, it is embodied in the consistency of stimulus and response; Then the pleasantness of sound, sound itself characteristics and individual be fond of and experience are the influence factors of it; Finally the voice and sound source identification, around which the listener judge on the basis of what had happened. Pursuit of sound quality in the process of spatial shape mainly concentrated in the following aspects: the uniqueness of sound, with strong regional characteristics, reflect the local details of life, in line with the local habits and human feelings, let the listener a sense of belonging; Sound coordination degree and degree of pleasure - basic positioning, fully considering the site according to the actual site of psychological needs, create can make the listener produce pleasant and harmonious feeling sound environment; The overall environment of high fidelity - prospects sound background distinct, voice clear and perspective, the voice is not be noise masking, the superposition of different voices will not interfere with each other, and masking. In this chapter, is trying to from these aspects, the discussion of the specific historical block of sound field environment atmosphere build and control means.

•3.1 The hierarchy of soundscape design

In today's sound environmental problem more and more attention, acoustic landscape design should be penetrated into all aspects of urban design, from the largest city in the hierarchy, to the regional level, independent environment space level, and then to minimum single view hierarchy, all need from the concerns of different considerations.

At city level, landscape design to fully study the city sound environment of the overall situation, on this basis, from the level of planning, value-added voice for the city environment, pay attention to improve the landscape of the city sound regional characteristics and diversity. France CSTB laboratory team is committed to sound environment research topic in urban planning stage to the acoustic environment of the overall idea, developed a system called CHAOS of software, and geographic information system (GIS) powerful map ability, high quality represent the city sound environment, and on this basis to cooperate with the overall urban planning, and using a computer controlled simulation technology, accurate simulation of planning urban sound system after the changes. So intuitive will sound system for the visualization, and facilitate in changing at any time control of the sound environment, from the overall plan to the specific project implementation, project grow naturally follow several process in real time, continuous optimization of targeted sound environment.

At the regional level, it is necessary to define the acoustic environment of the regional qualitative, and relationship with adjacent acoustic space coordinate. In historical block, for example, here is the area of local residents' daily life, also accompany with centrally to sightseeing, handle good atmosphere of two area two completely deviate from the relationship between the sound environment is very important, both to ensure that the two kinds of sound environment atmosphere to the largest reflected, and to avoid interference between them.

In independent environmental space, it is important to coordinate environment within each element singing of time and space, pay attention to what sound elements at the same time can gain the effect of atmosphere, which produces sound elements because of the frequency difference is too big not generate noise added to the harmonious, need one by one analysis environment within all the possible elements,

handle the relationship between each other.

The last is a single view hierarchy, consideration is reasonable use of voice, people and the landscape of the sound interaction. Through the environment construction, make a voice to bring some strong feelings and emotional interaction. The backyard of the jewish museum in Berlin, covered with a clearing the metal mask, in the space under the guidance of into the area, the metal will happen because people trample backlog, friction and deformation, screeched, at the same time, the sound is all around surround close smooth wall reflection, amplification, and only natural light down from the top, let a person heart afflictive, want to escape the struggles of but no way out. This is the purpose of the designer, think that through the interaction of sound experience felt jews during world war ii desperation, reflect on a dark period in Chinese history.

In historical block landscape design, from the city level, the voice of the environment as a whole tone has been formed, the design of the concentration from the regional level, the independent environmental space plane to a single sound scene design step by step. In the process, you first need to deal with the issues of noise reduction, lay the foundation of the sound environment to create a particular atmosphere; Then in view of the different area, to deal with the corresponding acoustic elements, create clear voice structure system; Finally with the visual sense to consider at the same time, given the value of "landscape" to sound environment, let environment atmosphere more strongly.

•3.2 Noise interference and shielding

From the physics definition, refers to the frequency and noise loudness change without law, sound body chaotic vibration sound. But from a psychological point of view, as long as it is alien to the environment as a whole atmosphere, tone of voice are all destroy whole sound environment noise, such as in the usual chat talking and laughing in a quiet environment is abrupt, is not welcome. So the listener in different environments have different tolerance to the sound of different level, in the process of space build, need to record sound environment of the whole area, to determine the location of different noise levels, with the appropriate methods to design the space.

•3. 2. 1 Sound-absorbing by mute wall

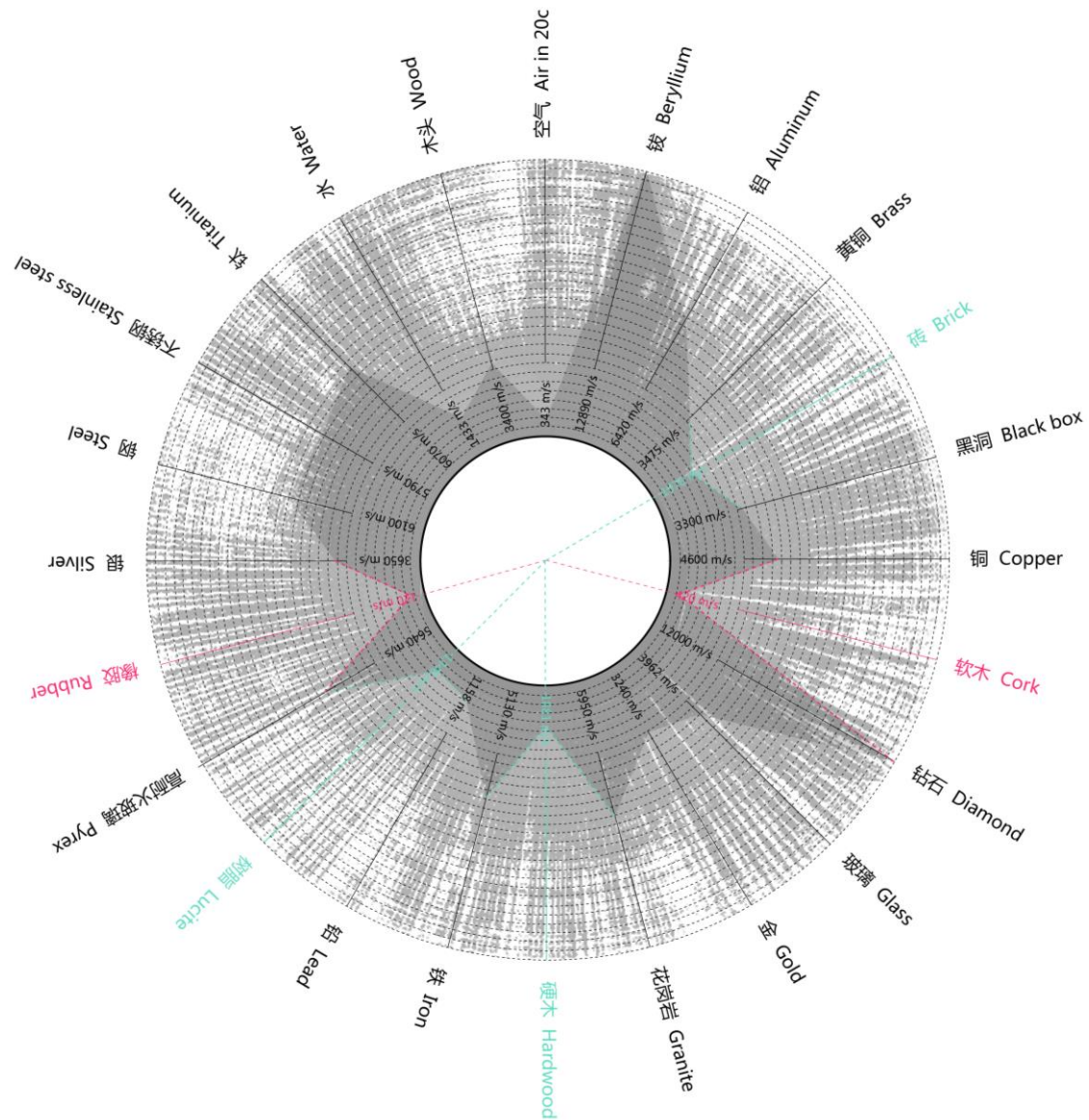
For high intensity, frequency change chaotic noise, noise reduction is the most effective means of using the mute wall. Sound wall noise reduction can be divided into reflection noise reduction and sound-absorbing noise reduction, the former is based on the wall surface to carry on the design, using the sound wave reflection principle to change the direction of propagation of noise, in the high-speed, high-speed along the road was a large number of applications. The latter is the use of the properties of the material itself, in the process of noise propagation in acoustic absorption. In the city, for noise level and considering the environment beautiful sex, with material sound-absorbing is a more practical method

The molecular structure of the material and density is directly related to sound attenuation ability, different materials of the resistance ability is the key to use. In the figure below (figure 3-1), analyzes the same intensity and frequency of sound in different categories of material transmission distance, this can clearly see that the resistance performance analysis (FIG. 3-2).



3-1 Sound propagation distance in different materials are compared ^①

^① Architectural Association School 2014 年学生研究成果，网站：

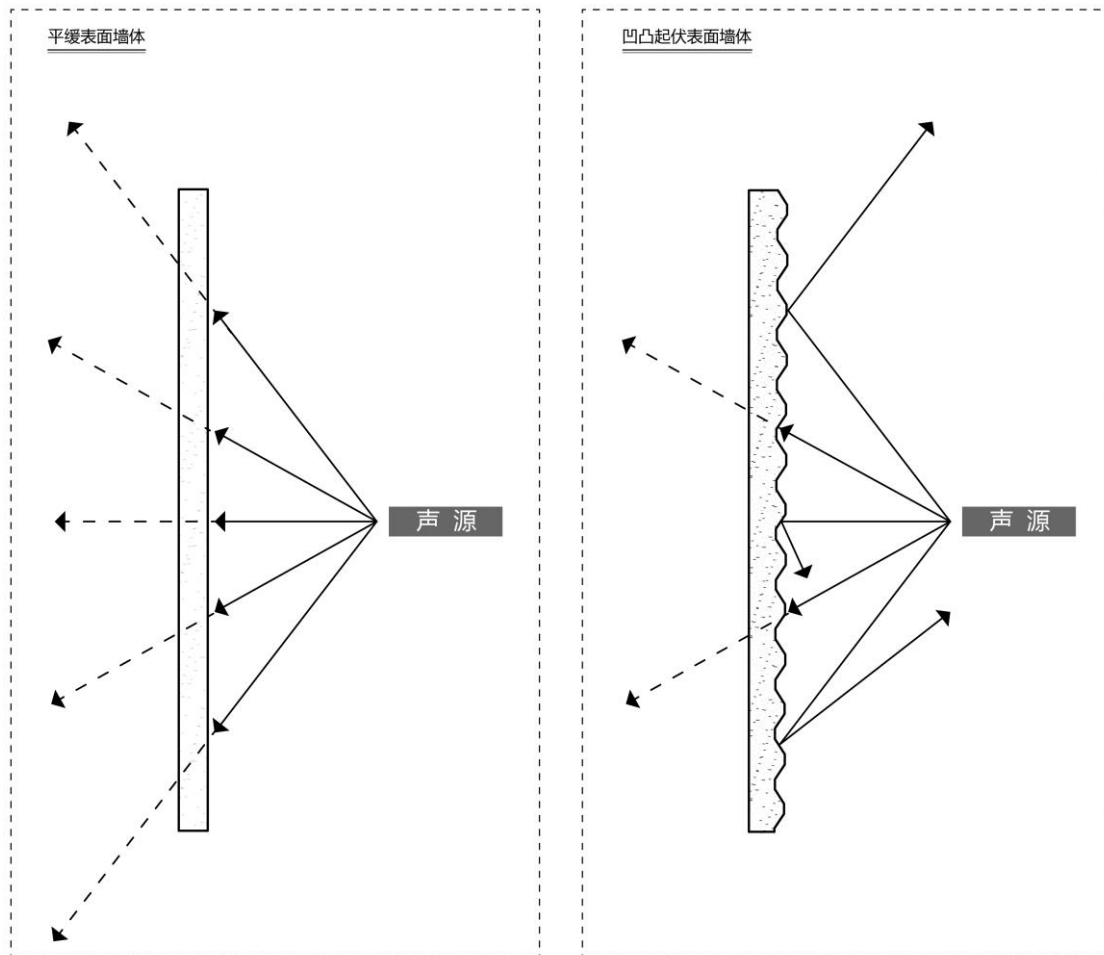
3-2 Various materials of sound effects ^①

As you can see by the picture in a second, and the same sound propagation in the inner rubber shortest distance, is 120 m, and then the cork 420 m, thus has the very good resistance sound effects; And in resin, hardwood and brick of the propagation distance is relatively short, 1340 m and 1881 m and 1976 m respectively, at the same time, these are the commonly used material, space construction can be applied to sound in the wall.

<http://pr2014.aaschool.ac.uk/INTER-07/Isotta-Cornacchia-Biasion>

① Architectural Association School 2014 年学生研究成果, 网站:
<http://pr2014.aaschool.ac.uk/INTER-07/Isotta-Cornacchia-Biasion>

Sound wall sound-absorbing besides depends on the properties of the material itself, can also through the form on the surface of the wall as auxiliary. Rough, more ups and downs of the wall surface can increase the reflective surface for noise, so as to reduce the noise in the source into the quantity (FIG. 3-3).

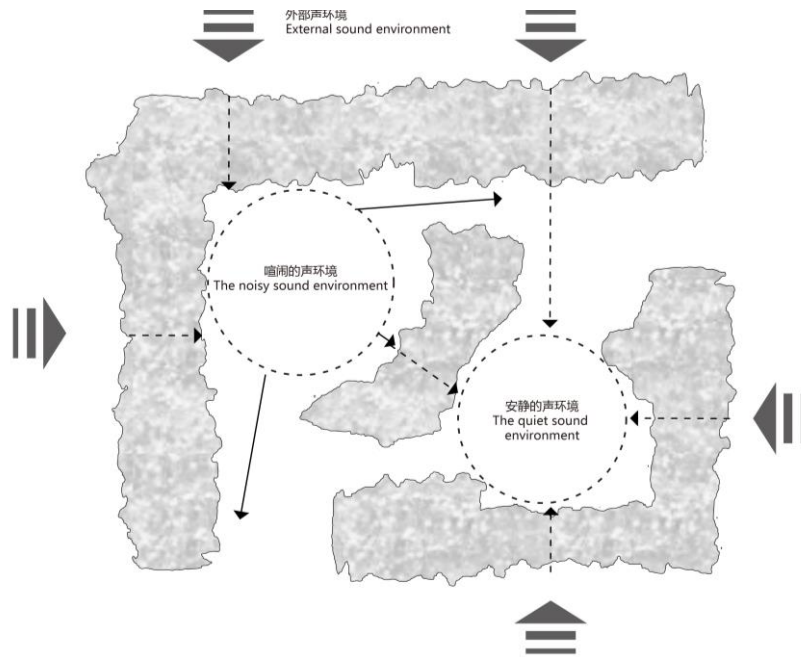


3-3 Different surface resistance wall sounds

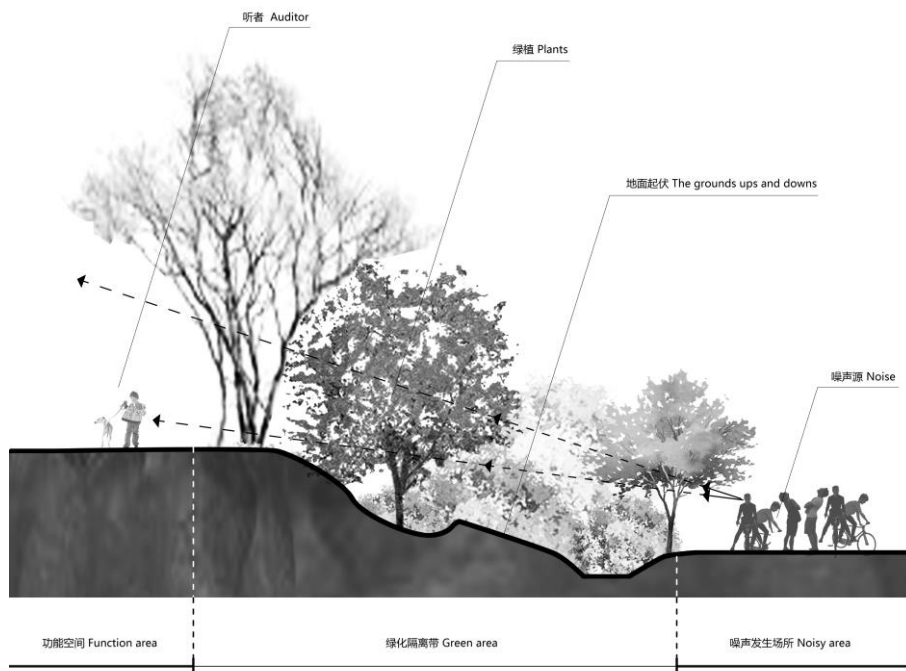
Relative to other resistance sounds, sound attenuation effect of wall is the most direct, the most striking a way, suitable for high decibel noise area. In the process of space construction, the selection of wall materials, the surface morphology is presented design focus.

•3. 2. 2 Isolate noise by greenbelts

For noise intensity is relatively weak area, using plants combined with the terrain, to afforest the isolation resistance can also play a good effect. Plants through configuration, strewn at random discretion supplement (FIG. 3-4, 3-5), can be formed in the periphery of the space of noise barriers, low-level noise effectively isolate noise reduction effect.



3-4 Green sound isolation resistance plane



3-5 Green sound isolation resistance section

Using green resistance, need to consider various levels of green plant supplement, from large, shrubs to small trees, trees, all need to choose the right kinds of plants, consideration of different kinds of plants to sound attenuation coefficient (see table 3-1, 3-2) and to the surface of the material and the terrain to cooperate. Contrast table 3-1, 3-2 data as you can see, in the choice of plants, need to choose broad-leaved, leaf thickness, the types of plant leaves with dense, low branch ^①。

Table 3-1 The sound attenuation coefficient of different types of trees green belt(β , dB m⁻¹) ^②

树带 Tree belt	频率 Frequency (Hz)					平均值
	200 ~ 400	400 ~ 800	800 ~ 1600	1600 ~ 3200	3200 ~ 6400	Average (dB m ⁻¹)
松树 Pine	0.08 ~ 0.11	0.13 ~ 0.15	0.14 ~ 0.15	0.16	0.19 ~ 0.20	0.15
小松树 Small pine	0.10 ~ 0.11	0.10	0.10 ~ 0.15	0.10	0.14 ~ 0.20	0.15
冷杉树 Abies fabri	0.10 ~ 0.12	0.14 ~ 0.17	0.18	0.14 ~ 0.17	0.23 ~ 0.30	0.18
阔叶树 Broad-leaved tree	0.05	0.05 ~ 0.07	0.08 ~ 0.10	0.11 ~ 0.15	0.17 ~ 0.20	0.12 ~ 0.17

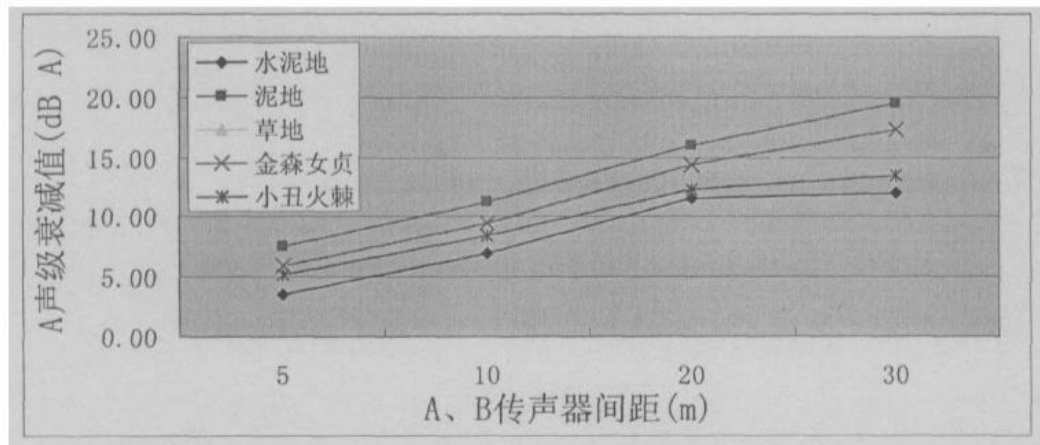
Table 3-2 Different types of sound attenuation on the surface of the earth ^③

① A.K.PAL, V.Kumar,.Noiseattenuationbygreenbelts[J].JournalofSoundandvibration,20(X),234(l):149 — 16

② 张宏昆：《高速公路林带降噪参数设计研究》[J]. 载《公路与汽运》，2009年04期，第156–159页。

③ 刘佳妮：《园林植物降噪功能研究》[D]，浙江大学

传声器间距 地 表 材 料	5m	10m	20m	30m
水泥地	3.60	6.94	11.50	12.04
泥地	7.54	11.26	15.94	19.58
草地	6.00	9.20	13.60	16.93
金森女贞	5.98	9.46	14.28	17.36
小丑火棘	5.2	8.46	12.34	13.4



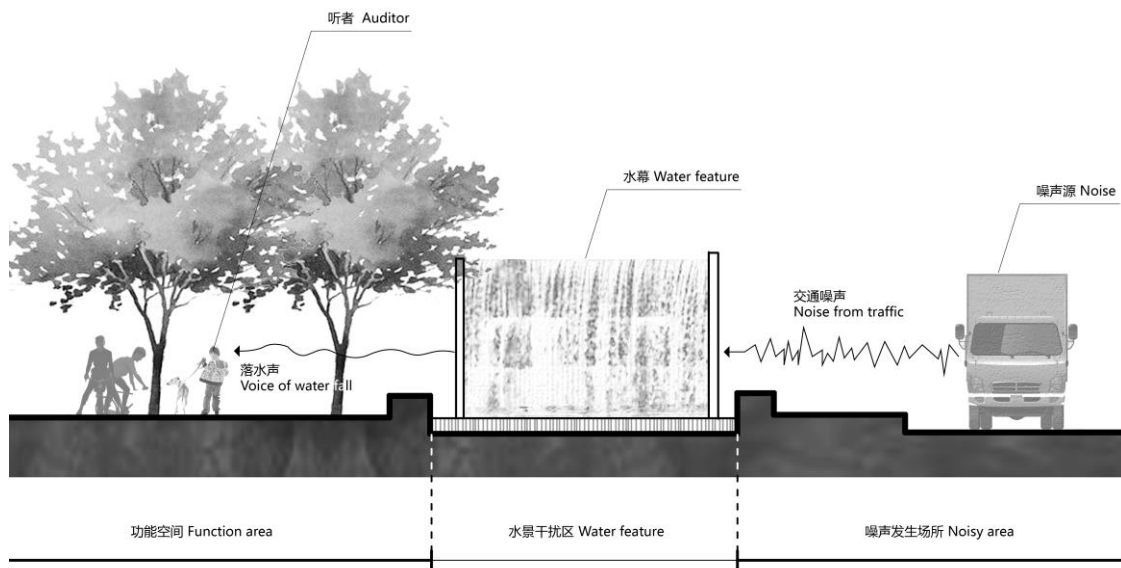
With sound wall is different, use green resistance, also from the another level to beautify the environment, different plants will produce different aesthetic feeling, supplement and finely the noise from the wind blows the leaves will, make the atmosphere more have interest. At the same time, green plant jagged and doesn't completely block line of sight, thus extending the boundaries of the space, let the whole area is still a coherent integral space. Both can stop the noise, and can optimize the sound environment, but also can satisfy the need of visual aesthetic, and therefore, sound isolation resistance is green city most advantages in the design of acoustic landscape way of noise reduction.

•3. 2. 3 The frequency interference censored

The human ear for voice recognition not only related to the intensity of the sound source itself, and also is related to the degree of fidelity voice within the same environment. In a quiet environment, even a whisper can be heard clearly, then the threshold is very low; And once you have any other sound source to join, will affect the listening effect, then the threshold is relatively high. This due to the frequency

interference between the voice and make the person's auditory sensitivity to reduce phenomenon is the masking effect of sound. In the environment design, and many times need to avoid the masking effect, in order to maintain sound clear, rich layers of sound environment; Can also set through the interference frequency, however, add some good voice let a person produce pleasant mood, effective use of masking effect to reduce the human ear hearing sensitivity to noise, and noise reduction effect.

In space design, the sound of water is the most frequently used environmental noise interference (figure 3-6).



3-6 Frequency interference sound profile

In addition to water, using the leaves, the sound of birds and other natural sound can have masking effect on noise. When people in such an environment, ears instinct "listen" to bring the choice of feeling happy voice, and subconsciously to ignore the noise interference. Swedish scholars have carried out on the two noise level in the same neighborhood, their noise intensity on the numerical value is the same, the one in the area planted a large number of green plant, attracted a large number of birds, and another is not. Researchers examined two community residents in the form of questionnaire for noise annoyance of living environment, the results show that abundant natural sound of community residents for the negative emotional is far lower than in noise environment poor neighborhood. It shows that the natural sound of noise frequency interference is strong positive role.

The advantage of frequency interference noise elimination, is that it is not only

the noise reduction of the effective means, at the same time can be combined with other elements of landscape design, improve the environment of the aesthetic artistic conception. Visual and auditory function at the same time, achieve the "sound" "scene" unification, can effectively reduce environmental noise bring negative emotions.

