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CONSERVATION MANAGEMENT GUIDELINES  
FOR TRADITIONAL COURTYARD HOUSES AND ENVIRONMENT  
IN THE ANCIENT CITY OF PINGYAO

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平遥古城传统民居保护修缮  
及环境治理管理导则



Conservation Management Guidelines for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao issued by Pingyao County Government.

Conservation Management Guidelines is initiated by Pingyao County Government and UNESCO, financed by China Cultural Heritage Foundation and Global Heritage Fund, compiled by Tongji University.

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# Contents

Preface 1 -----	4
Preface 2 -----	5

## Chapter 1

### Introduction to the Guidelines

1.1. Background to the Preparation of the Guidelines-----	8
1.2. Introduction to the Ancient City of Pingyao -----	9
1.2.1. Location and Development -----	9
1.2.2. Architecture and City Layout -----	10
1.3. World Heritage Site – Ancient City of Pingyao -----	12
1.4. Conservation Challenges of Ancient City of Pingyao-----	14
1.5. Legislative Framework -----	15
1.6. Objectives and Structure of the Guidelines-----	16

## Chapter 2

### Conservation Principles and Processes

2.1. Introduction -----	20
2.2. The Conservation Procedure -----	21
2.2.1. The Process from Application to Completion-----	21
2.2.2. Preparation of a Conservation Plan -----	25
2.2.3. Normal Procedure - Preliminary Design Document-----	27
2.2.4. Normal Procedure- Construction Design Document-----	27
2.3. Selecting Experienced Conservation Architects and Contractors-----	28
2.4. Works Requiring Government Authority Approval-----	28

## Chapter 3

### Introduction to Pingyao Traditional Courtyard Houses

3.1. Introduction -----	34
3.2. Factors Affecting the Style of Pingyao Vernacular Houses -----	36
3.2.1. Topography-----	36
3.2.2. Traditional Building Materials -----	37
3.2.3. Local Climate -----	37
3.2.4. Human Factors -----	38
3.3. Features of Pingyao Traditional Courtyard Houses-----	39
3.3.1 Courtyard Layout -----	39
3.3.2 Principal Courtyard Overall Scale-----	40
3.3.3 Building Layout of a Principal Courtyard-----	40
3.3.4 Courtyard Circulation Flow-----	41
3.4. Architectural Features of Courtyard Houses-----	42
3.4.1. Courtyard Boundary Walls -----	42
3.4.2. Main Gate -----	43
3.4.3. Daozuo -----	46
3.4.4. Paving and Flower Rail -----	47
3.4.5. The Middle Gate (Middle Hallway)-----	48
3.4.6. Wing House -----	49
3.4.7. Principal House -----	50
3.4.8. Roof and Screen Wall -----	52
3.4.9. Interior Layout -----	53
3.4.10. Doors and Windows-----	55
3.4.11. Carving -----	58
3.5. Building Materials -----	60

## Chapter 4

### Restoration and Maintenance Improvement of Traditional Courtyard Houses

4.1. Introduction	64
4.2. Courtyard Layout	65
4.3. Roofs	66
4.4. Walls	69
4.5. Timber Components	72
4.6. Courtyard Gates	75
4.7. Doors and Windows	76
4.8. Paving	80
4.9. Living Facilities	82
4.10. Decorations	83
4.11. Periodic Maintenance	84
4.12. Scientific Material Conservation and Performance Enhancement	89
4.12.1. Material Conservation Guidance Notes	89
4.12.2. Façade Cleaning	92
4.12.3. Installation of Vapor Barrier in Walls	93
4.12.4. Removing Efflorescence	94

## Chapter 5

### Traditional Courtyard Houses Performance Enhancement

5.1. Introduction	98
5.2. Adaptive Reuse	99
5.2.1. Standards of Adaptive Reuse	99
5.2.2. Guidance Notes for Residential Functions	100

5.3. Guidance Notes for Living Facilities Upgrade	102
5.3.1. Bathroom and Kitchen	102
5.3.2. Guidance Notes for Installation of Air Conditioning and Energy Source Selection	103
5.3.3. Guidance Notes for Disaster Prevention	103

## Chapter 6

### Streetscape Management

6.1. Introduction	106
6.2. Street Façade	108
6.2.1. Commercial Street	108
6.2.2. Residential Streets	109
6.3. Steps, Ramps, Paving and Platform	111
6.3.1. Commercial Streets	111
6.3.2. Residential Streets	112
6.4. Commercial Signage	113
6.5. Street Lighting	115
6.6. Outdoor Business Areas and Infrastructure	117
6.6.1. Outdoor Business Areas	117
6.6.2. Infrastructure	119

## Appendices

Appendix 1: English-Chinese Glossary	122
Appendix 2: Classification Standards of Protected Courtyards	125
Appendix 3: "Incentives for the Conservation of Traditional Courtyard Houses at the Ancient City of Pingyao", issued by Pingyao Urban Planning Bureau in 2012	126
Appendix 4: Bibliography	127
Appendix 5: Figures	130

## Inheriting the Conservation of Traditional Courtyard Houses

This Guidelines is in particular dedicated to our Pingyao residents.

I had the idea of creating conservation guidelines for Pingyao traditional courtyard houses for a very long time. Already during the 1980s, while I was directing the formulation of the Pingyao Conservation Plan for Famous Historic Cultural Towns, this issue was raised namely how to adapt traditional residential houses with contemporary living functions, how to provide residents with limited living space relatively adequate living conditions, how to provide stakeholders a complete conservation guideline book, etc. have been raised and incorporated in that conservation plan, with the intention to provide residents scientifically based guidance and constraints to prevent any damage and loss of regional characters of traditional architecture caused during the implementation of unguided restoration.