As detailed above three kinds of noise reduction was not an isolated, according to the actual status of the environment will in combination with the means of noise reduction, the effect of the environment together to create a level in a low voice. Brownlee museum in Paris is just such an integrated use of the typical cases of noise reduction methods in outdoor space (FIG. 3 to 7)



3-7 Isolated afforestation and comprehensive utilization of sound attenuation wall case - Musée du Quai Branly

The museum is located in the Seine side, at the foot of the Eiffel Tower, in visiting museum district strong demand for environmental noise reduction. Designer jean jean nouvel surrounded by using glass curtain wall in the side of the street entrance courtyard, a large number of rich vegetation planted level, combining sound wall and green plant barrier to resistance, effect is remarkable, the intensity of the sound for an average of 78 db down from the streets to 53 db at the entrance of main building of the museum, on the vision, through the cascade of green plants to visitors bring emotional comfort, for access to the building main body for the buffer; On hearing, lively atmosphere in the hustle and bustle of the transition from the strip to the

quiet and peaceful atmosphere, do mental preparation for into cultural tour places。

•3. 3 Different control technique for acoustic elements

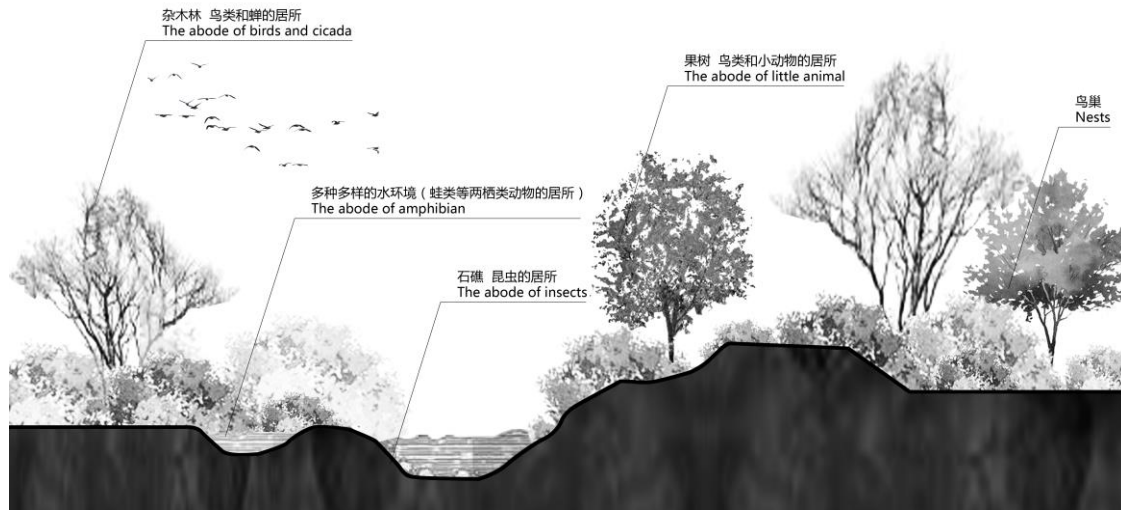
The basis of noise reduction is to create a good environment for the sound, followed by the need to do is to deal with other acoustic elements in space. The voice of the space environment is a variety of acoustic elements work together form the overall, judge the actor of low quality of a sound environment have a clear standard: first of all, good sound environment has a complete sound system, tone of voice, sound outlook and marking sound distinct; Then, the relationship between the acoustic elements reasonably clear, promote each other when they can deliver the acoustic elements arranged in the same space, can cover each other, or don't bring a good feeling of acoustic elements with distance between each other to prevent interference; The last item, is to speak on the timeliness of thoughtful consideration, for the steady state with appreciation value source provides enough space to attract people reside; For affected by seasons or time to change the dynamic source provides flexibility to the law of the voice.

On the handling of acoustic elements, natural sound, the sound of life and history have different control methods: natural sound can let a person feel relaxed, generally from psychological to the big noise masking effect, so you need to maximize use; Life has a strong timeliness, the place of voice directly influenced by spatial configuration, the same sound in different situation can bring different psychological feeling, so need to reasonable planning of space, lead vocal conforms to the person's mood change; And history of sound reproduction requires corresponding space form and social basis, so not all the history of acoustic for reduction, need to be filtered in accordance with the reality.

•3. 3. 1 The maximum use of sound natural

In country environment, natural sound itself is very rich. In this kind of atmosphere, people's perceptions of the voice become more acute, different from natural sound emotional nuances can be clearly reflected: frogs is sound of lively, let a space active wind blows the leaves rustle let a space more show calm, each associated

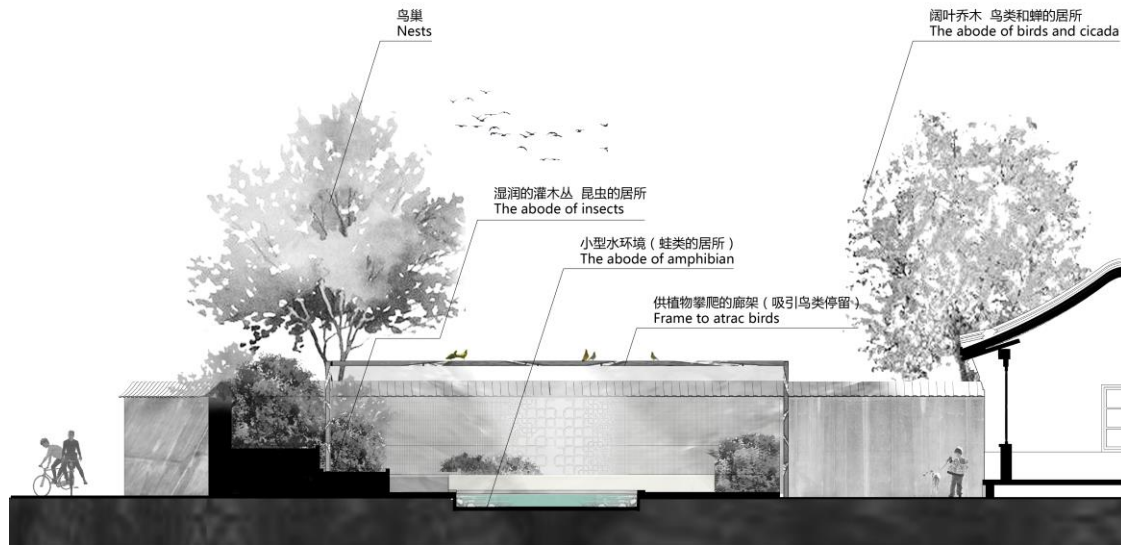
with different mood, can according to the experience of emotion set to deal with the space, setting the water environment, planting vegetation accordingly, add the wall, and so on (FIG. 3-8)



3-8 On the section show the natural sound of country environment ①

Sound natural rare in the city, when the overall sound can be heard when the environment is quiet and peaceful. Use natural sound in the city, the first thing you need to reduce the interference of the noise around them, through the various processing techniques of mentioned above, and then according to the conditions of the space, by planting trees attract birds to stay and join shrubs and cover to keep insects, soil moisture and ensure that appropriate introduction of water environment provide living space for frogs and so on (FIG. 3-9)

① 松藤贵子、外尾一刚、葛坚、公园を取り巻くサウンドスケープに関する研究、平成 14 年度日本土木学会西部支部研究発表会講演概要集、第 2 分冊、ppB338-339、2003 年



3-9 On the section show the natural sound of city environment

Both country and city environment, natural sound can bring the joyful mood, need to create basic environment, provide conditions for animal and plant growth, resulting in the maximum use natural sound.

•3. 3. 2 Control sounds from daily life

Physical space can't direct sound field, but for acoustic field has been formed, under the premise of without changing its properties, can to a certain extent, have the effect of regulation. Through understanding the behavior of residents' daily life habits mode of fixed sound environment, research the fixed elements of time and space pattern, through space planning on the basis of conform to the laws more rational guidance to different elements, regulate the related voice behavior.

Spatial sound regulation of life, first of all reflect on the influence of the spatial form of activity. Human activity is the foundation of sound produced all kinds of life. Space itself surrounded the morphology, and the condition of the whole atmosphere can largely affect the activity's content, which affect the status of the voice. So as the goal, in order to avoid interference between sound overlay design of space to put the life of the urban residential area and control.

However, for a mature urban areas, the people living there for a long time is the main part of the space, as the personnel structure stability, residents will be the place in

daily life according to their own will and to adjust the life habit, to develop the potential of space, form their own space usage habits. This case, the usage of physical space is not necessarily the same as the original designer of urban planning. The habit of residents formed a relatively fixed sound environment atmosphere. In this case, the sound environment of space optimization must respect has long been used in space, through the space form, the form of combination, interface control, materials, and other landscape elements influence the direction of propagation of sound, appear a gender, the degree of reflection and reverberation, fidelity, and the strength of comfort.

In the process of design of space, the listener is the existence of a complex, he is not only the audience, voice and sound, placing signage at sound in every link of the scene. Good sound scene space encouraging people's participation and interaction, the participation of people and create a new scene. And in this process, different gender, age, social background, cultural level, life experiences will make different listener produce different feelings, so in the process of design, need to fully consider all possible factors other than the acoustic sound environment in the situation.

•3.3.3 Reproduce historical sounds

Some voice, is a product in the history of a particular era, with the urban development level, social structure, way of life and communication. In the modern society, the globalization some traditional voice with the regional characteristics in slowly fade, replaced by the efficient operation of city no hell mode identification of city landscape.

In historical block landscape design, some selective reduction with regional characteristics, to represent a certain period of the history of urban style and features to reproduce, as a symbol of sound, is to make the blocks have an important means of cultural heritage value. The selection of sound history, in today's society on the basis of the degree of acceptance and practical. In Beijing, for example, the most can represent the voice of the hutong culture before reform and opening up is one of the merchants hawking with acoustic sound, it has to do with the level of social development, is directly related to the business background, People's Daily life items required for the vast majority of merchants from a lane, so for people who lived in that

time, cries the most let a person feel kind, loading a lot of memories of life. In today's society, however, people buying and selling goods is not dependent on traveling salesmen to sell, mall shopping experience type and the Internet convenient delivery is more like modern way of shopping. At this time of reappearance of merchants hawking's performance, the practical functions are much less.

But there are certain sounds, in today's society has no the function value, but still was welcomed by most people, that is the bell tower. Japanese sound scene such as mentioned above in 100, the bell has received the widespread attention, in different parts of the statistics, the national total of 12 bell was selected, their distribution in different parts of Japan, also have their own regional differences, but generally, they can let a person produce emotional sense of belonging, the deep tone let a person feel stable and regular rhythm, is relying on the local life, people sleep, life accompanies it. Although bell in the modern society the time function is not indispensable, but emotionally they are relying on the spirit of the local residents. History gave birth to a selective reproduction, therefore, should be based on the degree of the modern social demand, should also consider the listener's emotional factors, screening according to the specific area for specific analysis.

•3.4 Create “sound landscape” atmosphere

In the process of on the treatment of space, visual and auditory and need to be considered at the same time to deal with the mutual influence between them. The change of visual perception can affect hearing, and vice versa, this is the role of synesthesia.

Visual perception has strongly associated with auditory sensitivity, and directly affect the feeling of listening to. Studies have shown that the complexity of the public open space in the visual environment Settings will affect the hearing feeling, the more complex the visual environment, the lower the sensitivity of the auditory more vulnerable to the interference of other senses, visual environment, the more simple, the higher the sensitivity of the auditory, less susceptible to the influence of the other senses. For example, a neat, relaxed visual environment can reduce the noise of be

agitated feeling. And hearing can also affect the quality of the visual feeling, noisy sound environment lowers a person on the scene environment quality objective evaluation, on the contrary when hearing feeling good, also for the visual experience points. In space design, therefore, need to make full use of the synesthesia function of dealing with the present environment, to "see" and "hear" feeling to achieve unification.

It is worth noting that the "listen" and "heard" are two concepts: "listen" is a process of active feeling sound environment, its voice has the connotation, inspiring people sense of hearing, and "hear" the sound is loudness, frequency, and the product of the superposition of timbre, objective existence that not allow to ignore, is based on the field environment of passive voice "receive" information; Can let a person "listen" to the appreciation value of acoustic environment has the "landscape", to "hear" the sound is inevitable spatial dependency. , therefore, has the "landscape" aesthetic value of acoustic environment is a rich in information system, the high fidelity of sound, and there is a match the visual information of mutual promotion, stimulating experience person with aesthetic artistic conception to actively listen to sounds like enjoy visual beauty scenery.

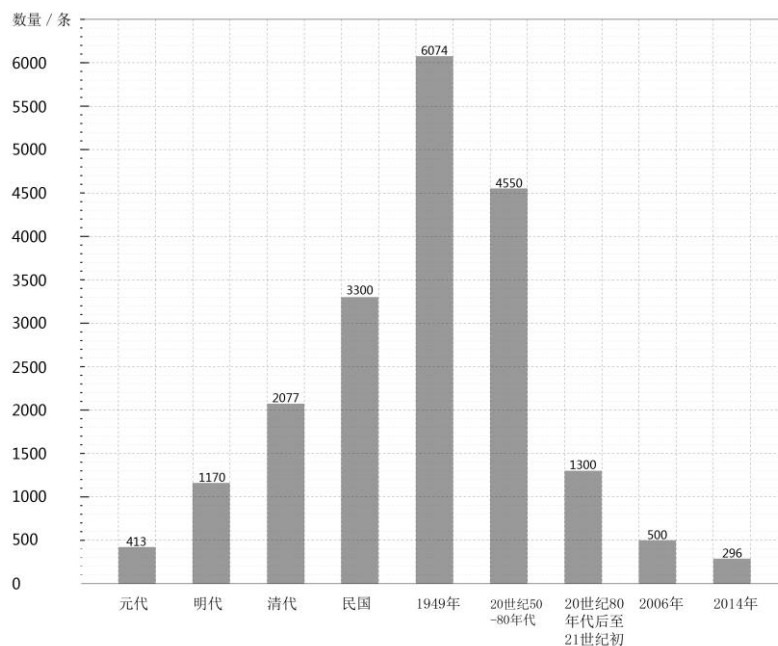
And for historical block, sound landscape value is not only aesthetic feeling, more is that regional culture convey: modern daily life and in the voice, sound landscape with time characteristics and cultural accumulation of history view, create good atmosphere is the core of the design of pursuit.

Chapter 4 Investigation and analytical for soundscape in Drum Tower area

Above discussed the historical block landscape design method, then have a tower block as an example, the starting field sound environment present situation investigation, targeted design. Collection is focused on the investigation about the region's history and status quo of the research of two parts: included the region specific period with typical regional characteristics of voice, parse the present stage the most can reflect the voice of the local state of life, and finishing and evaluation, establish sound valuable elements as their corresponding design orientation and spatial processing method, as the basis of acoustic landscape design later.

•4.1 The change history of soundscape in Beijing hutong

Before the founding of new China, the hutong is the most normal living forms, Beijing hutong space lively and active, all of family life coexist here, also generates a voice, rich and clinking. Refer to the data shows, from the yuan dynasty city celebrates its beginning, and then to today, the number of hutong after a steady growth to quickly reduce the process (figure 4-1)



4-1 The number change of Beijing Hutong^①

Chart clearly shows before the founding of new China, the number of hutong has been rising steadily, and this increase in the number of the population of the city are positively related. In the 50 s of last century, lane number began to decline, the building of residential form began to appear in the city. While the arrival of the reform and opening up to the survival of hutong caused devastating damage, and the number of hutong buildings quickly spread in cities. In "farewell, the old Beijing" records, the beginning of the 20th century ninety s, Beijing's hutongs disappear at a speed of 600 per year on average. In the 21st century, the number of hutong is lower than at the beginning of the level of the yuan dynasty, and continues to reduce. Perhaps this is the symbol of social progress, but it does the devastation of Beijing culture. There's a saying: the ancient culture of old Beijing "hutong culture", is in fact the hutongs once disappear, the geographical features of Beijing is lost, the foundation of culture will also cease to exist.

Hutong decrease with s changes, the number of the voice of the hutongs also will change, "authentic Beijing juice" in dissipate. The early 50 s wave of industrialization and the late seventy s reform and opening up are two large for hutong sill, they to a great extent, led to the hutong sound scene change in the nature.

•4. 1. 1 Soundscape of Beijing Hutong from 1949-1978

Before reform and opening up in the early days after foundation of China has not the concept of "tourism", so the time of the Beijing city belongs to local residents, the structure of the city and today is very different, living and entertainment have obvious zoning. As early as the qing dynasty, the qing government in order to protect the capital safety, does not allow migrant workers living in the city, and let them concentrated in the front door and chongwenmen, which also leads to form the qianmen street, bridge area of entertainment venues and theaters, and as a result of the highest civilian here to gather, formed the liulichang cultural street. And for the people

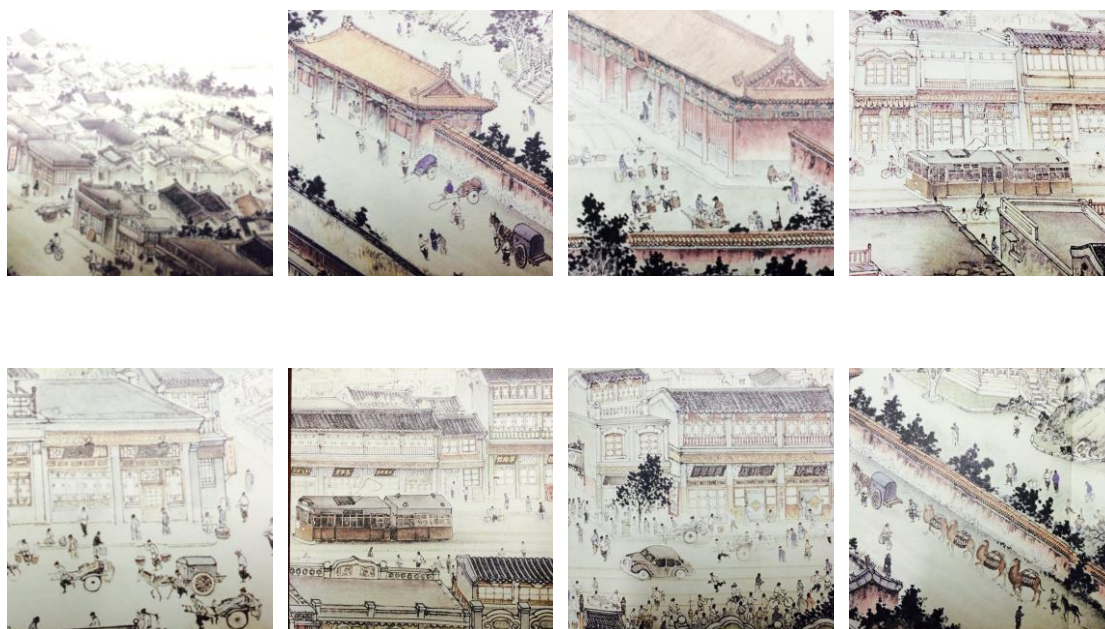
① 数据来源: 1) (美) 麦尔, 《再会, 老北京》 [M], 上海译文出版社, 2013 年版 2) 百度百科胡同词条 http://baike.baidu.com/link?url=b7n3ll_EXSpKWlbPxxSGdcxrdcpCKE1gee2RNpUkCjz3xY1AO5_uySmXXV_eIk8n-LZ-VB-ATBoJuG_qLAzdTDa

of Beijing, centralized activities is due to the drum tower area. Therefore, the drum tower, a piece of the residence is very representative, has long kept the most authentic old Beijing residential culture, and combines the function of entertainment and leisure in one, for the study of traditional scene provides a good foundation.

Hutongs peddler hawking and acoustic noise is the most authentic old Beijing scene. In the 1950s and 60s, this is a lane selling items in hutong life is the main source of supplies products, loud shouting to tactfully catchy that is the most indispensable residential landscape. At that time for sale is very exquisite, is divided into various small tradesmen, each profession of distinct cries, lasting appeal is dye-in-the-wood. And at the same time, because the special courtyard space structure, the merchants are afraid of pure cries loud enough, and in the process of selling joined the acoustic sound as cooperate with various business, acoustic noise are different, they often hear acoustic can know far walk is to sell what businessman, has a complete recognition. On the collocation of acoustic and selling, and full of exquisite, some business was shouting and acoustic, some business that only for acoustic, because business that sell out really is not tasteful, known as the eight not language. Every business that the acoustic and his unique name, such as grinding scissors choke chopper acoustic claims to "shock" the women, medical practitioners acoustic sound is called "tiger maintain child", a pedicure acoustic sound is called "the gentleman sitting", buy rouge gouache acoustic sound is called "calls marked", appropriate and elegant. Residents cries has very strong timeliness: wake up every morning is not the alarm clock, but vendors shouting early arrival on time; Then and is closely related daily life daily necessities traffickers have, in the afternoon, sell rouge gouache of sector a pedicure successively appeared, and when the ZhangDeng every day was the most lively hutong, peddled by all kinds of food, this is children the most looking forward to the moment of cadence cries of as emitted smoke drifting in the alley, is full of joy of life, at night the dealers also sell chamber pot on a string in the alley, it more hutong tranquil. At the same time, the sale because the content of the goods also has the seasonal change, spring flower, selling watermelon in the summer, winter chun, loud reminder hutong residents in the depth of the seasonal change. Hutong residents living and cries closely linked acoustic sound, voice, hook the residents of the mood also follow a quite excited. This sounds through the most authentic taste of Beijing, echoed in the alley, have lasting appeal.

This is the old Beijing hutong sound fun and temptation.

The era of urban scale is moderate, mainly on foot, not a lot of noise from motor vehicle and bicycle, occasionally floating in the alley drove a rickshaw foot ring. Guests arrive destination on the car, also don't talk, push a push bells remind cart man, like a tacit understanding between each other. More interestingly, suburban generation of hutong, could hear the city businessman camel TuoLingSheng or cavalry horse bell. At that time the hutong calm don't noisy, natural sound clear, occasionally overhead pigeon whistle, the motion of the wind blowing leaves, insect songbirds can hear clearly. (can be seen from the figure 4-2 state of the Hutong.



4-2 Scenery of Beijing Hutong^①

•4. 1. 2 Soundscape of Beijing Hutong after 1978

For a period of time after the founding of new China, the government to provide the opportunity to work for poor vendors, began to practice the work, but also established a cooperative, to bear the commodity sales. At the beginning of the implementation of the number of merchants effect is not obvious, however, with the

① 刘洪宽, 《天衢丹阙——老北京风物图卷》[A], 荣宝斋出版社, 2004,

influence of the cultural revolution, and the resulting of reform and opening up, make the modern business began to rise and development of Beijing, the number of merchants and residents to buy and sell way and places have changed, hutong hawking voice collapsed, this kind of typical representative sound scene began to rapidly disappearing.

In the eighty s, some features of the hutongs scene began to decline, but also with the development of the era of a new conform to the trend of The Times of voice, the voice of the TV set is a typical. Actually in the mid - seventy - s, the country began to implement "xiangyang", for the unit with the hutong residents' committees establish xiangyang college, began to appear on TV, the whole article alley people together in the evening watching TV, vocal mixed with the sound of TV programs, a chic era one scene. And in the early eighty s, the television began to enter the ordinary people, in the late eighty s has gained popularity, every family to gather together to watch TV in the evening, when the alley wanders down to wear a opening song, became a kind of power of summoning, urged people to go home. Like TV began to spread and bike during this time, a time to commute, hutong jingle bell ringing solicitation bicycle bell particularly lively, very modern.

After the founding of new China, the Beijing government attaches great importance to the construction of urban water supply capacity, invested a large number of water plants, it finally see great achievements in 1984, tap water introduced each house, before the end of the pump, water to cart wheel alone water and rushed to the long history of concentrated water stop receiving water. This progress, make the sound more vivid scene in the Beijing hutong courtyard, people's life coexist here, living in a variety of voice also produced here: neighbors water here, always be caring and attentive, chit chat. Wall for deep curtilage courtyard to ensure the basic life of privacy, but surround close out the proper communication place for them. Courtyard neighborhood warm conversation uselessly roaming in the alley was filled with gas. And the old Beijing, nice, good greetings to each other, different people met alley in the courtyard, shouted a throat, is to let the hutongs vivid enough.

Since entering the ninety s, however, the fate of the hutong began to plummet. The rapid expansion of city and the pursuit of the development of vertical direction quickly engulf the hutong. From table 3-1 can see clearly in the hutongs starting in the

ninety s the number dropped sharply. "Farewell, old Beijing" recorded in the "disappeared" in article 600 annual Numbers of data literally. At the same time, the number of vehicles is increasing rapidly, hutong and large urban trunk road adjacent places have begun to gradually subjected to noise pollution. And in this period, the commercial development has quite mature, the merchants of living space is little, cries almost extinct, have been included in the non-material cultural heritage, only ZangHong, hershaanxi, Zhang Zhenyuan peddles a group of famous old Beijing people still struggling, trying to live on the voice of the old Beijing culture.

By today about the number of existing in Beijing hutong is not the exact number of an official, can only say that will be about 300. Beijing hutong sound scene in the backdrop of the 21st century is a what kind of state? The author in 2014 and bell tower area, for example, launches the research, try to record the present state of sound scene in Beijing, as the late film sound area landscape design data to support.

•4.2 Soundscape element in Drum Tower area

Sound environment renovation of the first step is to the status quo, based on acoustic elements of different acoustic elements are processed by different means, so as to create the basis of the sound environment quality. For natural sound, the need to create the best use of site conditions; For residents of life, then you can through the space design to guide the voice activity, to control the location and scope of the sound of life, in order to reduce the sound source will overlap interference phenomenon, to create a high-fidelity sound environment; For the high decibel artificial acoustic noise and tourists, need through the use of space and the processing of materials for resistance and noise reduction processing. So the first step is the composition of acoustic environment and determine the research area the geographical distribution of various sound elements.

This study based on 2014 was carried out on the ground of three field reconnaissance (holidays and ordinary day two at a time, every day and night to record), comprehensive listening and recording of the variety of the sound of the bell tower area landscape elements (see figure 4-3) and distribution point (see figure 4-4). After the objective record, according to different sound body, the inductive sound to

4-4 Soundscape level

Thus it can be seen that in today's hutong, the voice of the natural basic has not changed, insect songbirds that remain, with the most distinctive features of the old Beijing pigeon whistle though less frequent, but still can find the trace; Merchants hawking and acoustic noise has almost disappeared, replaced by the concentrated market vendors Shouting; Meet residents between friendly greeting unabated, but no longer are all authentic Beijing accent; Change of the biggest is the voice of the motor vehicles inside the alley, the original is not possible in the alley noise began in some large-scale scattered in the hutongs, had a negative effect; At the same time, on the development of tourism to some famous hutong became the world of the foreign visitors, sightseeing cart creaking sound guide tourists discussing gunfire around, changed the hutong state of peace. Hutong sound environment compared with 50 to eighty s last century has been significantly changed, want to create the high quality sound environment system with regional characteristics, to reorganize and planning.

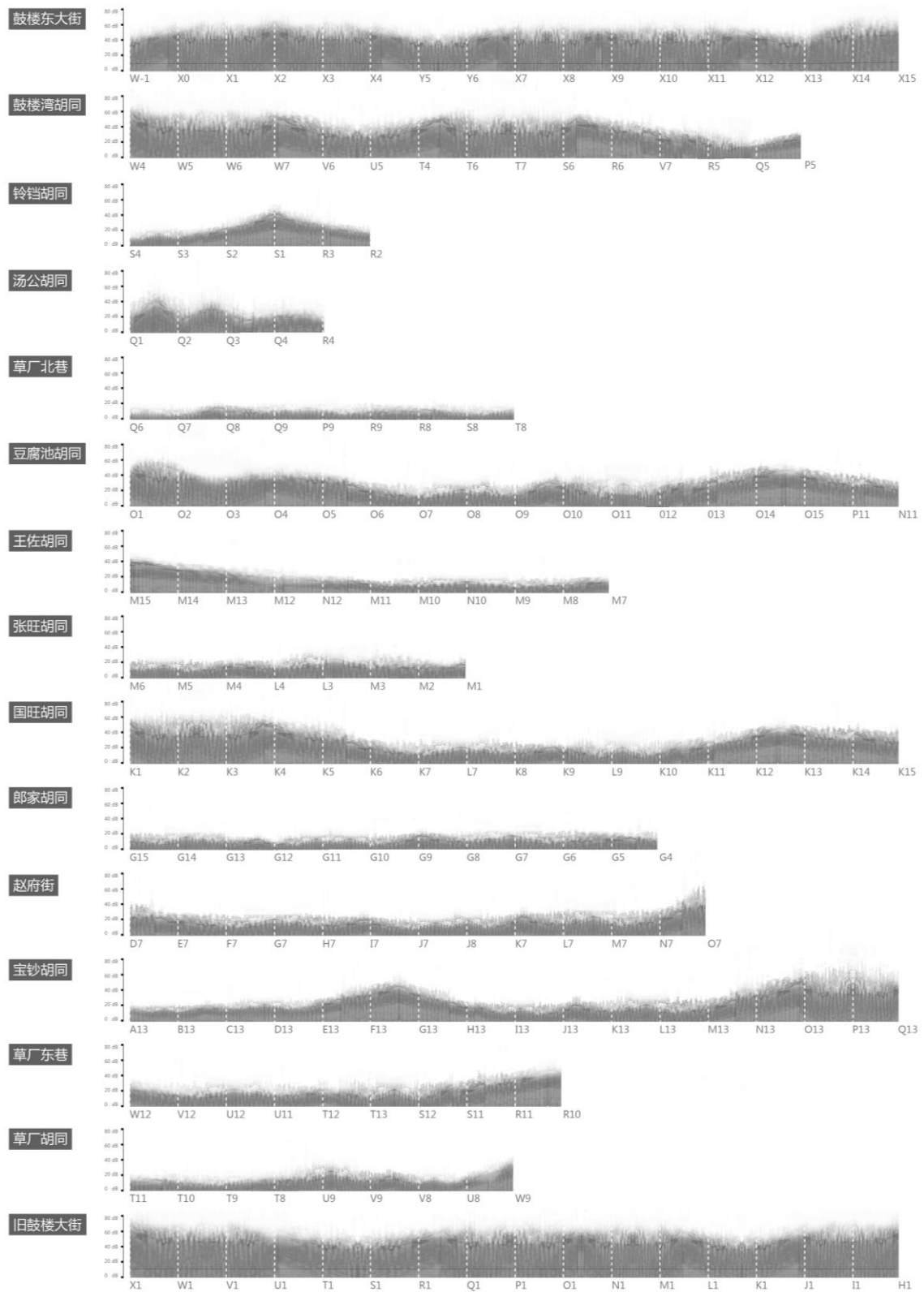
Drum tower district covers numerous hutongs, intention of element is widely distributed in the historical area and superposition effect between them, to generate the hutong different acoustic environment condition, before specific sound environment renovation design, need to various hutongs after the superposition of the sound source of sound level measurement data record, in order to guide the direction of each particular renovation of hutong.

•4.3 Sound level's data records

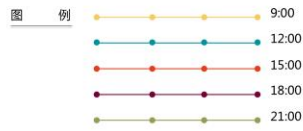
In order to grasp the sound level data of hutong exactly here within the area of 12 main hutong with "GM1351 high-precision decibel meter" testing the acoustic environment. Test points at 6:00 am, 9:00 am, 12:00 PM, 3:00 PM and 6 PM, 9 PM six hours, within each hutong every 40 m as a testing point, measuring record real-time voice data (figure 4-6), and generate the sound level of each hutong map (figure 4-7) and the period of time sound level change trend chart (figure 4-8).



4-6 Sound level's data records



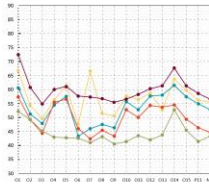
4-7 Sound change's data records



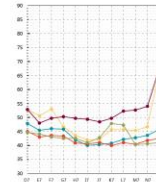
旧鼓楼大街



豆腐池胡同



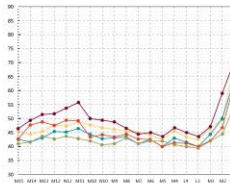
赵府街



鼓楼东大街



王佐胡同 + 张旺胡同



宝钞胡同



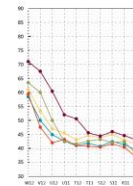
鼓楼湾胡同 + 汤公胡同



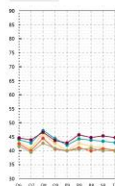
国旺胡同



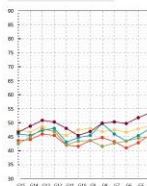
草厂东巷



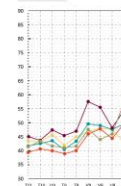
草场北巷



郎家胡同 + 国祥胡同

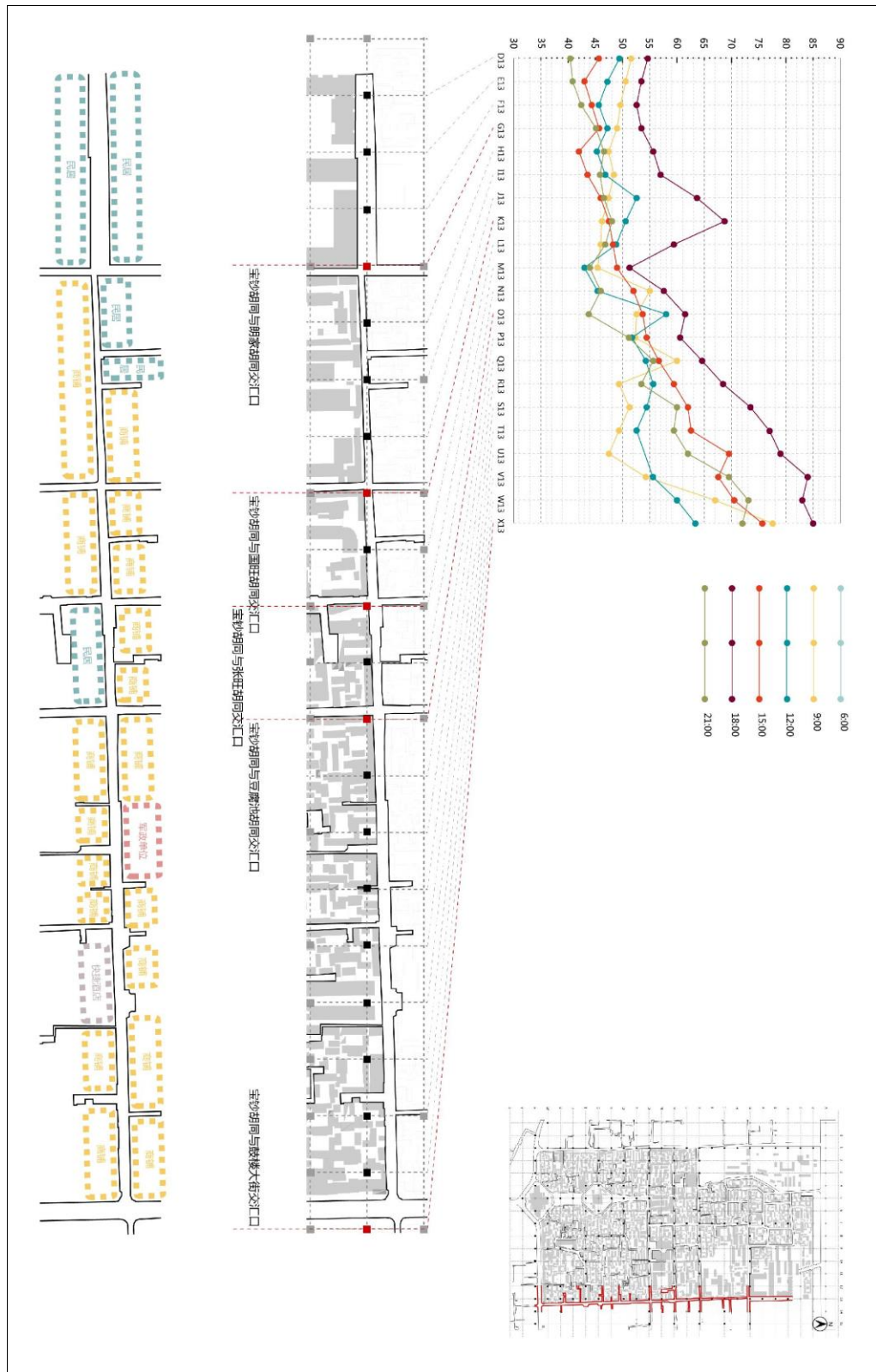


草厂胡同



4-8 Sound level change trend in Drum Tower area

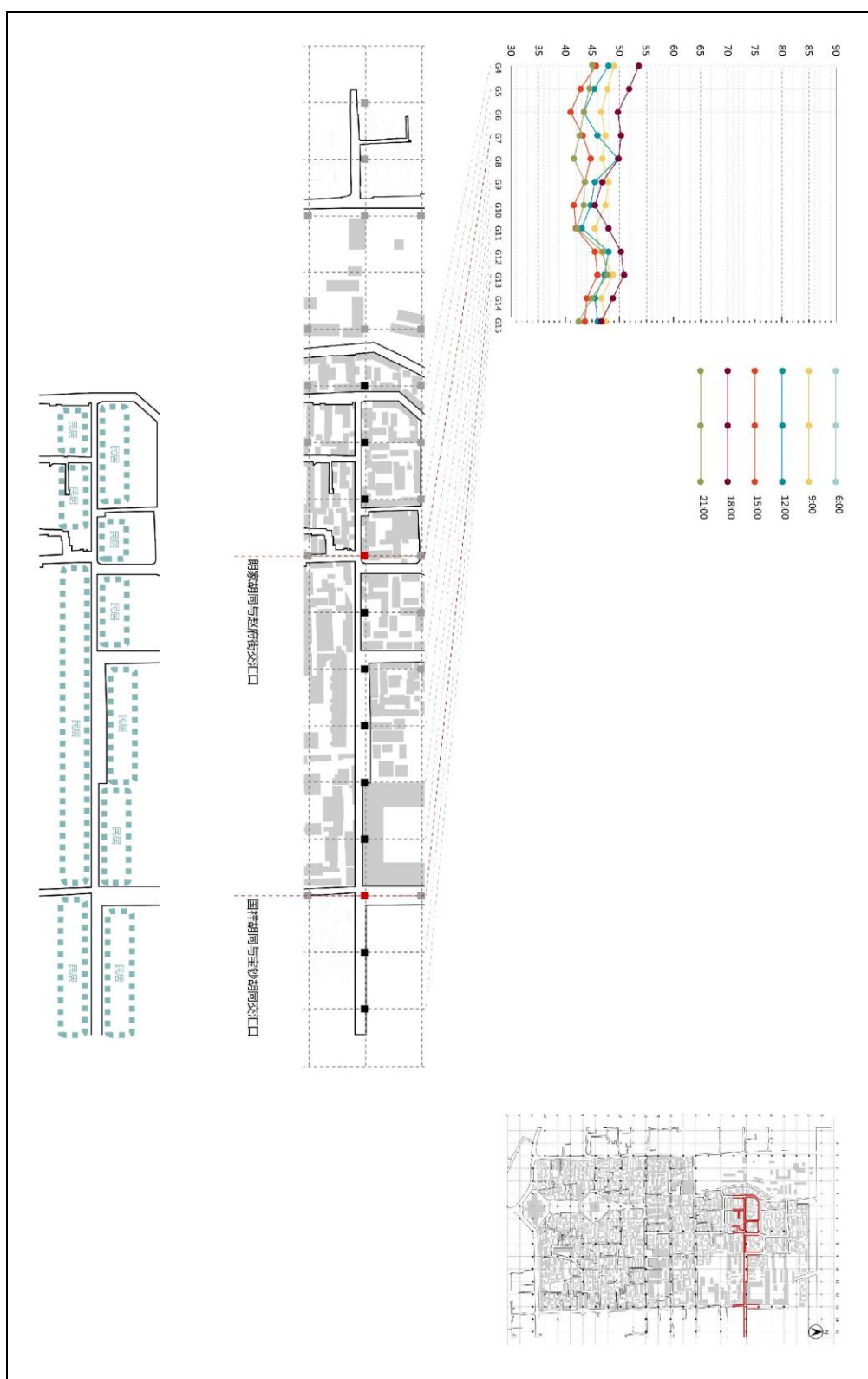
Seen in the summary table, some hutongs throughout every time sound level is not high and maintain in a relatively stable state, while others will fluctuate because of time different, at a certain point some more will sound level rise suddenly, ups and downs. Therefore, through the total table and cannot accurately summarized the hutong sound environment condition, should be carried out detailed analysis (see figure 4-9 to 4 to 18)



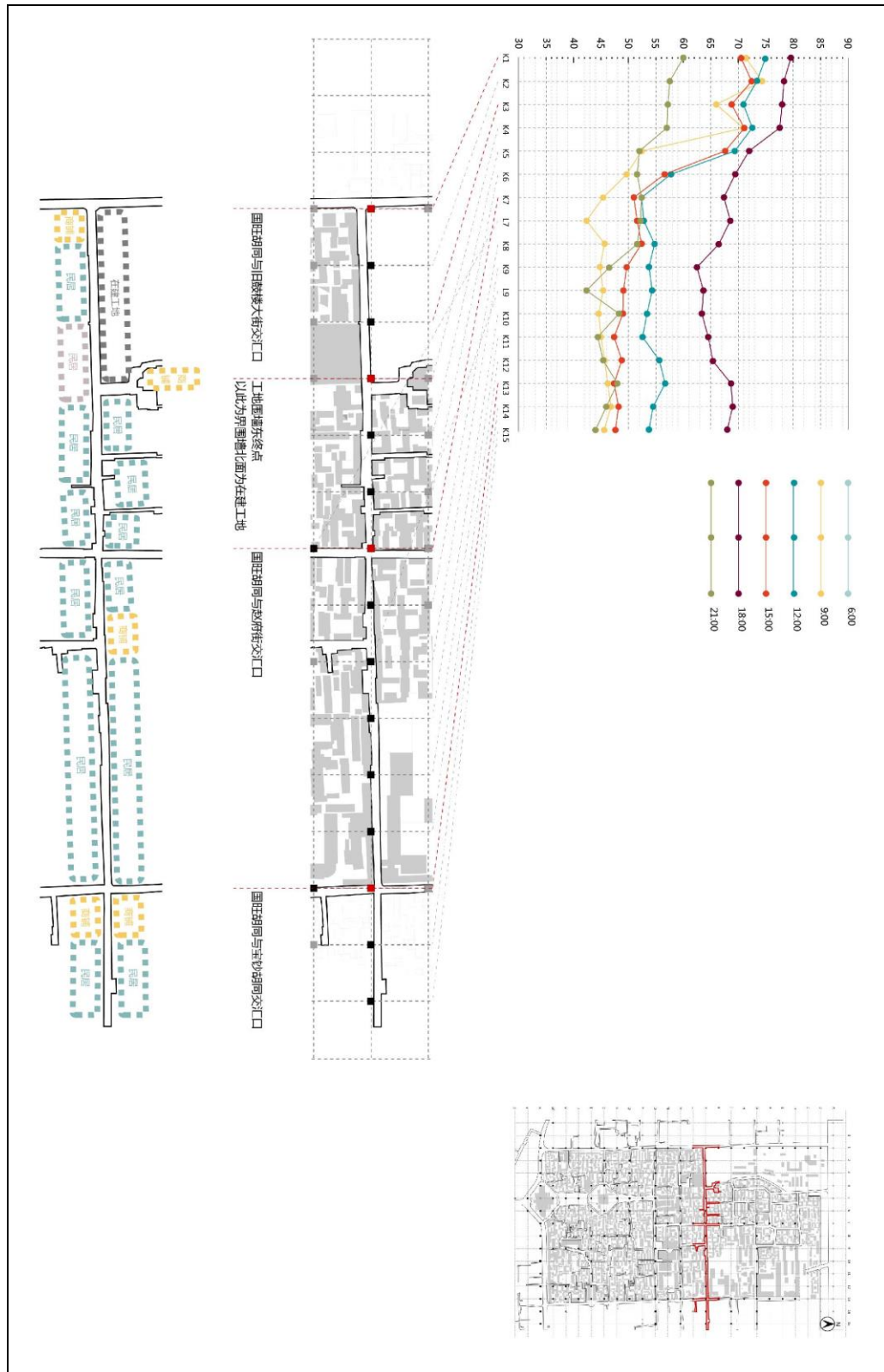
4-9 Baochao hutong



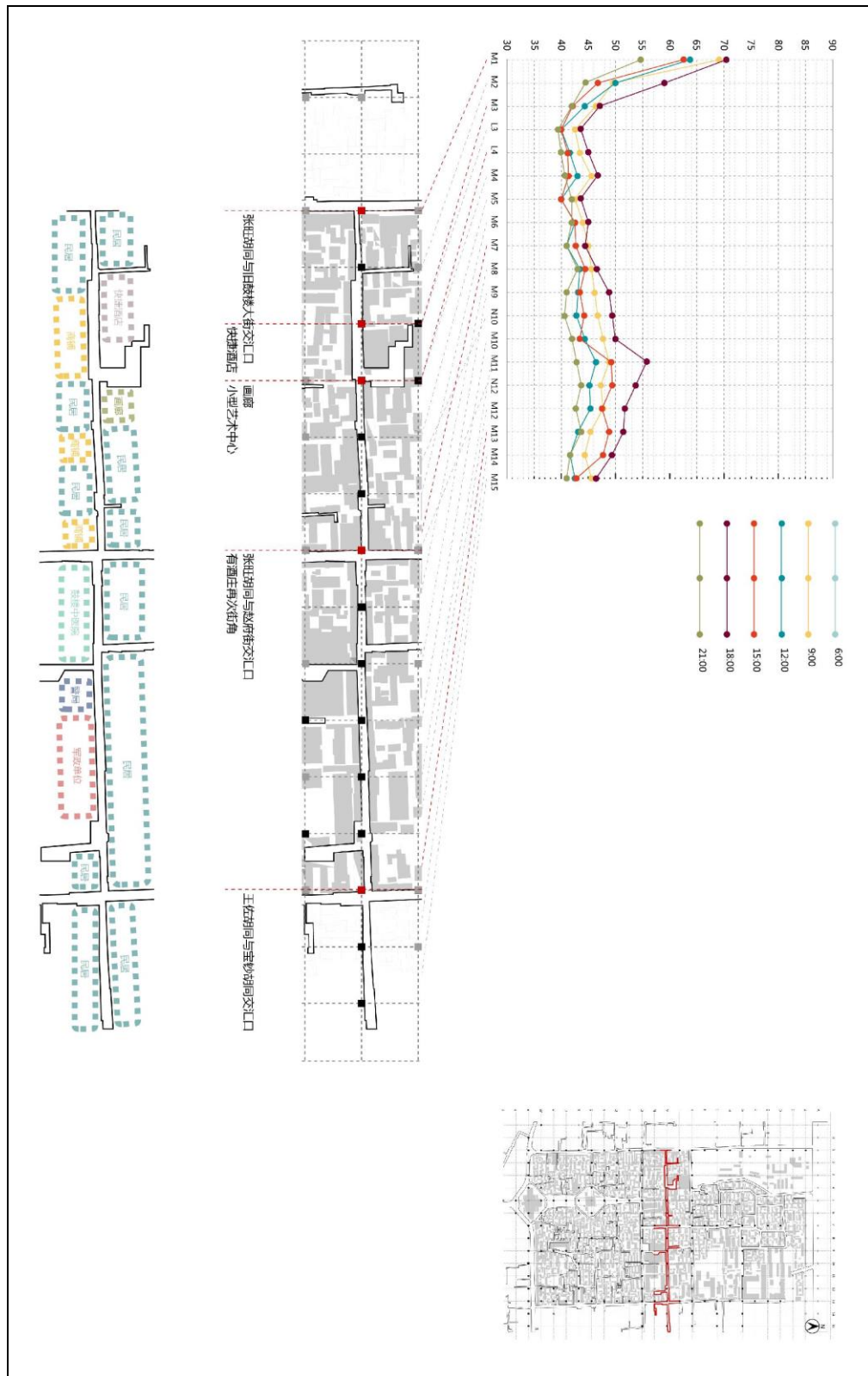
4-10 Zhaofujie hutong



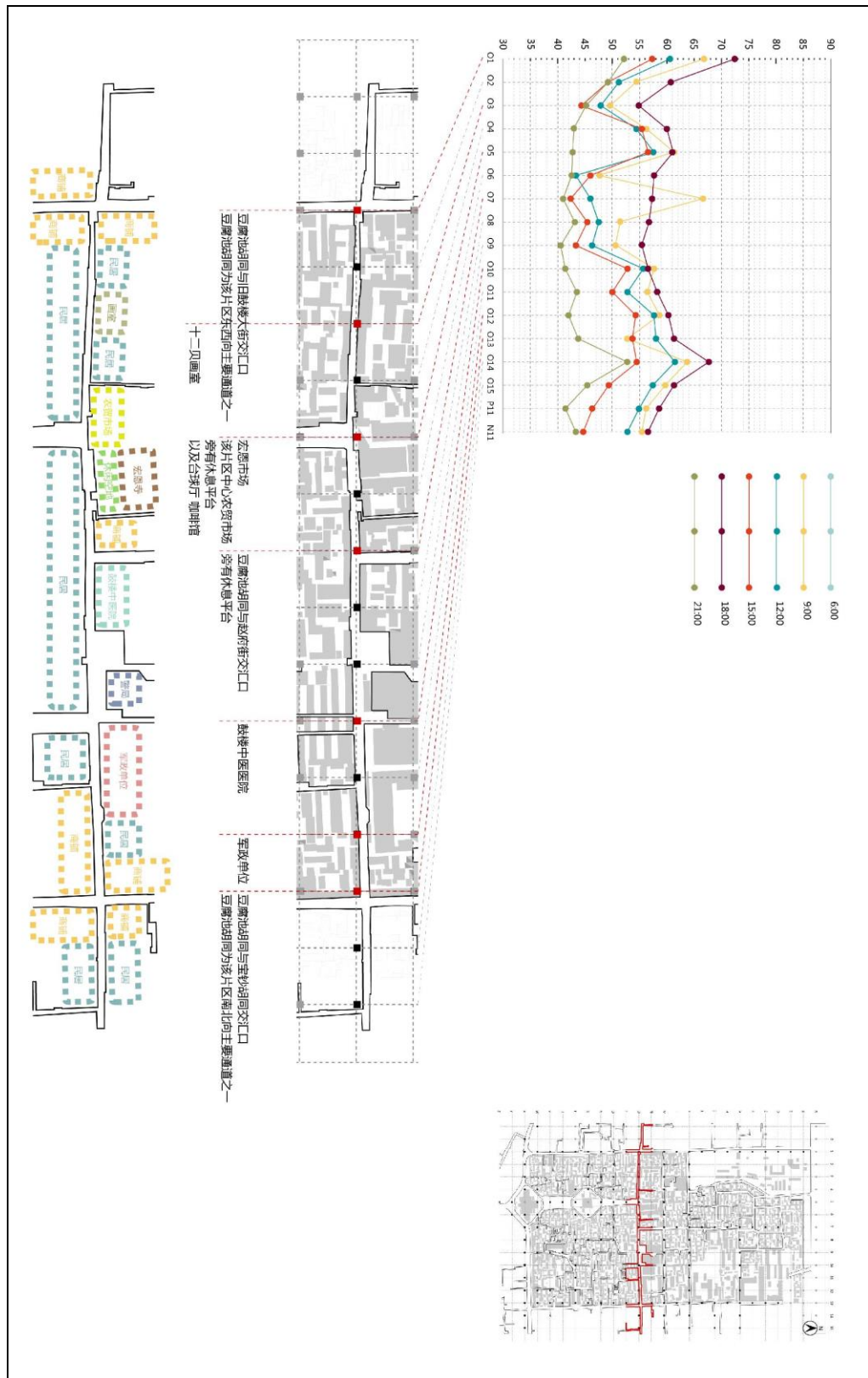
4-11 Langjia hutong



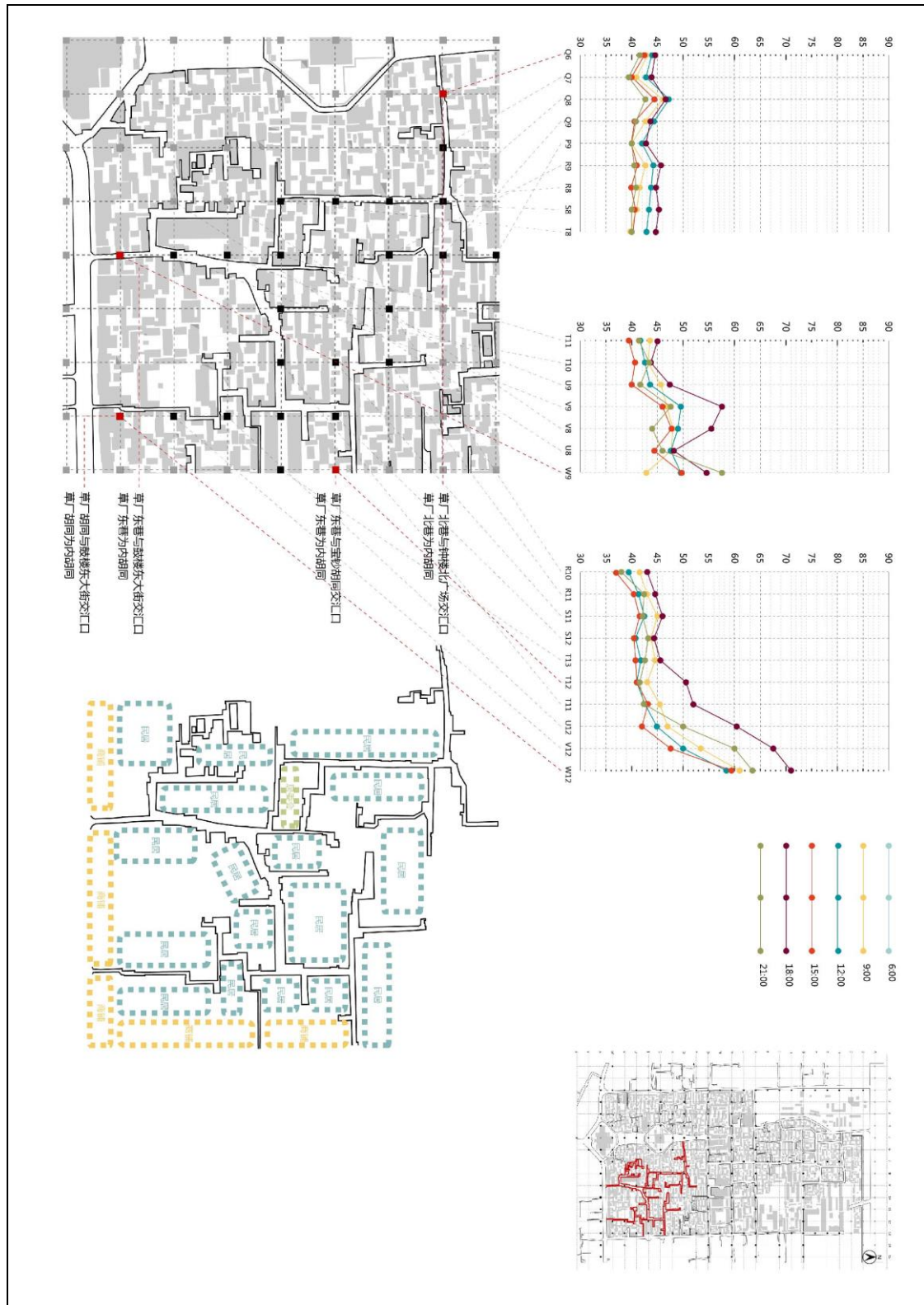
4-12 Guowang hutong



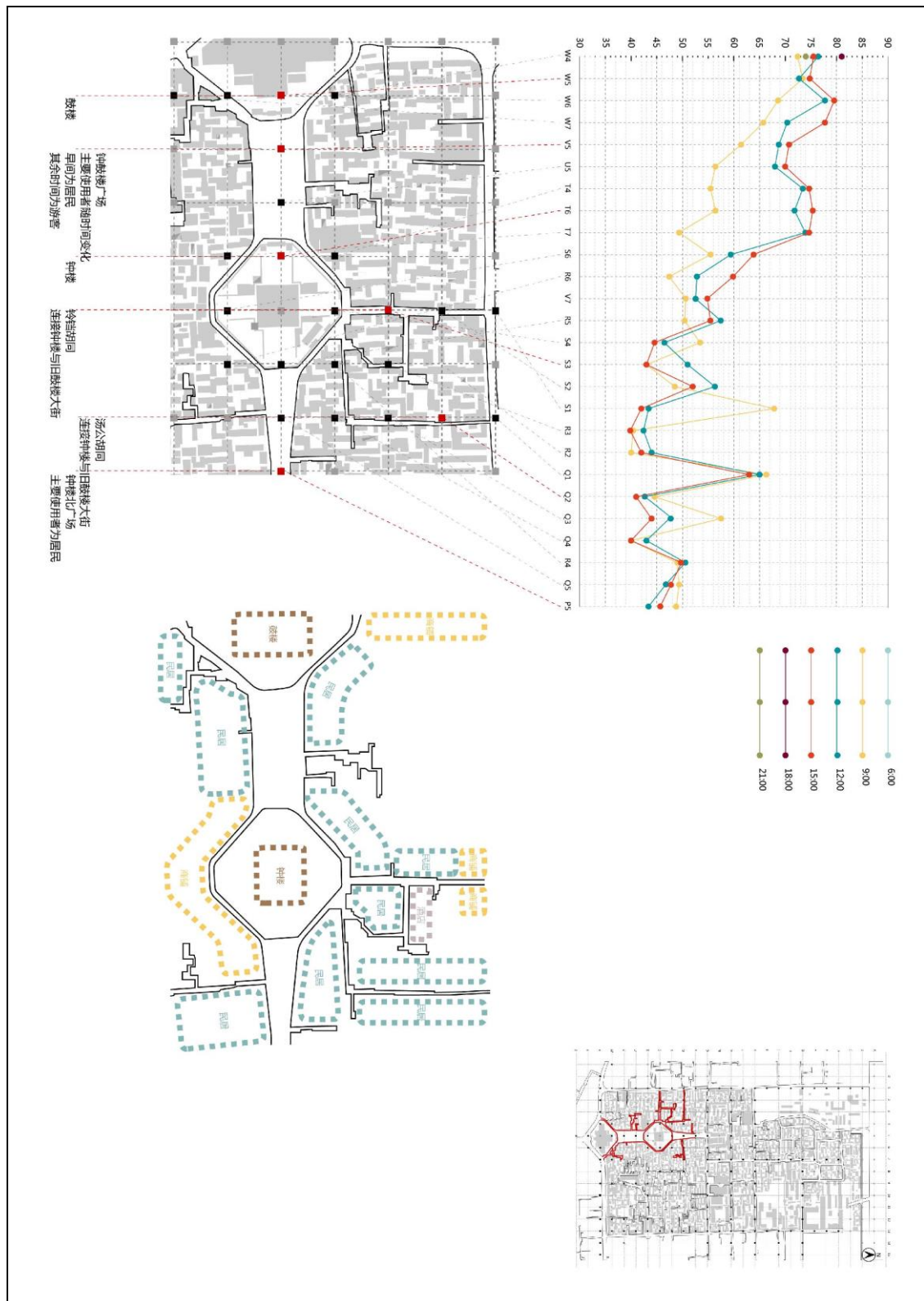
4-13 Zhangwang hutong



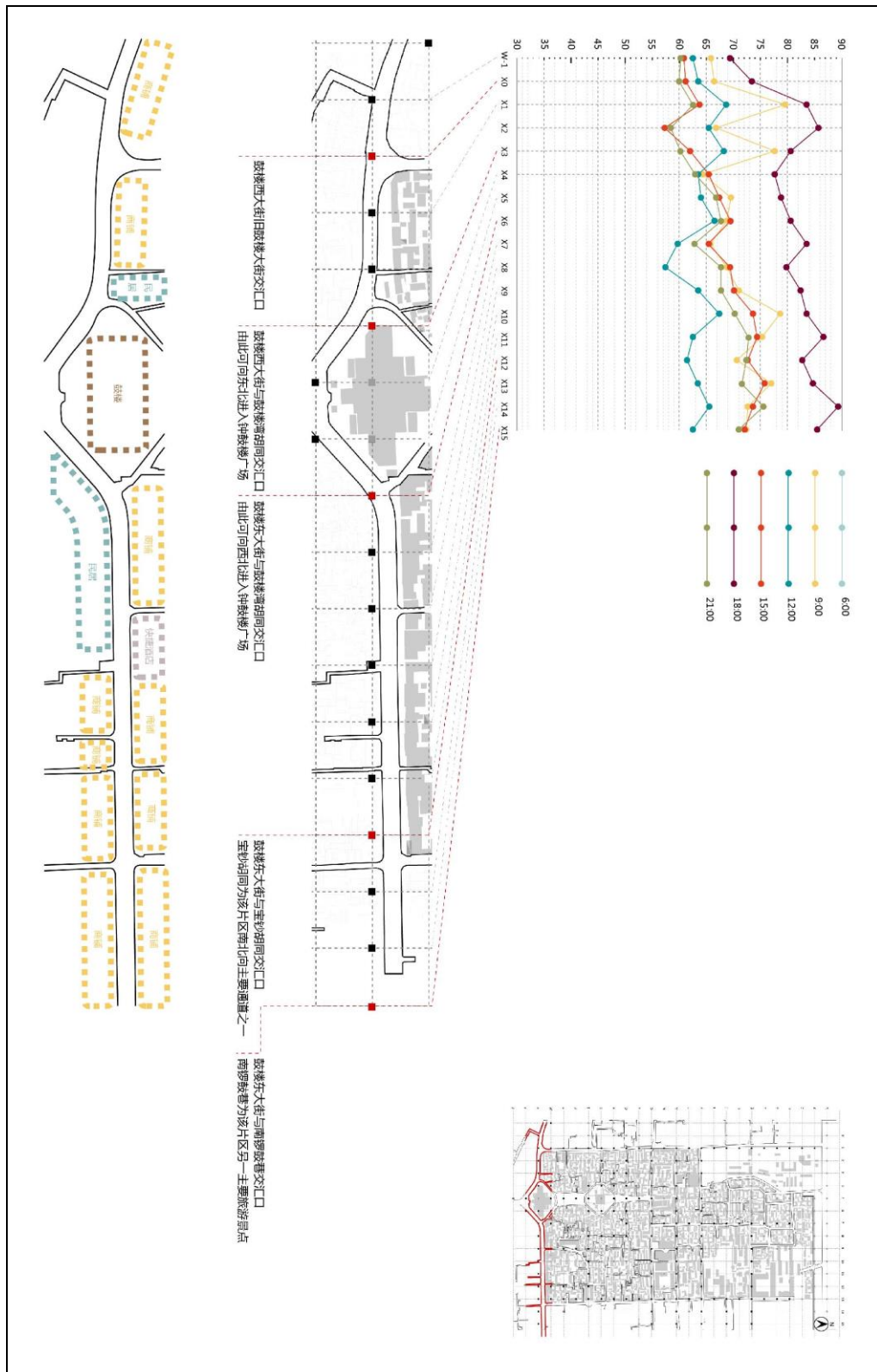
4-14 Doufuchi hutong



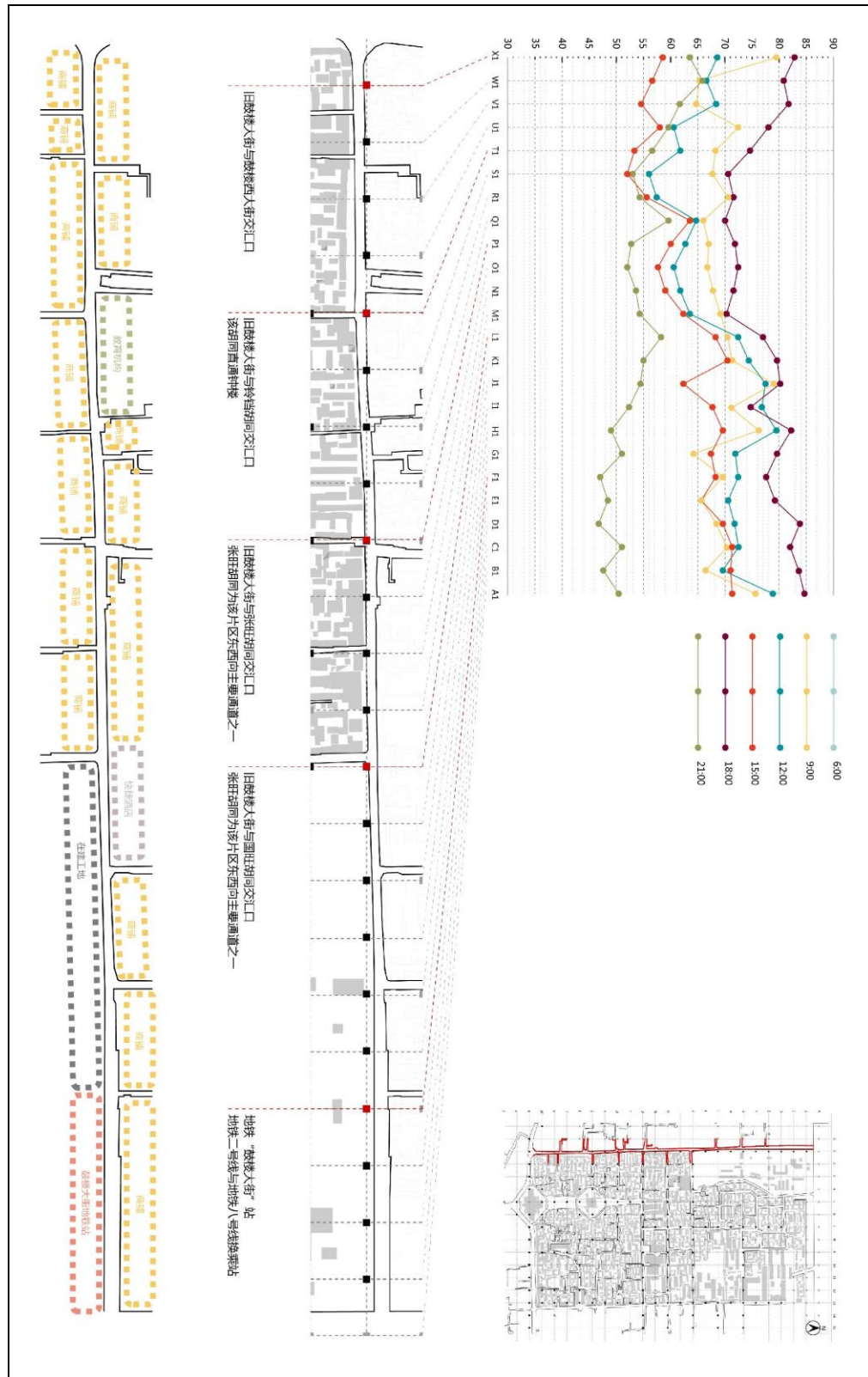
4-15 Caochang hutong



4-16 Gulouwan hutong



4-17 Gulou street



4-18 Old Drum Tower street

Period of time to record the sound level from the data objectively reflect the hutongs of acoustic environment. Overall, the whole area of traffic noise interference, a hutong connected with urban main road, from JiaoDaoKou within 40 m after basically no longer under the influence of traffic noise, so only within the scope of the crossings of 40 m need for noise reduction processing; The whole area of tourist activities in the area of more concentrated, the noise generated by the tourism and influence the basic control at the drum tower square area, the activities of the need for centralized guidance and noise reduction processing; Residents gather to produce sound life mainly concentrated in the clock tower of the north square, tofu pool lane in the middle, fork and pasture grass factory north lane, alley in the middle, so in these areas need to adapt to the function of the space processing partitions to guide different activities, so as to interfere with each other as far as possible reduction of the source fold lower acoustic fidelity; While the rest of the paragraph within hutong overall sound level daily maintain under 50 db, in line with the "city regional environmental noise standards" (GB3096-93). In such area, natural sound can be heard clearly, interference by other voice is weak, suitable for processing of the interface through space to maximize for the generation of natural sound and dissemination, so as to create a quiet and harmonious and rich natural sound level of sound environment.

•4. 4 Subjective assessment in Hutong soundscape

The hutong sound level data from objectively reflects the physical state of field sound environment, but with sound with very strong subjectivity, so only through sound loudness, frequency of physical quantities such as numerical can not accurately describe a regional overall state of the sound environment still needs to be involved in the listener's subjective feelings into consideration, common to a sound environment is described and evaluated.

On bell tower area, a total of 21 kinds of acoustic elements (see table 3-2) and life belongs to natural sound, artificial voice with three categories, and in the area of different areas have different kinds of sound plays a leading role affect the whole acoustic field atmosphere. Subjective evaluation of different kinds of sound elements, can determine the elements of emotional associations, in order to sound to sound

environment atmosphere build on late element selection and positioning play a direct role in guiding.

•4. 4. 1 Subjective impression of all soundscape element

Based on the record of the drum tower area in 4.2 the main landscape elements, the author in December 2014, two of 21 species listed in table 4-2 acoustic elements do questionnaire (see table 4-1), let the respondents use class analysis to scores of each sound source, evaluate the subjective impression from 11 aspects. Questionnaire distribution is as follows: 50 local residents and tourists 20; Questionnaire recovery situation is: residents of back 31 tourists questionnaire 9 taken back, the recovery rates of 57.1%.

Table 4-1 “Questionnaire of subjective impression for all soundscape element”

感谢您参加钟鼓楼片区声元素主观印象评价调查

特别说明：本表是针对您日常生活中的声音所做的主观印象评价调查，对每个人的回答内容进行统计和分析，调查的目的是以此作为本人（清华大学美术学院12级研究生张雪娟）的毕业设计数据基础，对于您的配合表示衷心的感谢。

调查对象基本信息

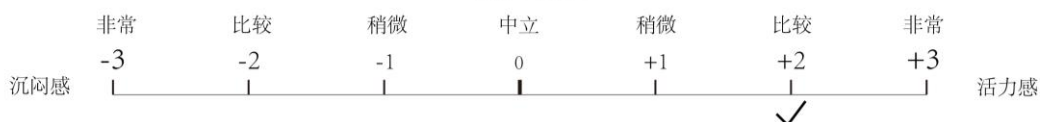
人员属性 ☐ 居民 ☐ 游客

居民背景 ☐ 原住民 ☐ 租住客

年 龄 ☐ 18岁以下 ☐ 18-30岁 ☐ 31-40岁 ☐ 40-50岁 ☐ 50-60岁 ☐ 60岁以上

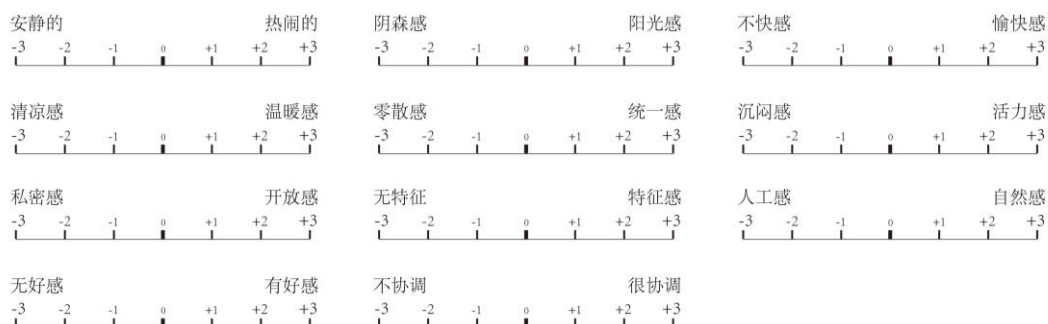
问卷编号

答题举例如下

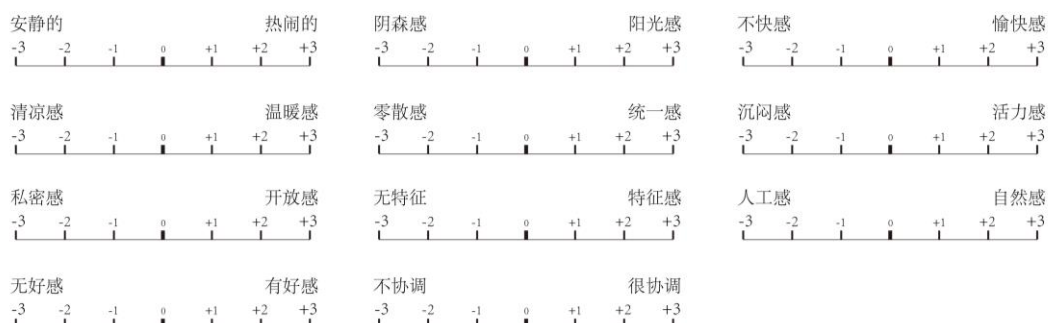


请您从以下10个方面，对每种声音给您带来的心理感受进行评价

01) 风声



02) 树声



03) 鸟叫



04) 鸽哨



05) 虫鸣



06) 猫狗叫



07) 市场声



08) 聊天声



09) 下棋声



10) 麻将声



11) 晨练声



12) 儿童玩乐声



13) 导游讲解声



14) 人力三轮车声



15) 游客喧哗



16) 晨钟暮鼓



17) 游商叫卖响器声



18) 脚铃声



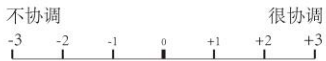
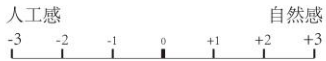
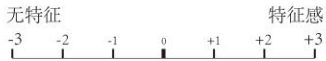
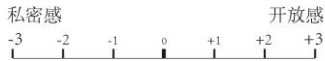
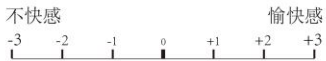
19) 商铺音响声



20) 机动车交通声



21) 自行车铃声

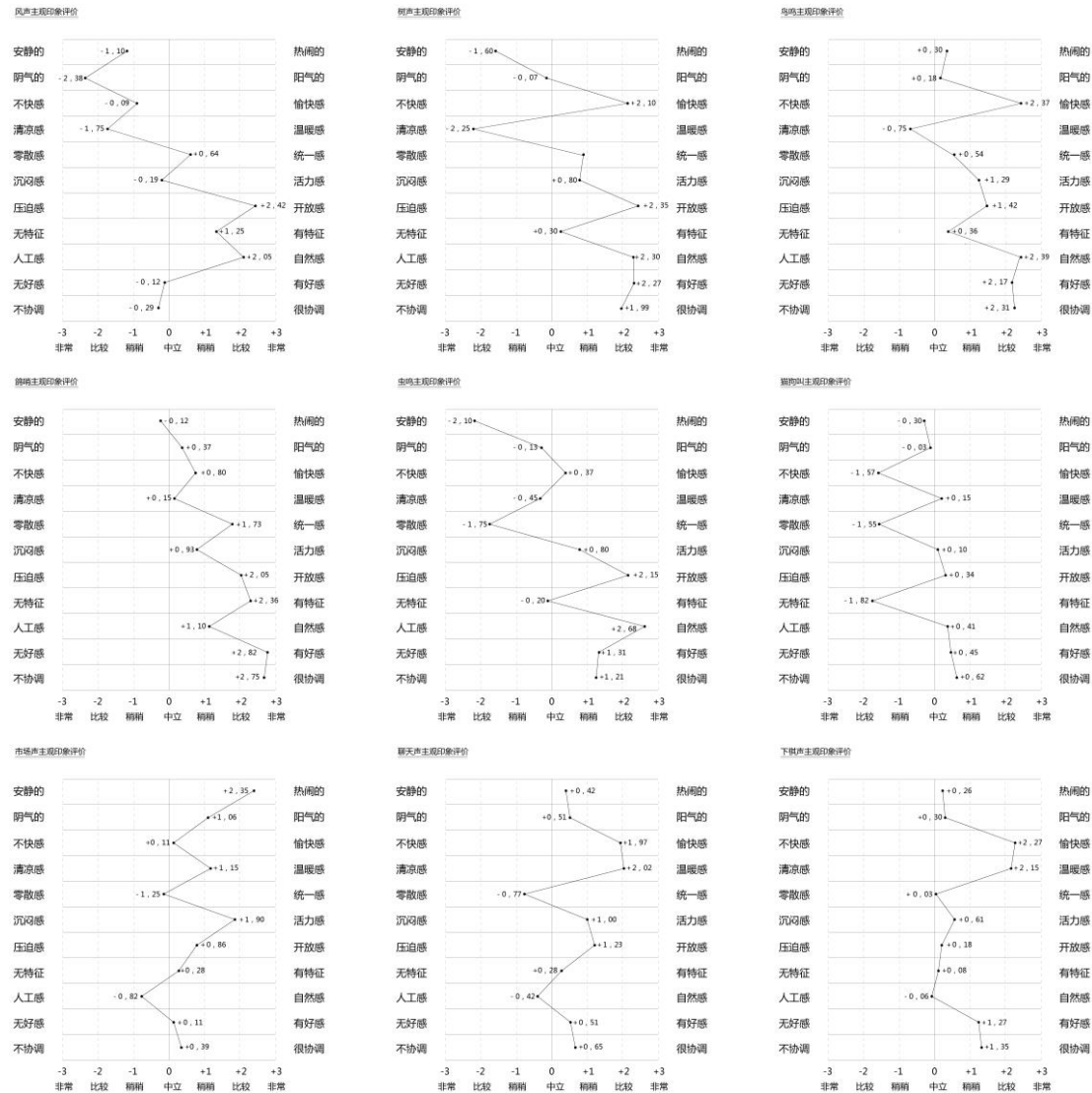


谢谢您的合作

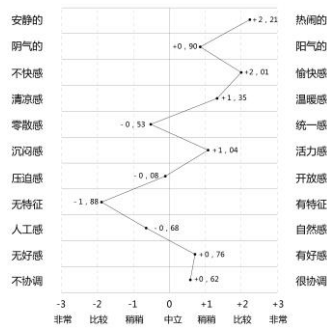
_____年_____月_____日

4.4.2 Mental map of all soundscape elements

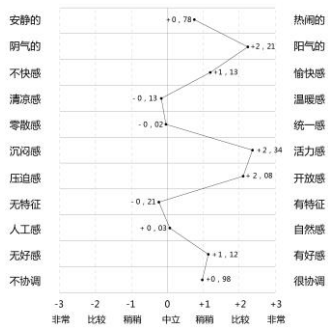
Through the recovery and finishing the above questionnaire, conclude that the sound element corresponding to the subjective impression of mental map (see figure 4-19), it can directly reflect each kind of sound elements located in the heart of the listener:



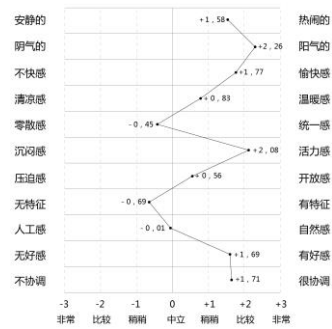
鼎炉声主观印象评价



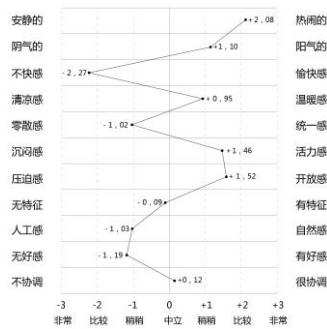
晨练声主观印象评价



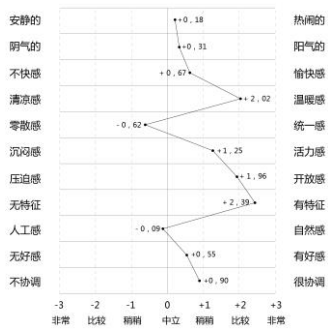
儿童玩乐声主观印象评价



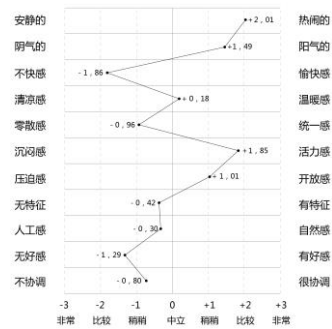
导游讲解声主观印象评价



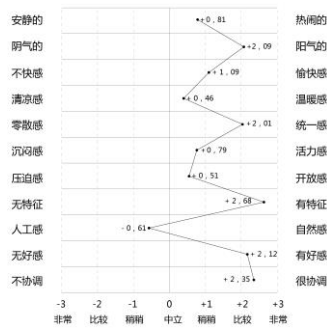
人力三轮车声主观印象评价



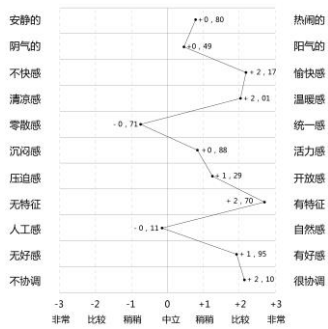
游船游湖声主观印象评价



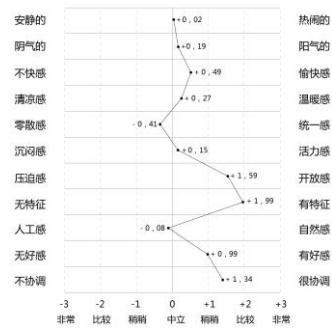
晨钟暮鼓声主观印象评价



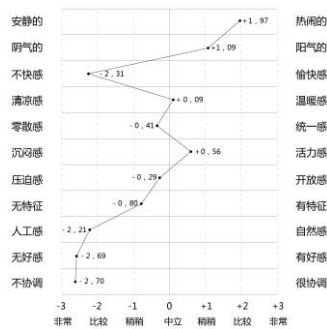
叫卖声主观印象评价



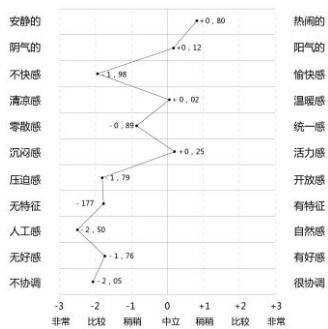
脚踏车声主观印象评价



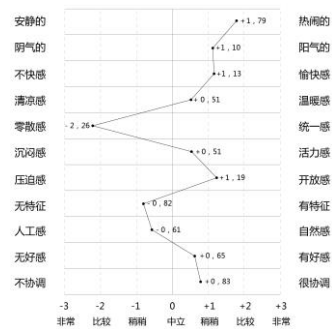
商贾嘈杂声主观印象评价



机动车交通声主观印象评价



自行车铃声主观印象评价



4-19 Mental map of all soundscape elements

Sound mental image scene graph of goodwill degrees and coordinate values as the

main basis of use in the design of acoustic landscape. Goodwill refers to the respondents degree of preference for certain sound scene, the coordination degree of thinking is a sound of landscape and environment of the overall coordinating relations. At the same time, each kind of sound elements have their own subjective impression, namely each tone will have the environment atmosphere, according to different tone sound elements, need different space to cooperate, can build a higher degree of visual and auditory matching environment atmosphere. Natural, open voice needs to large scale, the space of vision, lively and active voice need hierarchy is rich, suitable for together, strong sense of public space, has a history of characteristics, warm sound produce need to create activity space as to cooperate, and uncomfortable, feel oppressed voice may need to be done by the structure of the space surrounding fit resistance noise reduction processing. As a result, the subjective evaluation of the acoustic elements (table 4-3) is the late space construction method in the design of acoustic landscape main reference basis.

•4.5 Sound field partition in the site

Physical space is the carrier of all activities, is the place that sounds produced, voice in physical space form of sound space for the center with the sound source, namely sound field. Involved in the design of acoustic field of voice, the transmission of voice and sound receiving three levels. Above each acoustic element in the field for the data record and psychological evaluation, then began to study sound transmission and reception of places - the arrangement of the sound field in the physical space.

The scope of the sound field and the boundary of the physical space does not necessarily correspond to, some properties of this unique sound space itself. The particularity of acoustic field firstly embodies in voice permeability characteristics, this creates the boundary of the acoustic field can not be restricted by physical space boundary, bring the feelings of people will sound space and physical space caused by the difference between visual perception. In physical space within the source, the scope of its influence can be greater than the space entity boundary, radiation throughout the surrounding area, inaccessible on the line of sight, but can bring a person from the overall sensory space outspread feeling. So several adjacent physical

space can be because has the same sound environment atmosphere and become unified.

The particularity of acoustic field at the same time also reflects on the continuity of space. Discontinuous distribution of the sound source caused the adjacent sound field discontinuity and inhomogeneous state. The acoustic field are relatively independent, each other without grades, subordinate relationship. Look from the physical space, perhaps a continuous whole, but because of its internal distribution of the multiple discrete sound field, and makes the physical space environment properties are difficult to single qualitative, every sound field has its own environment atmosphere, will cause the multiple attributes of the physical space. At the same time, there is another kind of situation, it is a variety of sound source at the same time in a physical space interaction, the overlay, is the formation of multiple sound field influence each other and masking, the attribute of physical space is more complex, it is difficult to use unified standard to qualitative whole space.

Third characteristics of sound field in the boundaries of the space. The boundary of the adjacent sound field exists objectively, but not stable, will change with the change of objective factors such as over time. It is different from physical space with fixed boundary conditions. The boundary of the acoustic field is not physical, but psychological boundaries exist objectively. Sound space border instability is mainly caused by two factors, one is because of the sound field plane is dynamic, all kinds of sound source itself has been in a constant state of change; Secondly, as to urban residents, the psychological needs of acoustic environment is change over time. The most obvious embodiment of this kind of psychological needs change in the tolerance of noise to the environment. In the daytime, the city residents to the noise of patience is far higher than at night, the change of this kind of patience is not only reflected on the acceptance of noise sound level, also reflect on the influence of noise. It is because of the sound source itself and the listener psychological needs changing, leading to the boundary of the acoustic field fuzzy uncertainty, has no definite boundaries, and the configuration of physical space is no necessary link between.

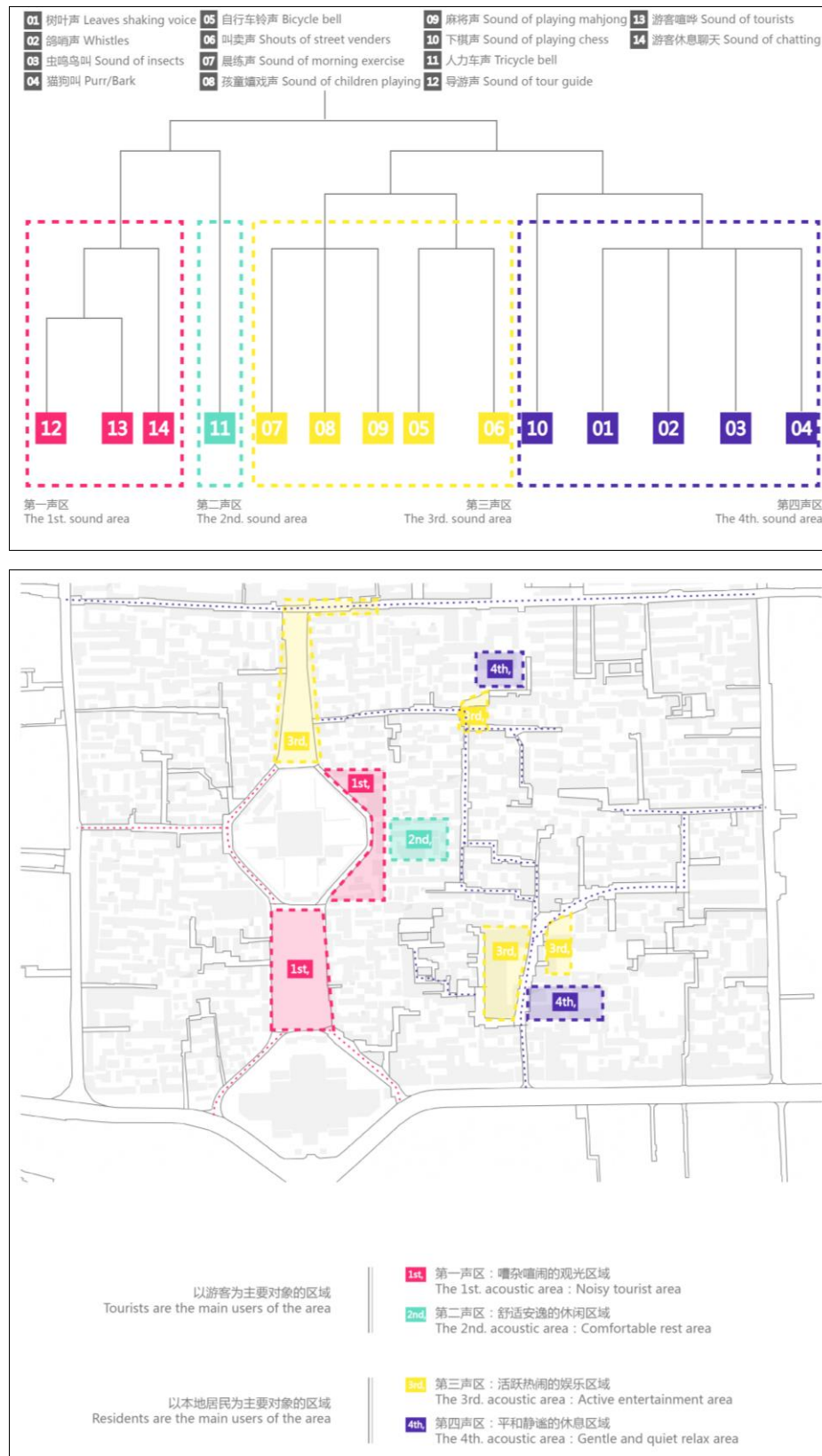
Can be seen from these characteristics of sound field, the physical space is only the sound field is an objective basis, it can provide conditions for the transmission of voice, and as the voice of all kinds of sound source to create possible, but can't control

of the sound field generated in essence. Physical space cannot be absolute control of the sound field, but it can take the initiative to sound field controls the physical space environment atmosphere. Physical space environment atmosphere of the build, the ultimate goal is to cause people in a space have some special feelings. People in place of physical activity in the space, watch, listen to, feeling and experience of sound field actively, and to handle all received information in the mind produce associations. Physical space visual stimulus should not only design the only pursuit, should also pay attention to the coordination of a series of senses such as hearing and trigger certain spatial association, through this place experience, perception and lenovo to give people the spiritual sense of belonging, make physical space becomes meaningful. Acoustic field of ambience will need social factors, cultural factors are taken into consideration, emphasis on collaborative auditory vision experience at the same time, paying attention to of lenovo's experience. This model is put forward for the sound field of physical space under the influence of the higher requirements.

Given the special property of acoustic field in the design practice, try from a new Angle, with sound field environment atmosphere is different as the basis of physical space partition, the different space atmosphere of the sound field, and the scenery of the sound value extraction and utilization of acoustic landscape design.

According to the above drum tower blocks subjective evaluation score of each sound source basic established various sound elements of the environmental atmosphere, then, can use the clustering method to partition of all the acoustic elements, subjective evaluation according to the above can calculate the Euclidean distance between similar atmosphere sound environment, according to the size of the distance to differentiate affinity-disaffinity relationship, based on this, according to the attractions of acoustic landscape is divided into four zones. Using SPSS (Statistical Product and Service Solutions) 20.0 statistics software calculation results (see figure 4-20)

Through to bring different feeling of sound elements to locate and to calculate the distance between each other, it is concluded that the field of acoustic environment can be roughly divided into four kinds of atmosphere of the acoustic area (figure 4-21)



4-21 Sound field partition in Drum Tower area

The first area - the noisy tourist area (tourists) : the main environment participants in this acoustic area for foreign visitors, the impact scope of a generation of basic fixed to the drum tower square. Guide, discussion and noisy sound, tricycles shuttle visitors of ring the bell hanging over the whole area, such as noise. Residents of these voice full of negative resistance, lively is too noisy.

The second area of (tourists) Slow and easy and comfortable leisure area,: the vocal register of the participants is still of tourists, the impact scope of sporadic distribution in various cafes, restaurants around, and there is a certain distance and the center of the tourist area, often scattered in the alley, with square think the vision to see from a distance the noisy crowd, but have a certain distance, to be able to pull away in the noisy environment, enjoy temporary comfort and ease, peaceful enjoy quiet breath deep in the hutong.

The third district - active lively entertainment area (residents) : unlike noisy tourist area, the acoustic area are the main participants of hutong residents. Beside this sound field are often focused on the market, spacious hutong intersection and kindergartens, schools and other places, people's life coexist here, be caring and attentive chatting each other daily, or poly group playing mahjong in good weather, walking the dog for a walk, walk the children let the spacious lively active deep in the hutong. And these small venues noisy level is moderate, won't have a negative impact on the lives of the residents, but people have a strong sense of territory belonging to bring the whole hutong, is very valuable.

The fourth district, gentle and quiet rest area (residents) : the sound field range is very small, usually hidden in the end of the alley in a suddenly become a little open space. This area especially private, often only belongs to the end of a few families, the wind, trees, insects, birds, natural sound here. In the courtyard to become painting build phenomenon is serious today, such illicit is close and open space is very rare, in this space in the sunshine and reading a newspaper alone, or under the two chess, peaceful and comfortable.

This is the bell tower area hutong basic sound environment of partition, they sound scene constitute each are not identical. Each acoustic area is composed of different acoustic elements, they influence each other, superposition, seepage, constitute the sound environment of each acoustic area specific atmosphere.

Chapter 5 Using soundscape in historical area landscape design

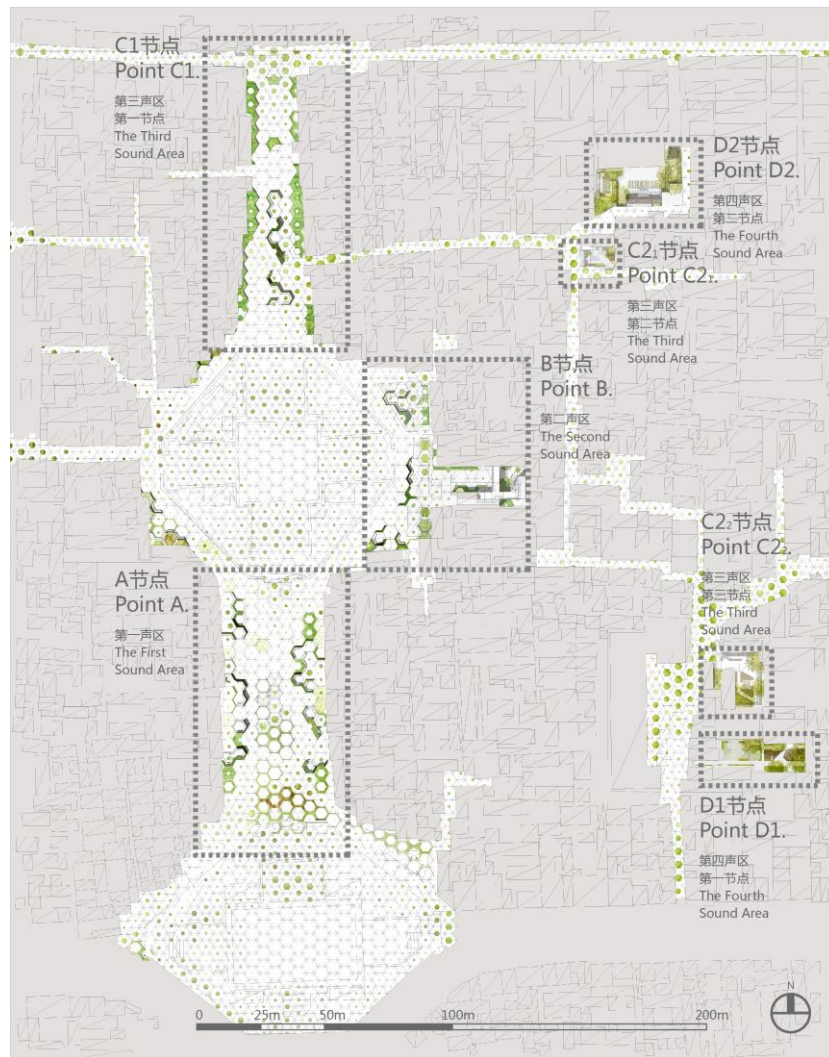
•5.1 Design partition and positioning

In the area of acoustic landscape renovation design, based on above analysis it is concluded that the acoustic area for the unit. Acoustic area is acoustics in the sense of space function, in the process of area for improvement, need to sound as spatial layout of guidance.

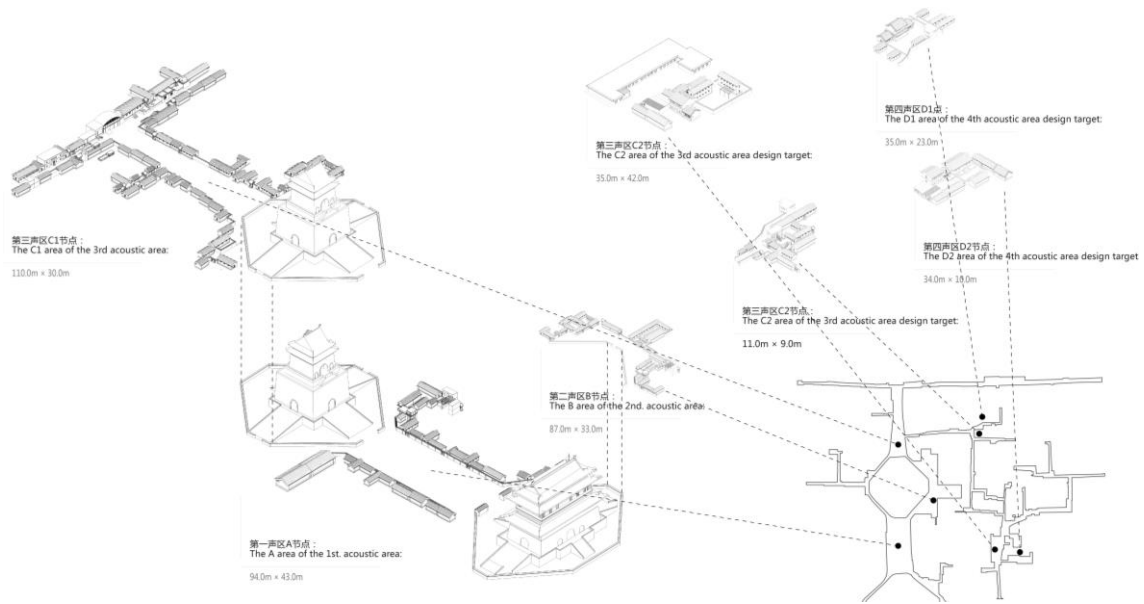
In the field, there are four types of vocal register, and by comparing the space type found: "active lively entertainment area is divided into two situations: one kind is produced by the planning of residents gathered entertainment area, another is the residents through their own needs to modify the space form the entertainment area; "Gentle and quiet rest area" is divided into two kinds: one is by several families Shared ZaYuan, the other is by a single family owned private courtyard alone. Therefore, segmentation produced six types of space, in the next practice, respectively, selected the seven specific representative node expansion design (FIG. 5-2) : the first acoustic area, A node in the drum tower square, between the side of the fence, and residential area in this transition, as the main scenic area; Second acoustic area B node, located in the clock tower on the east side, into the drum tower square, south to the north into the clock tower north square, and contains two lane entrance, as auxiliary visit node; Acoustic area 3 C1 node, located in the north of the clock tower, drum tower on the north market (the original HongEn temple), within the things on both sides of hutong entrance and for planning of residents recreational area; C21 node, located in the factory at the end of the eastern north lane, three distributions of hutong, recreational area for residents spontaneously transformed into; C22 node, located in the south area of grass factory hutong near east gulou street, north to the community residents' committees, and the community to the kindergarten, citing specific function caused by residents gathered area; Fourth acoustic area D1 node, located in the south C22 node, for family share the public courtyard; D2 node is located in the factory at the end of the

east of north lane, the confluence of three lane, close to the north of C21 node, a private yard.

The seven selected node covers all types of vocal register area scope, targeted on acoustic landscape design can provide a reference for site within the same type of acoustic area reconstruction basis. At the same time, connecting the vocal register hutongs are key points of design, by using sound pressure level data from the field, to the alley of the acoustic area in series metope and ground to carry on the redesign, deal with the relationship between the hutong voice interaction inside and outside permeability, can make the whole area of the sound environment for the ascent of the whole (figure 5-1).

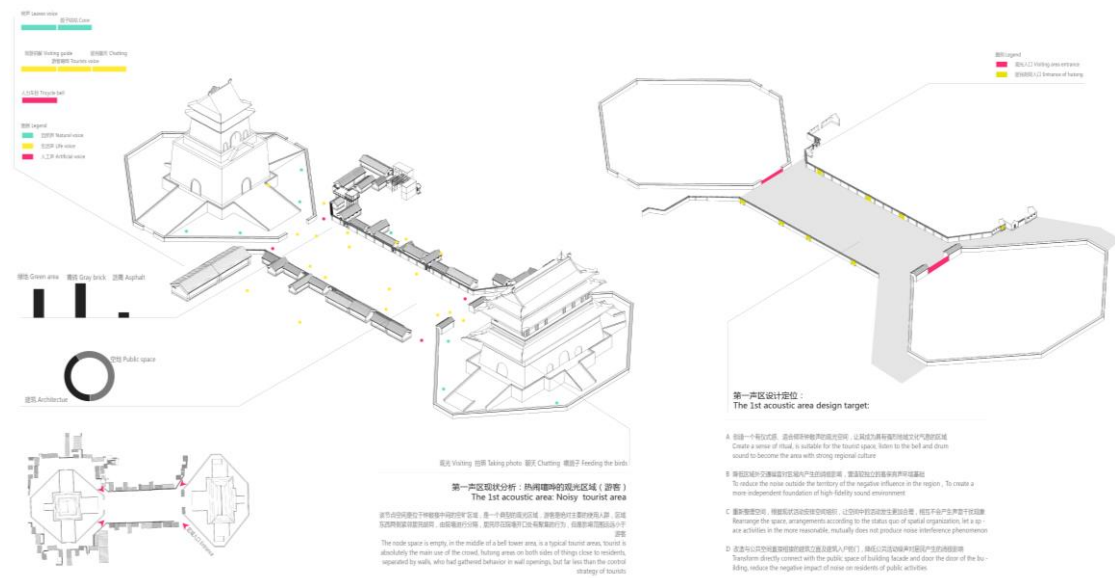


5-1 scope of design



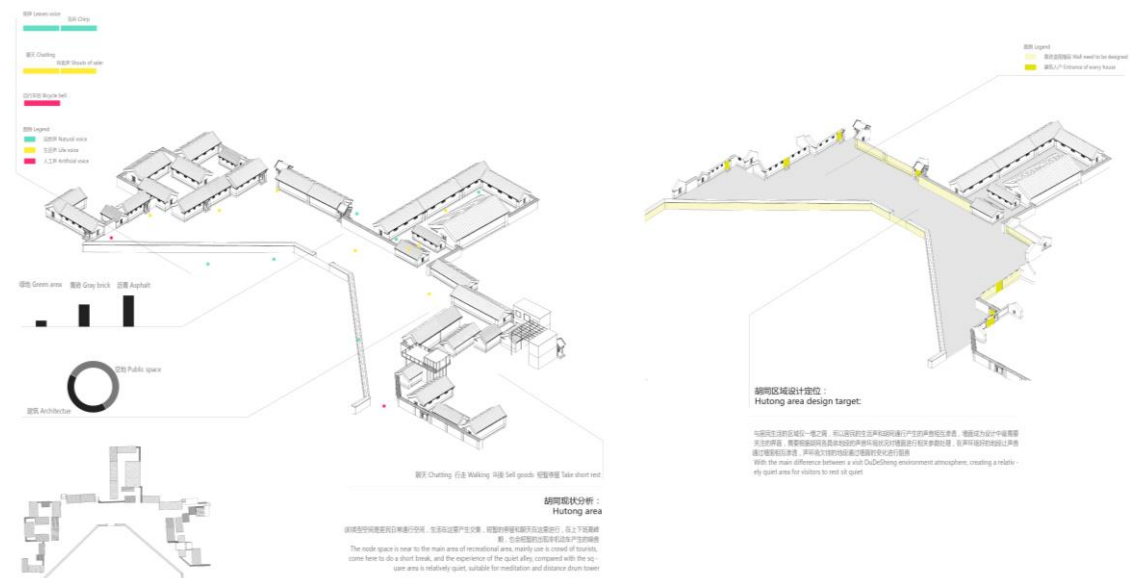
5-2 Axonometric of Design point status

Respectively established seven design considerations above node (belonging to the noisy noisy tourist area of A node, is comfortable and easy and comfortable leisure area B, belongs to the active node lively entertainment area of C1 C21 C22 three-node and two nodes belong to the peace and quiet rest area of D1, D2) of space and the present situation of acoustic environment, and based on respectively to establish their design positioning: (FIG. 5-3 to 5-9)



5-3 Design point A' s status and design orientation

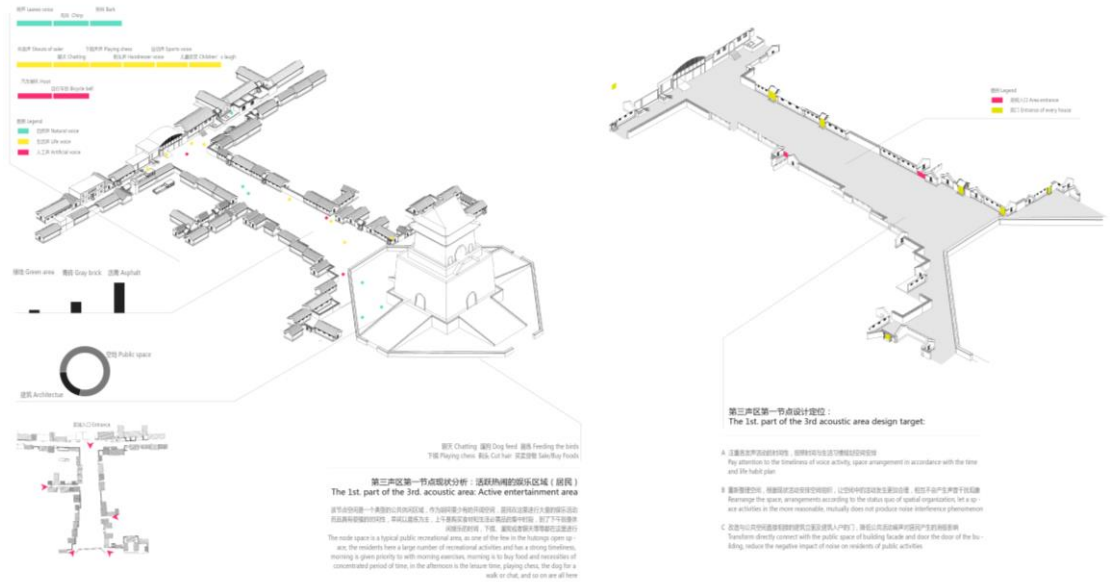
A design point positioning: 1) to create A sense of ritual, suitable for listen to the bell and drum sound tourism space, make its have strong regional culture of the area; 2) reduce the area outside the negative impact of traffic noise in the region, to create a more independent high-fidelity sound environment; 3) rearranging space, according to the status quo of spatial organization activities, let a space activities in the more reasonable, each other does not produce noise interference phenomenon; 4) transformation directly connect with the public space of building facade and door the door of the building, reduce the negative impact of noise on residents of public activities.



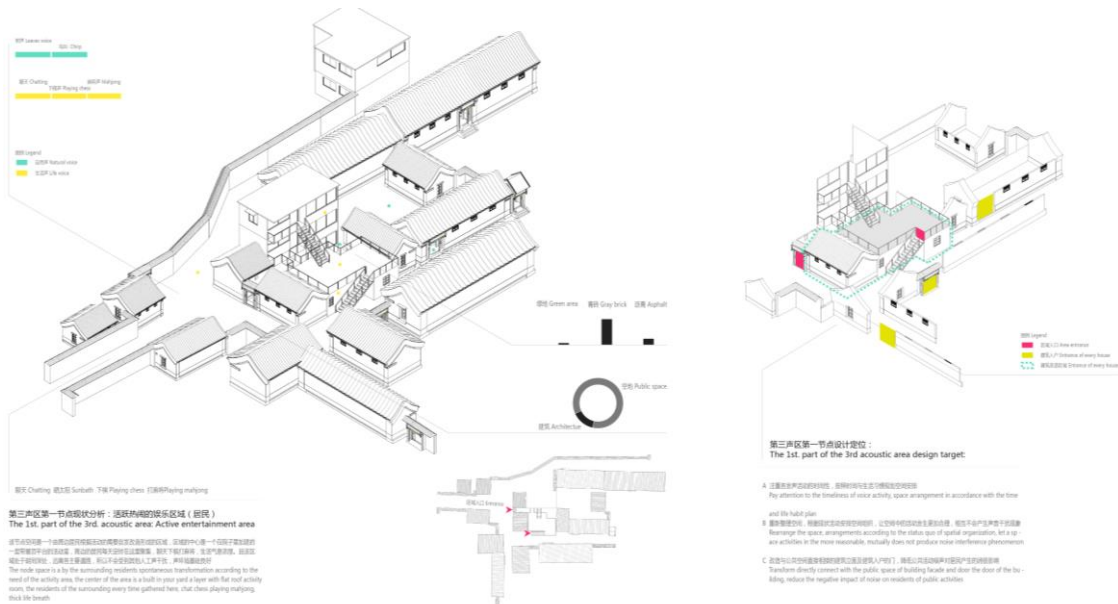
5-4 Design point B' s s status and design orientation

B design point positioning: 1) with the main difference between a visit OuDeSheng environment atmosphere, creating a relatively quiet area for visitors to rest sit quiet; 2) on the acoustic field separation and the main tour area, but in the line of sight on the connected, provide a good perspective for far view tower; 3) introduction of cries and space requirements related to the hutongs cries of scene can be tourists feel; 4) transformation directly connect with the public space of building facade and door the door of the building, reduce the negative impact of noise on

residents of public activities.



5-5 Design point C1' s status and design orientation



5-6 Design point C2' 1 s status and design orientation

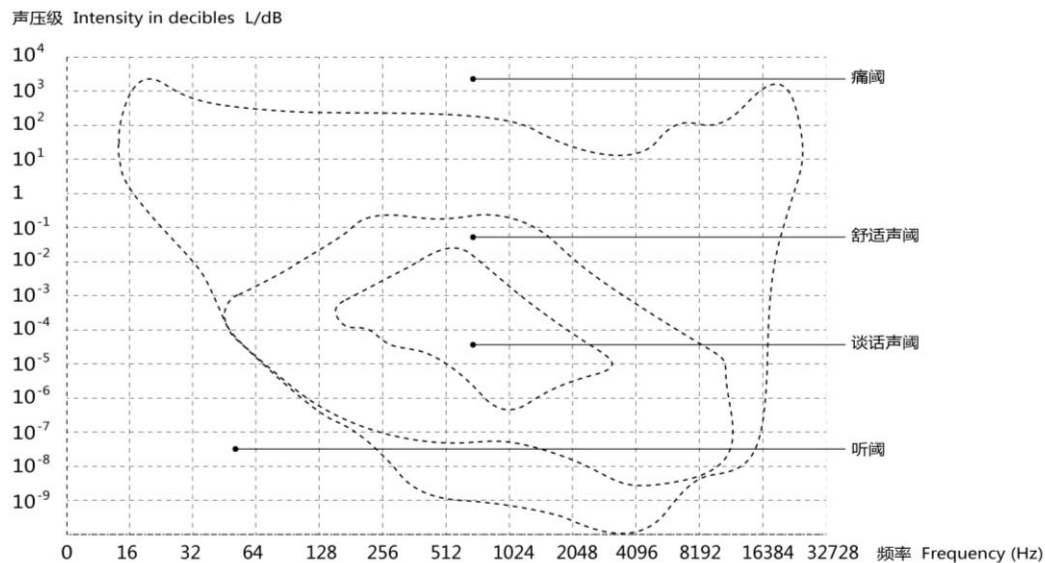




through the other landscape elements of the design, make space more quiet, peaceful atmosphere.

•5.2 Noise reduction processing Based on parameters of loudness

Before the sound for each node to view design, need to article 4.3 before each test point record sound pressure level of sound pressure level status, controlled below the level of noise in the 5-10 according to the acoustic environment of acoustic area to locate, accordingly: white noise for noisy noisy sightseeing area, need to isolate the peripheral motor vehicles such as artificial. For the comfortable recreational area, to reduce the interference brought by tourists noise as far as possible; In active lively entertainment district, residents belong to consider is to reduce the field of activities disturb of the residence on surrounding environment; In peace and quiet rest area, for in addition to the natural sound of all the sound source to intervene, in order to ensure quiet atmosphere.

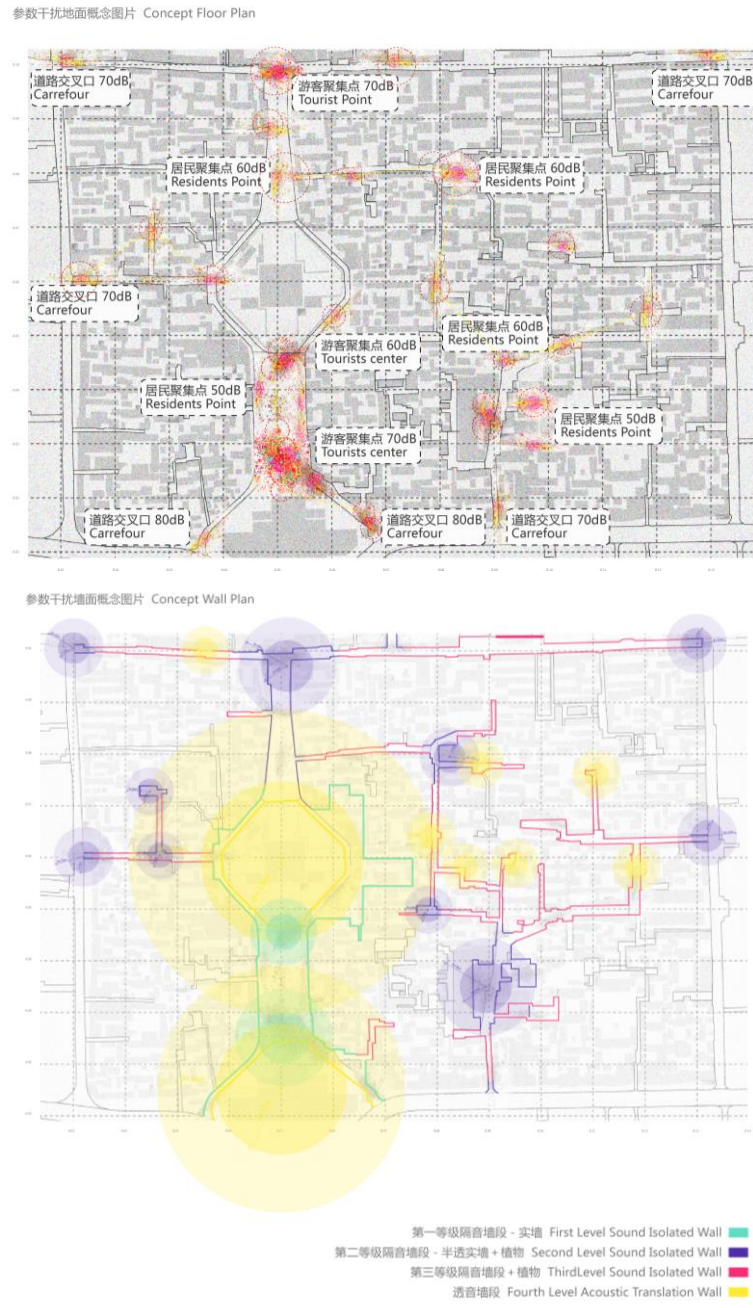


5-10 hearing threshold for human^①

On the basis of above, below 5 to 11 in the upper picture shows the extracted the location of the noise inside each area, the lower picture is according to the specific

^① http://amuseum.cdstm.cn/AMuseum/perceptive/page_2_ear/page_2_3/page_2_3_1_i.htm

noise decibel and environmental requirements planning out the corresponding noise levels:

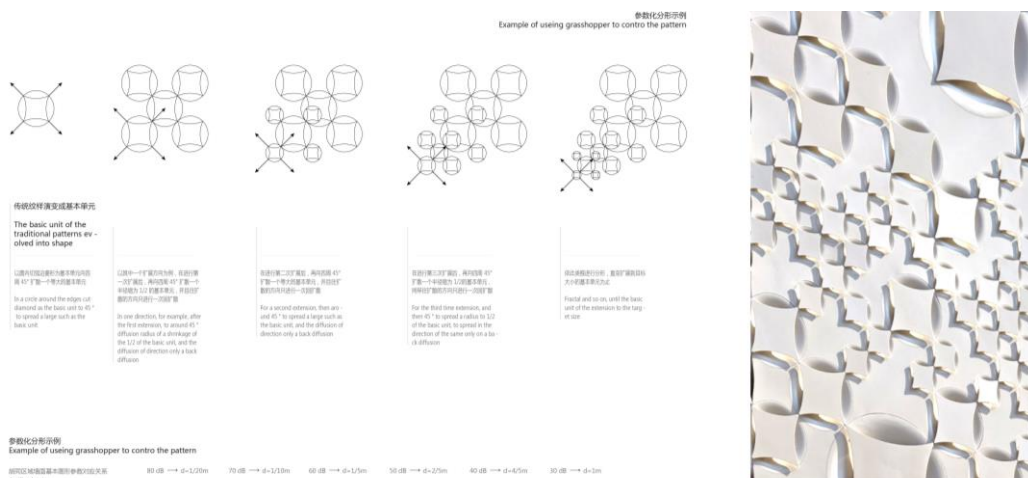


5-11 Space arrangement for different level' s noise

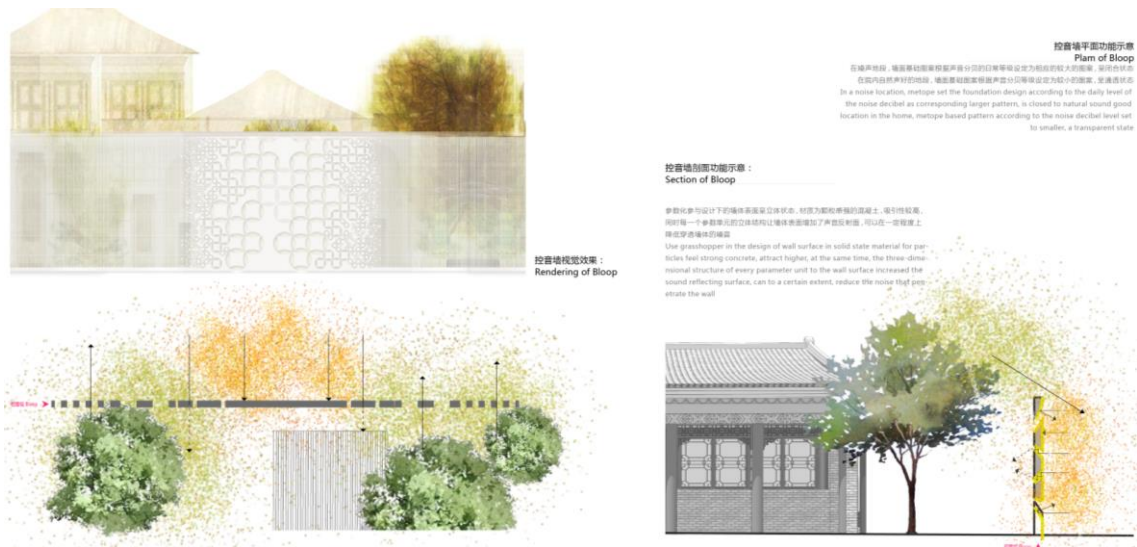
According to the requirements of noise intensity of the field noise reduction methods are divided into four levels: available for high noise area, using solid wall of

sound insulation, the conclusion of wall materials in accordance with figure 3-2, you can choose rubber, cork, blue bricks, hardwood or resin; For a small range of low-level noise, use a semipermeable wall combined with green plant isolation of noise reduction mode, because the internal area generally located in the alley, the overall sound pressure level is not high, and has a certain timeliness, belong to briefly point noise, using this way to low-level noise isolation effect, and can beautify the visual environment, affect the person's psychological feeling; For quiet area noise processing, because the sound pressure level of the area itself is very low, so the interference of "noise" sound pressure level is low, such as normal chat, bicycle bell, etc., in such an area with the introduction of a large number of vegetation to increase the natural sound, can be eliminated by natural sound YanBi effect of noise on people of negative psychological interference.

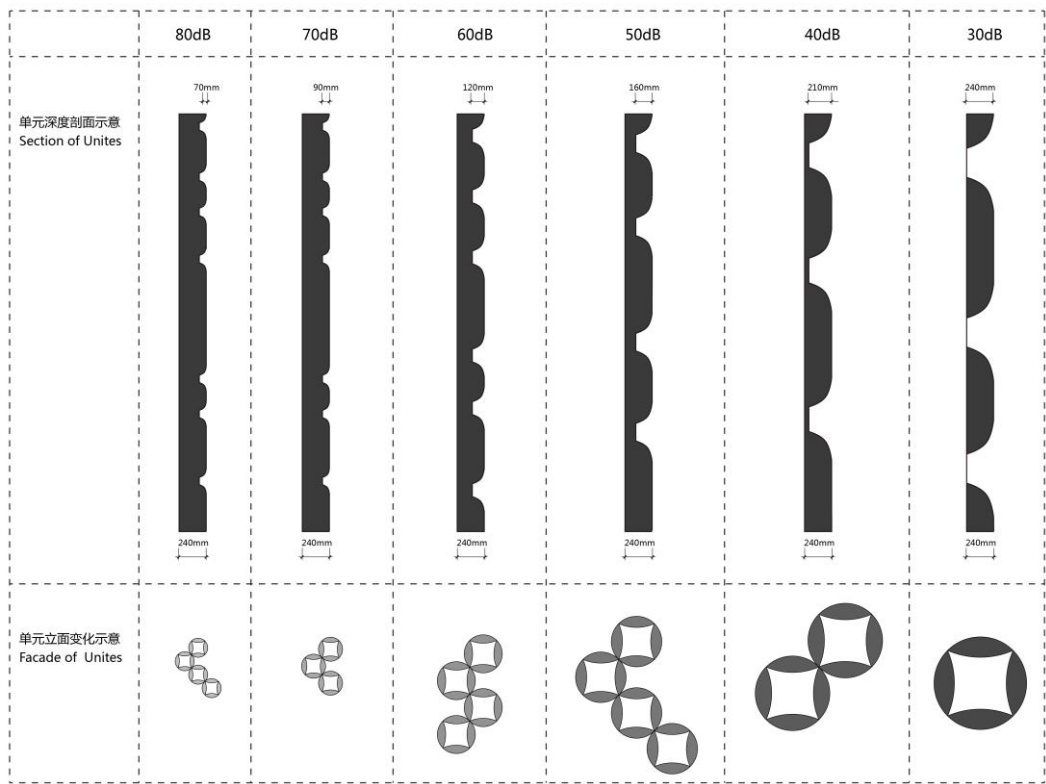
In specific hutong metope design aspects, in order to accurately use of wall body control quantity of sound propagation, and combines visual perception and auditory closely, reflect the strength of the noise from the vision, the introduction of parameterized design method, all point to the strength of the sound pressure level as a parameter, the change of the influence degree of metope unit closed or fully (FIG. 5, 5-12-13), the higher sound pressure level of hutong unit of metope is smaller, more is not fully, more conducive to sound penetration; Local metope of the unit of sound pressure level is lower, the greater the more fully, more conducive to the penetration of sound (FIG. 5-14).



5-12 Example of using grasshopper for wall



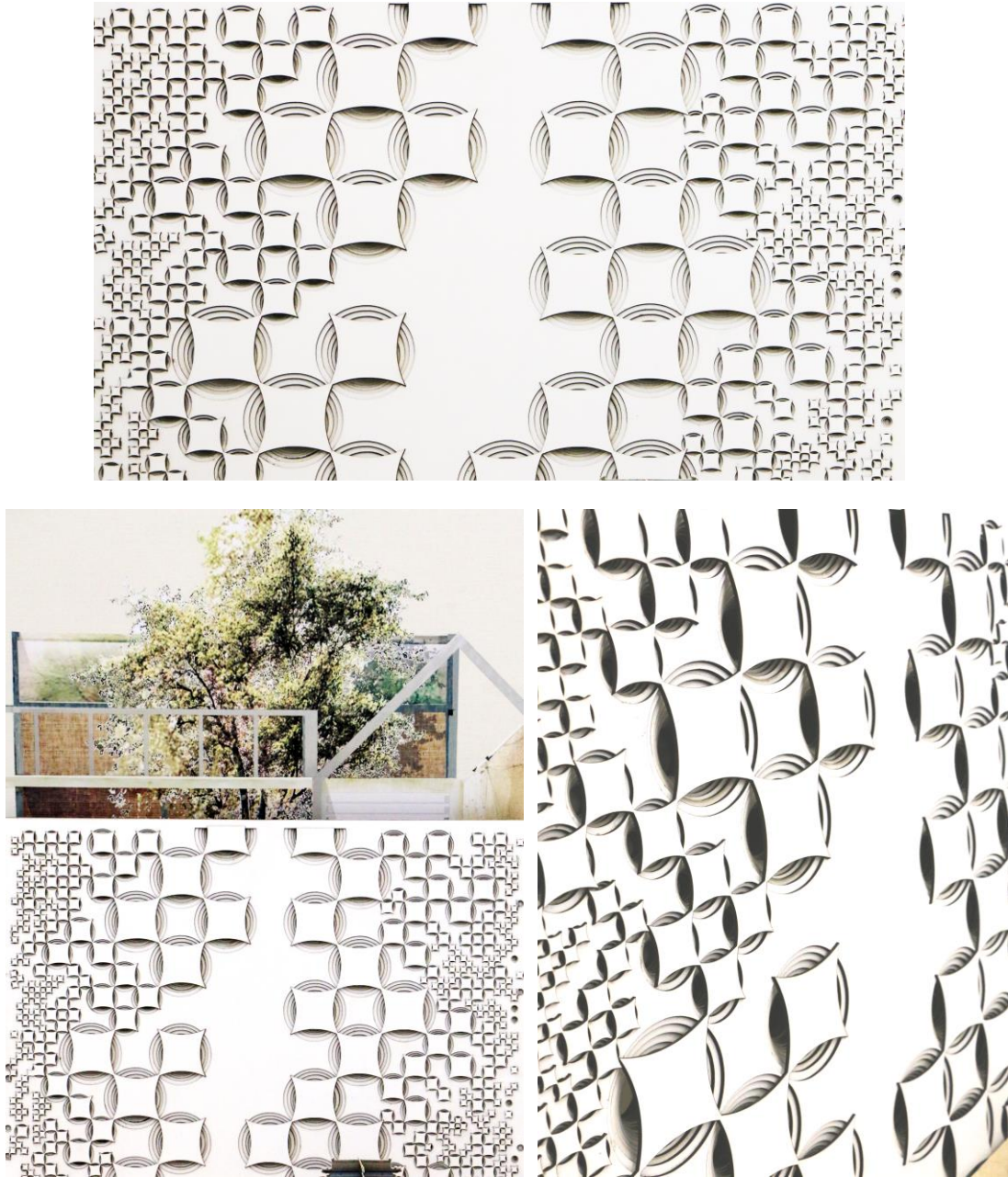
5-13 Grasshopper wall analysis



5-14 Grasshopper wall changing analysis

3-2 on the choice of materials and on the basis of selecting resistance effect is good, easy to shape material. At the same time, because half appear status, can become the scene of vine plant growth, combined with a wall of the form, the gain of the visual

effect. Because of the noise is mainly composed of hutong, and most of the building height is only a layer of hutong area, so sound walls can play a good effect, and because of the wall height, not in the region have weaken the natural sound. (FIG. 5-15)



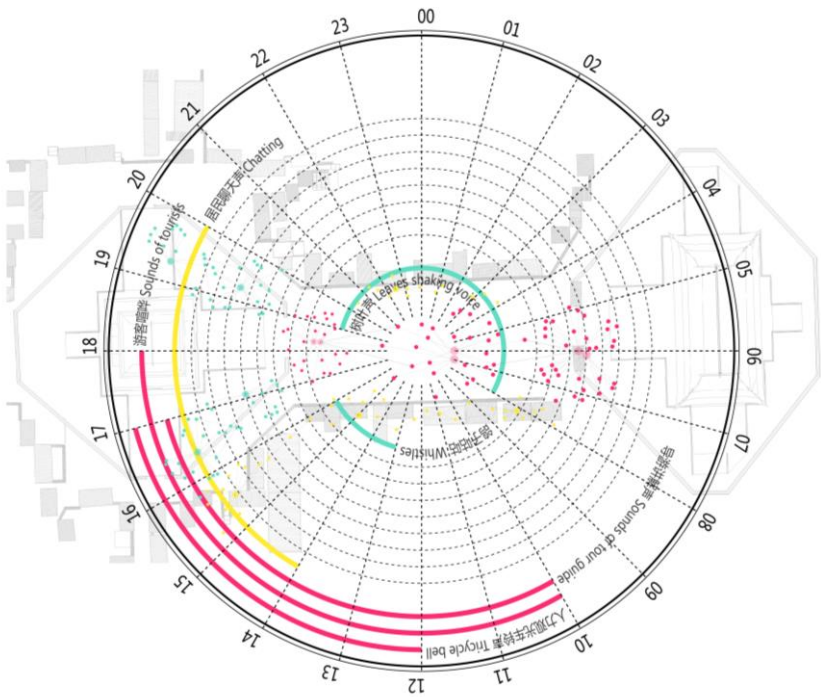
5-15 Grasshopper wall model

•5.3 Acoustic area space planning

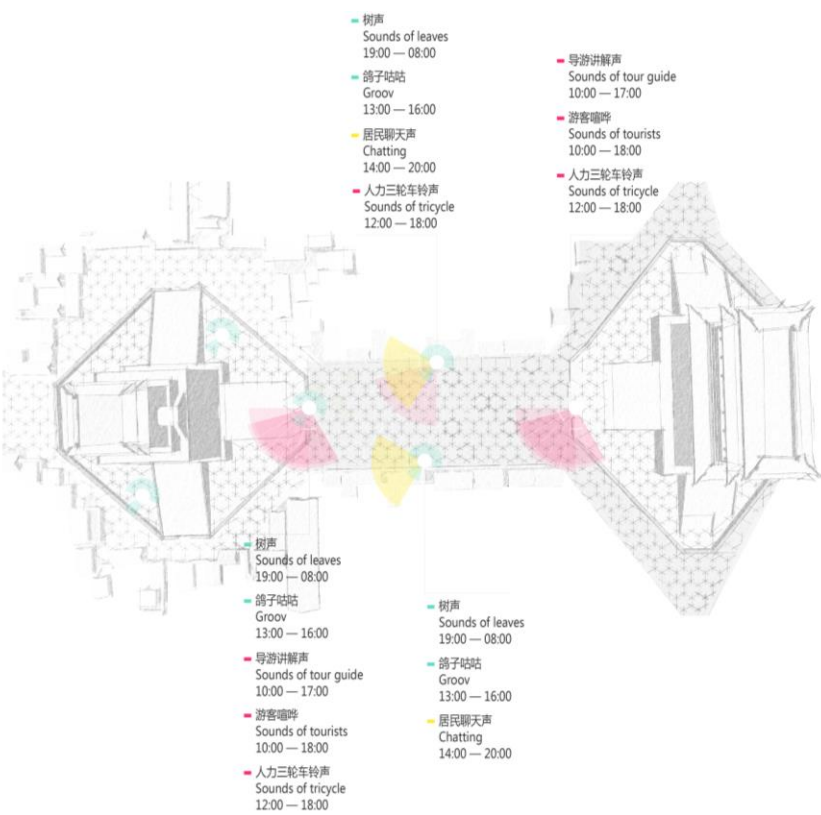
Noise reduction for area, to guarantee the overall sound environment foundation next to the voice of every node in the specific space planning. Acoustic elements for each acoustic area to the principles of space planning is all beautiful, meaningful voice can be heard clearly, and won't produce superimposed with each other, the masking effect, in order to ensure high fidelity sound environment.

On acoustic area in the process of spatial planning, the first step is to record the vocal register all time regulation of elements of singing, and then through the analysis of the existing space of staff activity rule and site conditions, rearranging the functional partition, through the space surrounding fit, space form, the relationship between the spatial organization of comb, avoid activities will produce interference effect at the same time at the same point. Comb at the same time the introduction of more natural sound, voice and sound cooperation relations, let can promote each other to produce a particular voice the voice of the atmosphere at the same level.

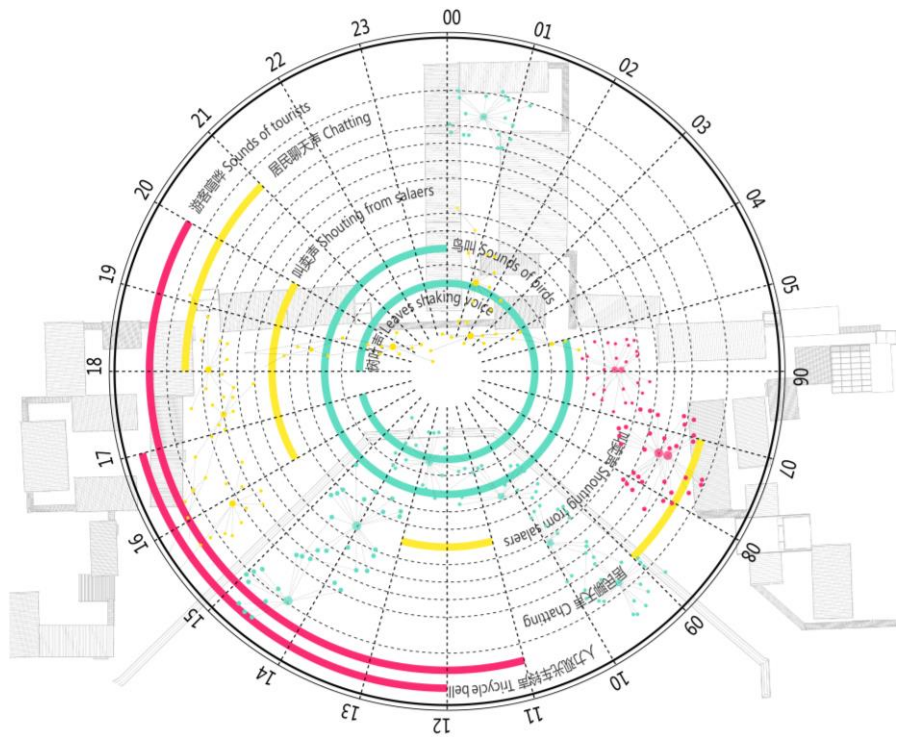
Within the following four acoustic area involved in the design of the sound law summarized seven node (figure 5-16, 5-18, 5-20, 5-22, 24, 26, 5-5-5-28), and then according to the above principles, to reframe the vocal register sound elements and spatial planning (FIG. 5 to 17, 5 to 19, 5-21, 23, 25, 5-5-5-27, 5-29).



5-16 Design point A Sound law



5-17 Space arrangement of A point



5-18 Space arrangement of B point

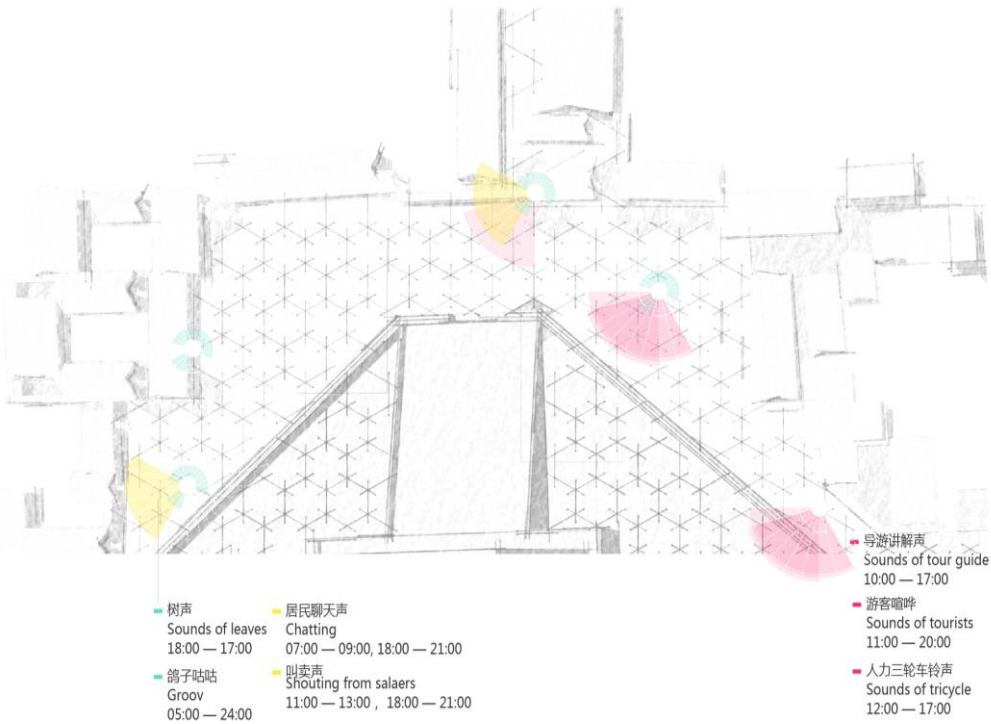
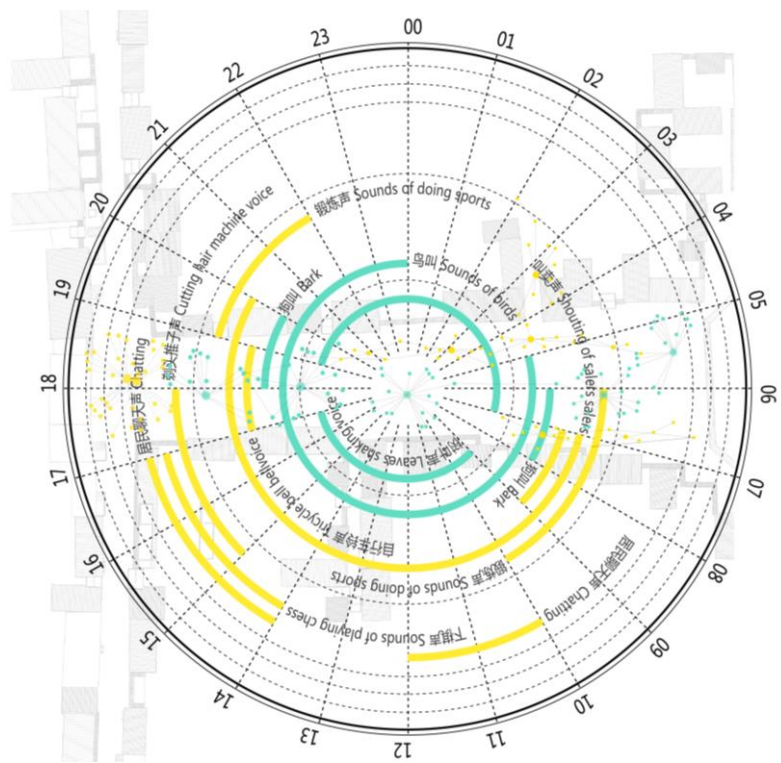


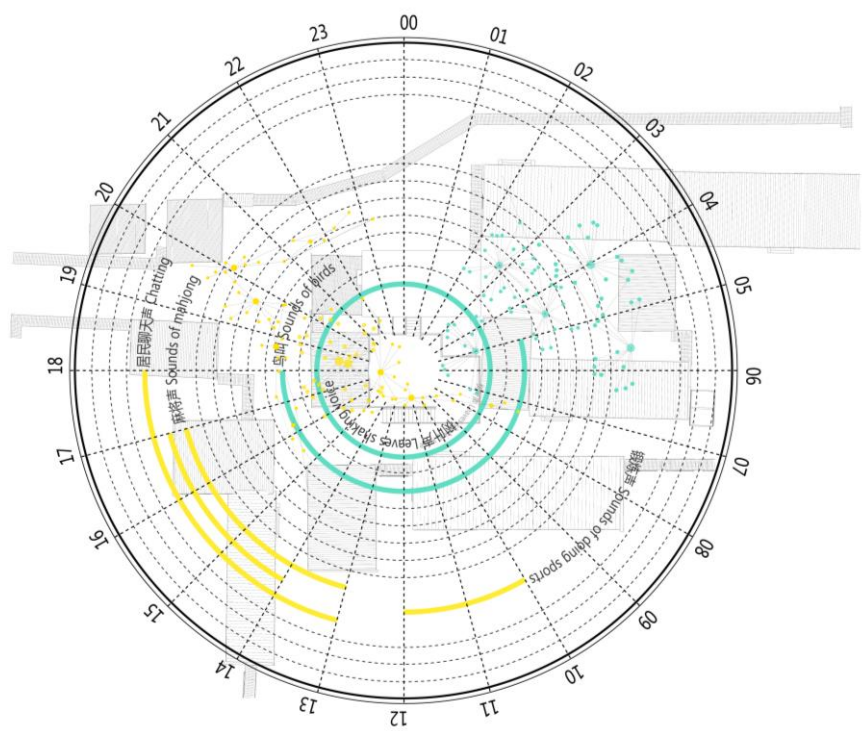
图5-19 Space arrangement of B point



5-20 Design point C1 Sound law



5-21 Space arrangement of C1 point



5-22 Design point C2`1 Sound law

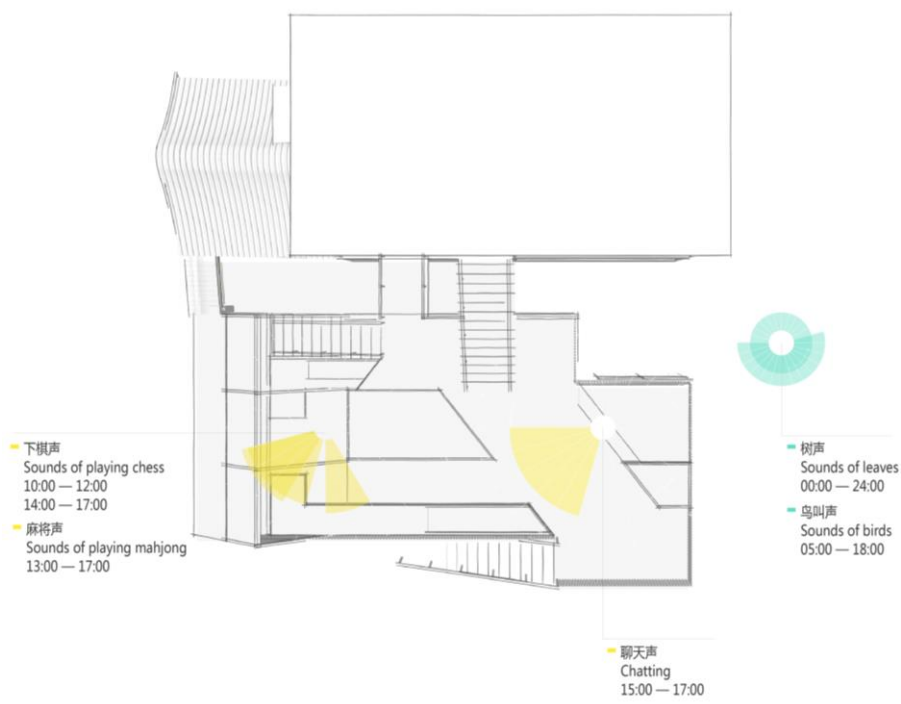
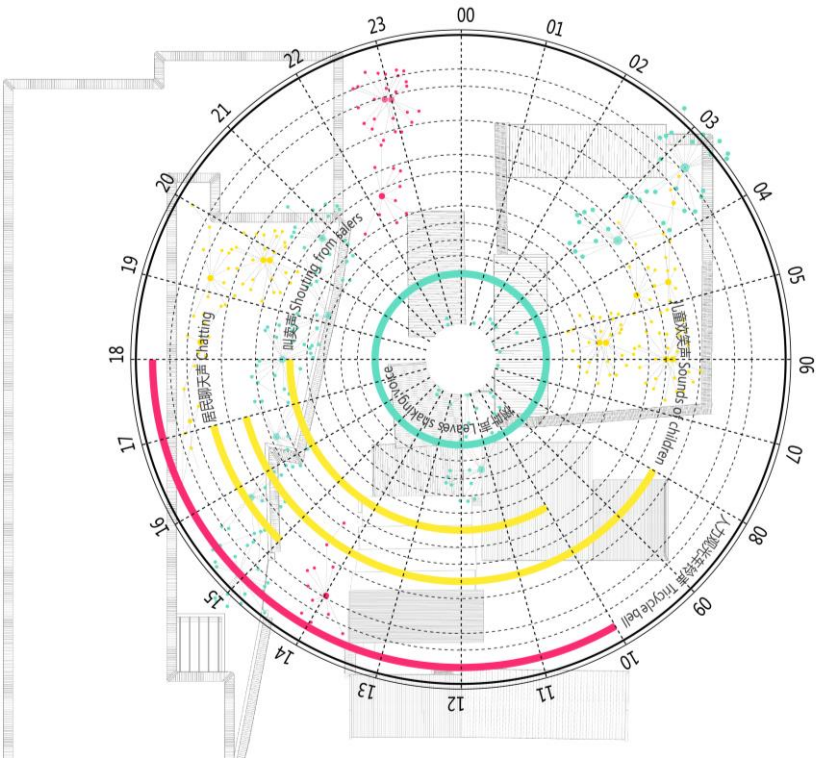


图5-23 Space arrangement of C2`2 point



5-24 Design point C2`3 Sound law

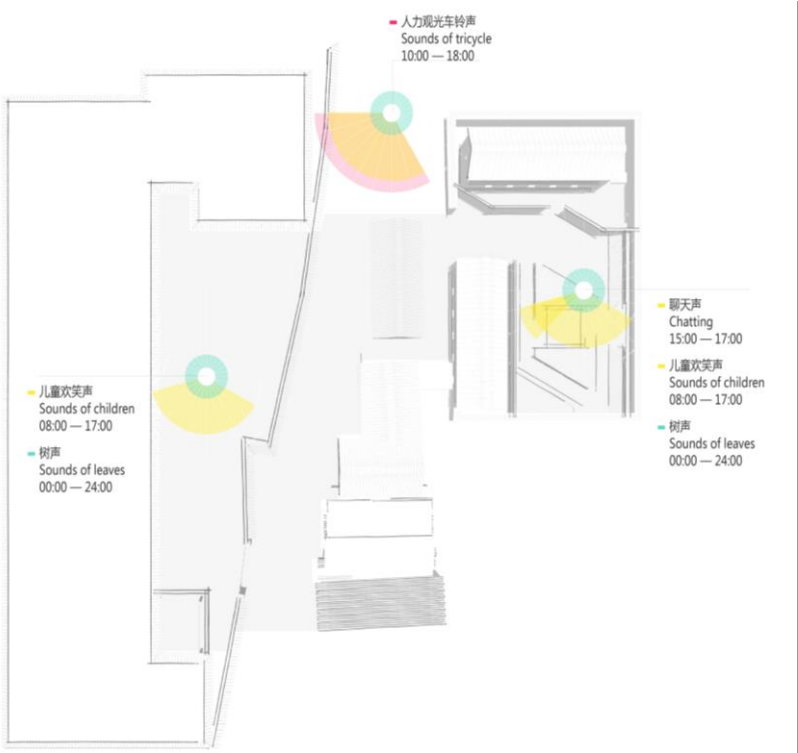


图5-25 Space arrangement of C2`3 point

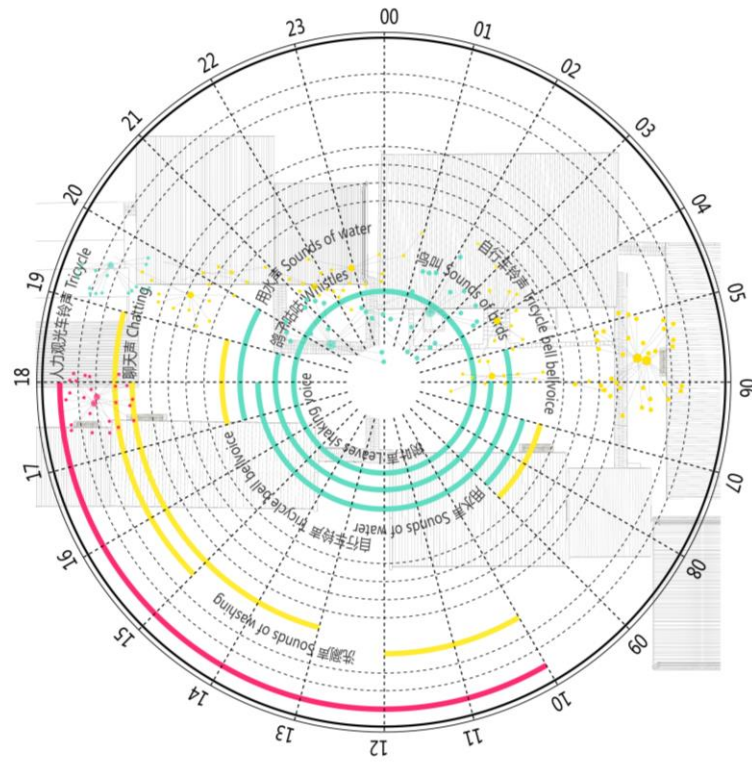


图5-26 Design point D1 Sound law

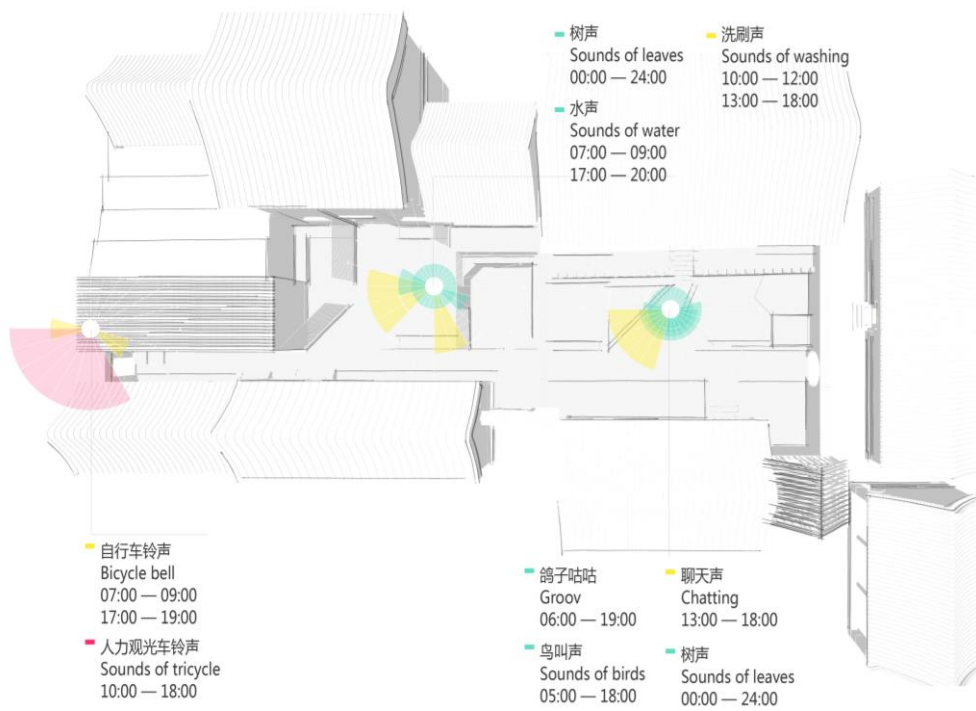


图5-27 Space arrangement of D1 point

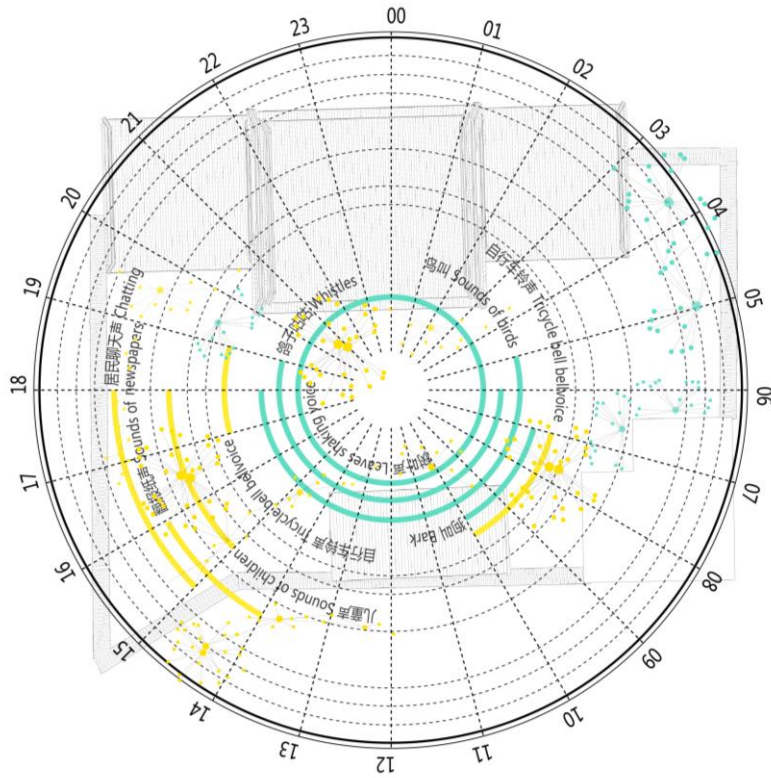
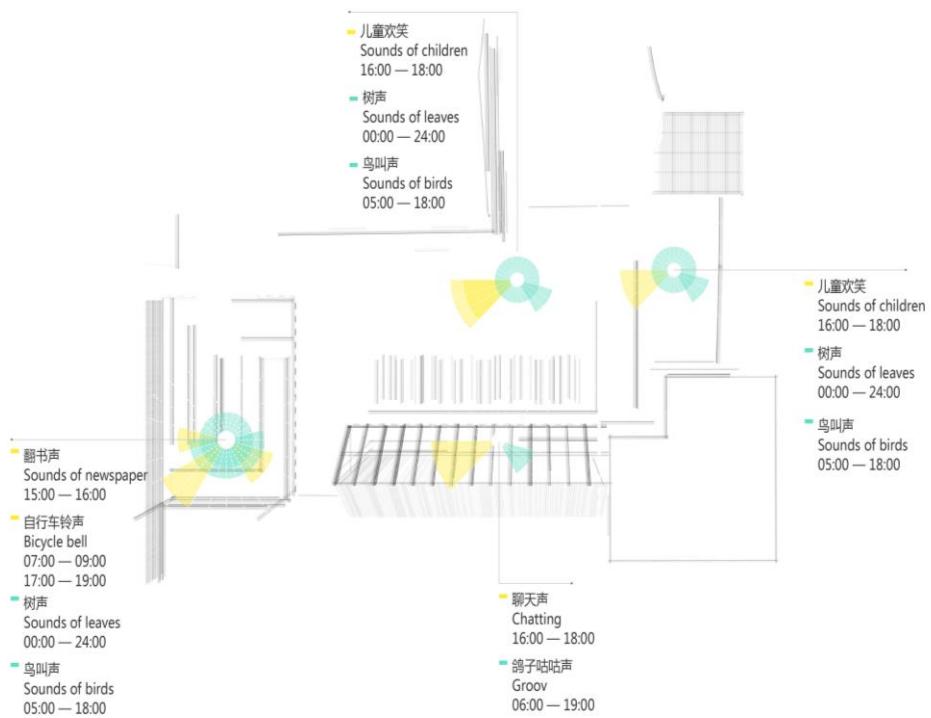


图5-28 Design point D2 Sound law



5-29 Space arrangement of D2 point

•5.4 Analytic hierarchy process for soundscape elements design

Above research results, in each acoustic area, can be contained different kinds of sound elements are compared, and one to one step by step to obtain more determinant, and can use AHP software to calculate the weights of various sound elements w , according to the different weights to set each of acoustic landscape elements separately using priorities and proportion.

The area - the noisy noisy tourist area (tourists) : according to the results of calculation software, for this area is the voice of the whole landscape, historical $w = 0.51$ has been one of the most important, it shows that the tourists for chase high historical and cultural memory, sound history is most in need of voice in this area focuses on design elements; Followed by natural sound $w = 0.18$, (residents) $w = 0.15$, embodies the pursuit for the landscape of the sound field ecological tourists; Quiet life $w = 0.08$, then the sound (tourists) $w = 0.06$, the last is artificial acoustic $w = 0.02$. In it, for the most important historical sound is the sound of the morning bell and evening drum reminders need most prominent use $w = 0.42$, which embodies the reverence and the worship of ancient culture, followed by traditional sale and acoustic sound $w = 0.35$, reflects the form of traditional residence in native traditional scene of recall, and then can take advantage of the human three rounds of sightseeing car foot ring $w = 0.23$, these can be designed to evoke the landscape of the ancient capital of sound collective memory.

Second district, comfortable and easy and comfortable recreational area (tourists) : in this scenery area, the embodiment of the natural sound is the most important $w = 0.35$, followed by quiet $w = 0.29$, then the history of acoustic $w = 0.16$, life (residents) $w = 0.10$, the last is almost the same weights (tourists) and artificial life voice with $w = 0.05$. Such results reflected the tourists for a quiet place in the pursuit of hope in a natural and quiet environment from listening to the sound of history and local residents and finely the voice of the living, to perceive the local-style dwelling houses of old Beijing culture. For the largest proportion of the natural sound, the most important $w = 0.46$ pigeon whistle, this is the voice of the most authentic taste of

Beijing in the natural voice, the voice of strong rope, can arouse the collective memory; Followed by the sound of birds $w = 0.30$, in a quiet place in the background, the joyful noise can cause tourists most emotional resonance. Also higher $w = 0.13$ and the rustling of leaves $w = 0.11$, it is completely natural voice, can bring spiritual peace.

Third area - active lively entertainment area (residents) : according to the statistical results, live sound (residents) occupies absolute important proportion $w = 0.56$, residents are the sound field of the absolute subject, the appeal of the life is the most important, all sounds associated with live entertainment can cause residents have pleasure and sense of belonging, this strong regional living plot has been highlighted here; Followed by natural sound $w = 0.17$ and quiet $w = 0.14$, this is the basic task of people normal life; And history is only the background of everyday life sound $w = 0.10$, is not necessary for daily life, but also a powerful embodiment of regional culture, that causes emotional dependence, let residents belonging, so in the design should also occupies certain proportion; However, artificial acoustic $w = 0.02$ and tourists life produces sound $w = 0.01$ is deeply unpopular in the sound field, they are the invaders, acoustic field can cause direct damage to the quality of life, so is the need to avoid involvement in the design of acoustic elements. But for residents of the most important, the weight of the specific analysis is as follows: does sound can cause the attention of the residents and most directly with $w = 0.27$, because it indicates the beginning of a new day, vitality, filed a hutong is a symbol of vitality; Followed by neighbors chat voice $w = 0.24$ and the children's laughter $w = 0.22$, this is the most daily, hutong residents feel kind and true; Then the leisure hutong $w = 0.12$ and mahjong chess voice with $w = 0.10$, this is the active atmosphere, the embodiment of the state of carefree life; Finally is the sale in the market and bargain $w = 0.05$, this sound of the ShiJingQi is extremely thick is the reflection of real life.

The fourth district, gentle and quiet rest area (residents); This is the privacy of some relatively sound field, quiet here is one of the most important environmental protection $w = 0.50$, then add natural $w = 0.43$, will produce "cicada noise Lin Yu static, birdsong mountain more deep and remote" artistic conception, let these rare rest area more peace and quiet; And historical acoustic $w = 0.07$ is dispensable, here is a quiet environment to produce some interesting, also won't affect integral atmosphere of the sound field; But both tourists and residents of noisy sound $w = 0$ are unpopular,

they will damage the whole acoustic field, change the sound environment of overall qualities.

Acoustic area acoustic element weights determines the proportion of use in the space, the space configuration were positively correlated with the corresponding activities. Therefore, the weight is the basis of a direct guidance space design.

•5.5 Method of creating soundscape atmosphere

Acoustic sense of space in the block function design, after the space planning of acoustic elements need to be made to match the visual perception, to beautify the environment in traditional landscape design style, build match the sound of visual environment, make sound landscape has some kind of emotional atmosphere. Spatial organization, landscape level, fit form, plants such as supplement, can build play a role to promote the sound atmosphere of the scene.

The atmosphere of various acoustic area have different requirements:

First acoustic area need to build is the history of the ancient capital of massiness, need to broaden horizons foil deep loud bell and drum sound, and need to raise the point of view, guarantee the drum tower building on the line of sight is not obscured. At the same time, need relatively symmetric space form, guide of environment through the form.

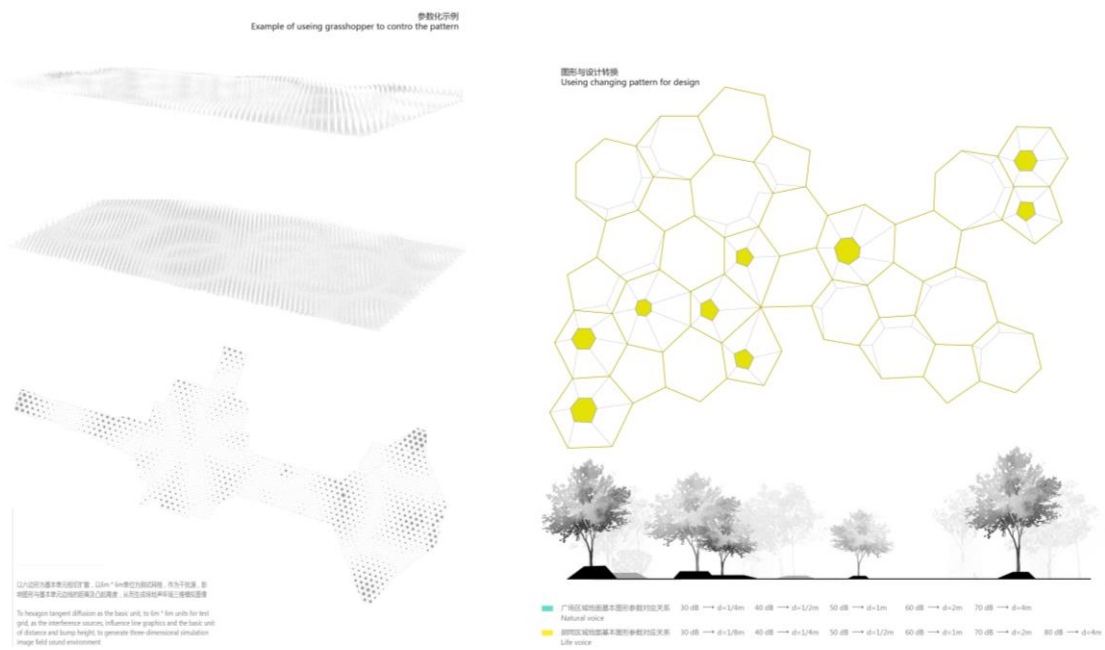
Second acoustic area need to build is with rich beauty, let a person feel warm and relaxed space atmosphere, which requires a high enough platform, ensure that the line of sight is not obscured, clearly see the drum tower buildings and traditional dwellings, together at the same time, can avoid noisy noise of tourists. According to the orientation of the sound element in the space of fit appropriate to create an open form, need both in the line of sight and sound element interaction, and need to keep the fidelity of sound, in the process of transmission attenuation of as little as possible.

Third acoustic area need to tone is relaxed, lively environment, which requires

small space close to the combination of the flexible style, comfortable with each other. On the technique of concrete can be influence by space sequence arrangement of voice activity, let the vocal register sound environment flexible, have the strength to change. At the same time, need to plant the supplement and strengthen the introduction of natural sound, with rich layers of green plants reduce sound environment too noisy from the vision of negative emotions.

The fourth acoustic area requires the quiet and peaceful atmosphere, isolated from yard outside the hustle and bustle of the space. Therefore, the line of sight on the shade is particularly important. Can through various forms of walls, the plant height supplement as space isolation. At the same time, more organic, soft floor, such as grass, pine needles, rotting leaves, bark, and comes with a green plant wall facade can help ease the mood, in a spirit of peace. In addition, the form of space can be compared with the sex, don't need to be neat, founder of activity space, and more need to be mixed according to the habit of using small scale warm place.

In it, each acoustic area have introduced the demand of the green plant, and the demand of plants with sound environment of db values were positively correlated, the higher the sound pressure level of the place, the more need of vegetation, no matter from the noise level or visual effect to alleviate noise of negative emotions. In order to accurate quantitative requirements of each point plants using parametric design field ground (FIG. 5-30), according to figure 4 to 6 records each point sound pressure level status, to determine the cell levels of vegetation.

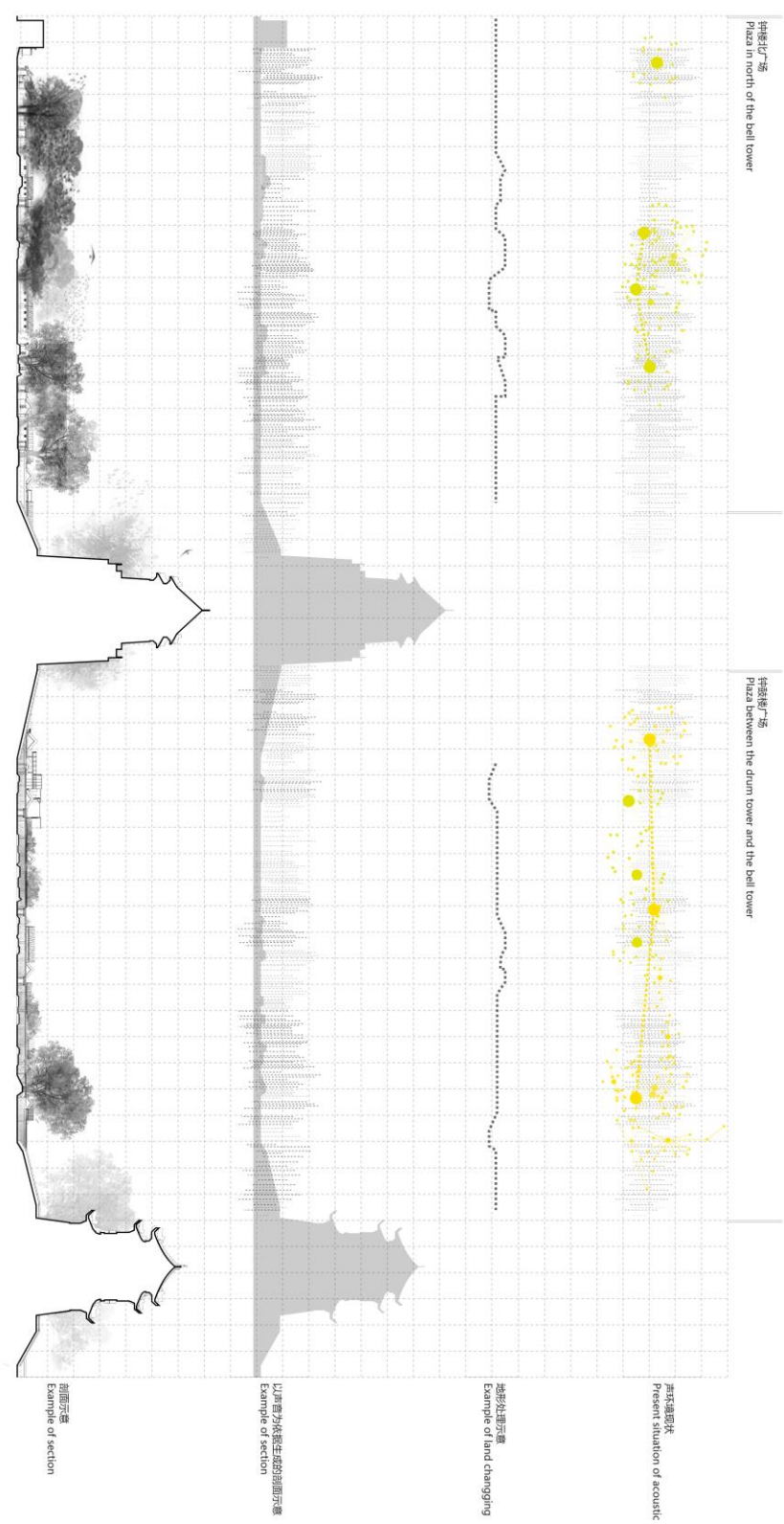


5-30 Concept of grasshopper pavement

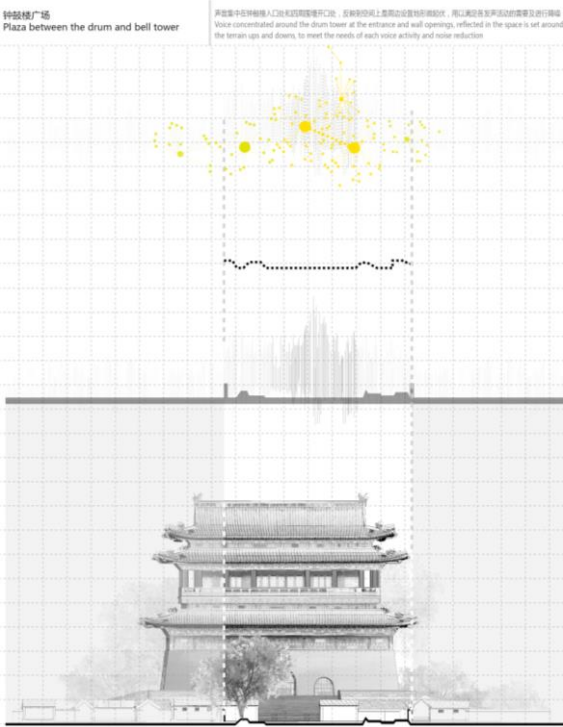
According to the above position requirements, all nodes on the following sound landscape design.



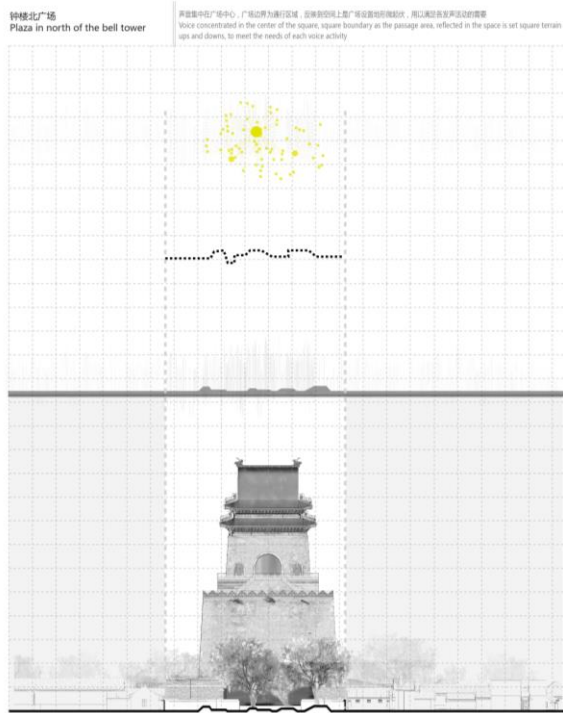
5-31 Point A, B, C1 plan



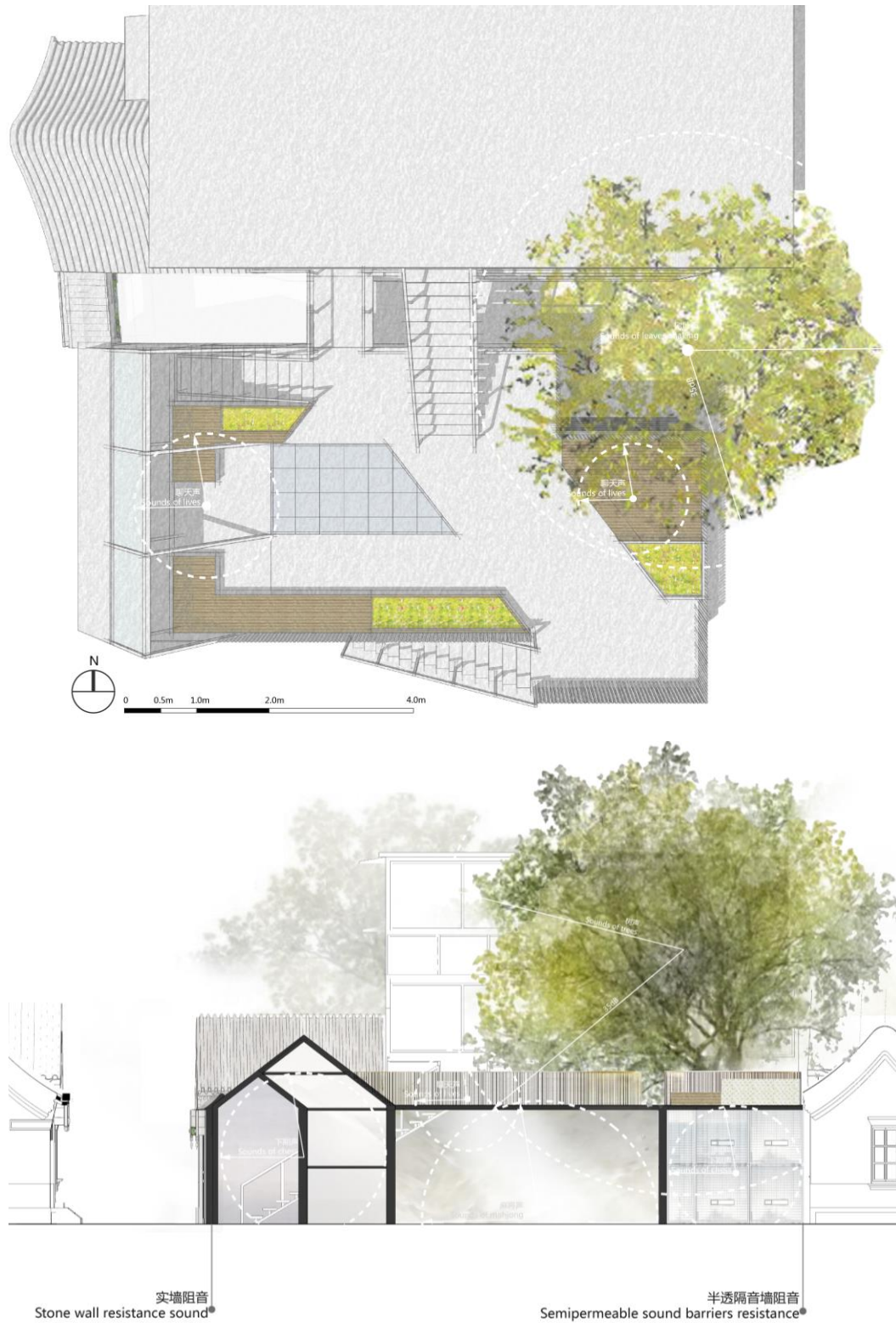
5-32 Point A,B,C1 section



5-33 Point A section



5-34 Point C1 section



5-35 Point C2 1 plan and section



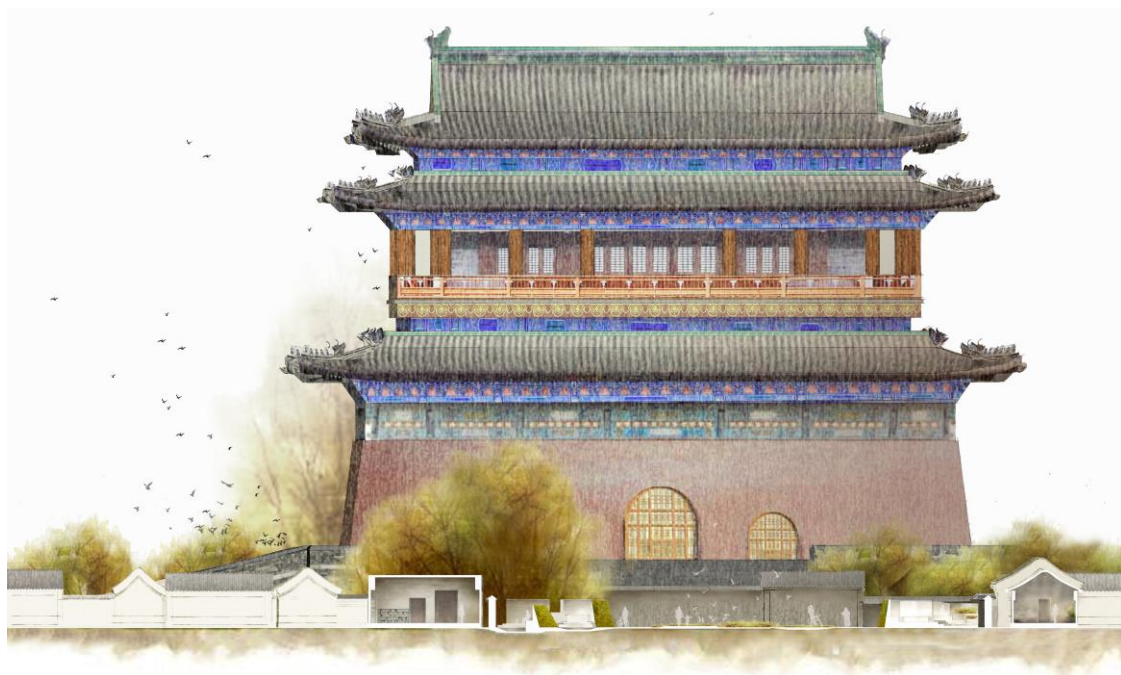
5-36 Point C2 2 plan and section



5-37 Point D1 plan and section



5-38 Point D2 plan and section



5-39 Point A rendering



5-40 Point C1 rendering



5-41 Details of point B



5-42 Rendering of Grasshopper wall

Chapter 6 Epilogue

This section is to inductive do research mentioned above, the following conclusions were:

1) focus on the sound environment, a sound scene design needs to infiltrate into every aspect of urban design to hierarchical level: urban level, regional level, the independent environmental space hierarchy - a single sound scene hierarchy. In it, first of all, is the city as the research object, in the early stage of the planning process will sound environmental elements into consideration, to ensure the diversity of the overall sound system and geographical uniqueness as the goal; Then narrowed to the regional level, it is necessary to define the theme of acoustic area atmosphere properties, and through the participation of design for strengthening, at the same time pay attention to the relationship with the adjacent sound field, to avoid interference between the two, the superposition or masking conditions; And then into the independent environment space hierarchy, there needs to be based on the investigation and research, clarify all inside the space law of sound elements, voice of the period, the spatial location of corresponding activities, and consider all the sound pressure level and frequency of the acoustic elements, during the design of space, in order to avoid the frequency will be generated after the noise of voice acoustic elements at the same time the same place, to ensure a high fidelity; space environment Finally is a single scene hierarchy, here to each element as the research target, to experience the emotional resonance as the basis of consideration, is committed to play a sound interactive scene.

2) in the environment space of the historical block transformation of acoustic landscape, divided into the following steps: field sound environment of data records, to determine the main location of the noise, according to the atmosphere of the acoustic area demand according to different levels of noise reduction processing, in view of the sound field in different types of elements, based on acoustic area atmosphere requirements for the processing of different ways, to ensure the high fidelity of acoustic area environment, given the value of "landscape" to sound environment, create more have some kind of artistic conception of the environmental atmosphere, strengthen the application of synesthesia, prompting the feeling of visual and auditory

mutual gain and atmosphere resonate with the environment.

3) about the sound environment noise, specific research into the following three kinds of noise reduction method: through the silencing wall through the green sound-absorbing, sound isolation resistance - by silencing frequency interference. Among these, the most direct and effective is quieter wall sound-absorbing, through the study of different material properties, determined the cork, rubber, blue bricks, hardwood and resin five sound-absorbing performance is good material can be applied to the mute in the wall, at the same time, through the wall surface morphology processing, can increase the reflective surface of sound, and change the direction of propagation of sound, reduce the volume of the directly through; Green sound no sound isolation resistance wall directly, but through the combined with the terrain can also play a good role, at the same time isolated afforestation can optimize the environment, from the vision through synesthesia role brought from psychological noise disturbing emotions; Sound attenuation by frequency interference mainly by using the masking effect of voice, in the environment can increase some shading effect pleasure mood of the auditory voice to control, weaken the auditory sensitivity to noise, which have the effect of noise reduction, in this respect, the most is used in the manufacture of frequency interference is the sound of water, and a series of natural sound, it can not only improve the environment sound quality, can also beautify the environment, from the vision to achieve better landscape effect.

4) to the study of different category technique for controlling acoustic elements, divided into three categories: maximum use natural sound - the sound through the space design regulation of life - has the choice of history. For the processing of natural sound, mainly concentrated in the largest degree of creating natural voices and propagation conditions, control the overall environment of the sound pressure level, safeguard natural sound can be heard clearly; Live sound is produced by human activities, have their law of time and space, through the space design to regulate the life, the main is based on law of human activities, optimize space combination relationship, avoid in the same space at the same time different sound source overlap with the phenomenon of the noise, guarantee high fidelity sound environment; For existed in the history of the field, has a history of strong regional characteristic, requires filtered according to the present social attributes and life needs, choice in the

modern society still functional significance or voice to represent the cultural heritage value, as a unique landscape, with the regional characteristic become the symbol of the city.

5) the ultimate goal of landscape design, is to give the value of "landscape" sound. Through the reasonable use of the role of synesthesia, build and strengthen the integral atmosphere of the acoustic environment, through visual feeling to inspire people hearing consciousness, to enjoy the scenery mood listen to the voice in the environment, and visual collaboration with aesthetic experience to the environment.

6) in the landscape design practice, Beijing drum tower historical block is chosen as the venue, in the region of the data records of acoustic environment in detail and the various elements of psychoanalysis, as the basis of design. In accordance with the results of research area is divided into four types of acoustic area: mainly tourists noisy sightseeing area, comfortable and easy and comfortable leisure area and give priority to with residents of active entertainment area, the rest area of peace and quiet. And in the region of the residents' activities, and because of the space usage by further subdivided: entertainment area atmosphere generated by the planning on regional entertainment and spontaneous transformation generate small hutongs intersection residents gathered area; For as a rest area of the yard, there are two kinds of situations: one is composed of multiple family public ZaYuan, the other is a private owned by a single family courtyard. The overall sound environment according to the above acoustic area location, within the venue has chosen six nodes (belong to the first acoustic area of A node, belong to the second acoustic area B, belongs to the third acoustic area of C1 and C2 nodes and belong to A fourth area D1 and D2 node) for the design of concrete practice. According to above research the process of the overall design: environmental ratings of noise reduction, different kinds of sound elements control, voice scenery atmosphere build.

In historic blocks for the ultimate goal of landscape design, the voice of rearranging region system, improve the landscape of the city sound regionality, through the atmosphere of the sound environment construction, give it the value of "landscape", awaken people's auditory consciousness, experiences and feelings from the perspective of multidimensional space.

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