The Conservation Management Guidelines for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao, initiated by Pingyao County Government and UNESCO, financed by China Cultural Heritage Foundation and Global Heritage Fund, and compiled by Tongji University, presents a scientific value from a technical perspective, an environmental perspective and a methodology and provides an overall analysis of its practical uses. I was very pleased that the contents and focus of the Guidelines coincides with the original intention of the Pingyao Conservation Plan thirty years ago, nevertheless presented with a more intact, more comprehensive, more elaborative and even more “Pingyao” research output. More importantly, with the deep awareness of the significant role of traditional courtyard houses as the essential and eternal spiritual value and as the source of vitality of the Ancient City of Pingyao, more and more talented people are devoted to the conservation of the traditional courtyard houses, ensuring a bright and promising future for Pingyao.

Thereby, my respected Pingyao friends, I truly wish that you are pleased with this Guidelines and benefit from it!



Li Jinsheng

Deputy Director of Shanxi Provincial  
Department of Housing  
Urban-Rural Development

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## Protecting Traditional Courtyard Houses: the Essence of Preserving the Ancient City of Pingyao

The Ancient City of Pingyao is an outstanding example of Han cities in the Ming and Qing dynasties. It retains all the Han city features, provides a complete picture of the cultural, social, economic and religious development in Chinese history.

Traditional courtyard houses are without a doubt one of the most important elements in this picture. 3739 traditional courtyard houses and other public buildings in the Ancient City of Pingyao are the living evidence of the traditional culture of Han Chinese, most of which are still in use, playing an important role in residents' daily life. All those traditional courtyard houses in varying conditions together represent an inherited 2700-year historic memory of Pingyao, not only as residents' houses, but also as the "root" of this miraculous turtle-shaped city (the general layout of the Ancient City of Pingyao resembles a turtle, which is a symbol of "longevity and tenacity" in China).

Conservation of the traditional courtyard houses is the vital step of preserving the Ancient City of Pingyao. It is the responsibility of history, culture and humanity, more importantly, it is a commitment of Pingyao. Since the application for the inscription on the World Heritage list, successive Pingyao Party Committees and the Pingyao County Government have continuously endeavored in the conservation of the Ancient City of Pingyao. However, due to the social and economic development over time, funding shortage, property rights problems, lack of regulations, etc., Pingyao has become increasingly in danger of losing its traditional courtyard houses. A new pathway for the conservation of traditional courtyard houses is therefore urgently needed.

In recent years, the Pingyao Party Committee and the Pingyao County Government have been devoted to strengthen the conservation capacity and explore the new conservation pathways with limited funding: enhancing the social donation for the conservation of traditional courtyard houses; developing Mijiangxiang No 12 courtyard as a sample conservation courtyard; selecting 53 traditional courtyard houses to provide restoration guidance and government financial compensation since the establishment of the financial compensation policy in 2012.

Recognizing that overall living preservation is an important principle of conservation of traditional courtyard houses, since 2012, the Pingyao Party Committee, Pingyao County Government and UNESCO have initiated, and Tongji University has compiled the Conservation Management Guidelines for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao, with the kind support of Shanxi Provincial Department of Housing Urban-Rural Development and international experts. This Guidelines aims to guide the conservation work of Pingyao traditional courtyard houses, improve the living quality of residents, accelerate the development of conservation and management of traditional courtyard houses, as well as provide a long-term technical management support for relevant government departments.

This Guidelines is a cohesive output of all the experts, combining international and national advanced experiences with the practical need of the conservation of traditional courtyard houses in Pingyao. It is our commitment to apply this Guidelines into conservation practices. The Pingyao Party Committee, the Pingyao County Government and all other relevant county departments shall use this Guidelines as a baseline for the implementation of conservation work, in order to develop and promote consensus and awareness for the importance of the conservation of traditional courtyard houses.

Conservation is urgently needed for the traditional courtyard houses, as it is the key for the inheritance of history and culture for future generations.

I truly wish success for the future conservation of Pingyao traditional courtyard houses!



Wei Mingxi

Communist Party Secretary-General  
of Pingyao County





# Chapter 1

## Introduction to the Guidelines

- 1.1. Background to the Preparation of the Guidelines
- 1.2. Introduction to the Ancient City of Pingyao
- 1.3. World Heritage Site – Ancient City of Pingyao
- 1.4. Conservation Challenges of the Ancient City of Pingyao
- 1.5. Legislative Framework
- 1.6. Objectives and Structure of the Guidelines

# Chapter 1

## Introduction to the Guidelines

### 1.1. Background to the Preparation of the Guidelines

The Ancient City of Pingyao is one of the most intact ancient walled cities in China. It provides an outstanding example of a Han Chinese city of the Ming and Qing dynasties (14th–20th centuries), retaining its original features to an exceptional degree. Moreover, Pingyao showcases the cultural, social, economic and religious development in Chinese history, and it is of great value for studying the social form, economic structure, military defense, religious beliefs, traditional thinking, traditional ethics and building styles and forms.

The Ancient City of Pingyao was inscribed on the UNESCO World Heritage list as World Cultural Heritage in 1997. Following its inscription, the conservation of Pingyao has become a key objective. However, increasingly it has been recognized that the current living conditions of the local residents are still sub-standard and a key challenge now is how best to improve the living conditions of local

residents while meeting the requirements of heritage conservation and maintaining the value of the World Heritage site.

The current existing local regulations covering the restoration, maintenance and adaptive reuse of traditional courtyard houses do not fully address this challenge, and there is still a lack of clearly defined and enforceable guidelines to guide conservation projects and practices. Clear, practical guidelines for the conservation and restoration of traditional courtyard houses are therefore urgently needed.

In this context, the Pingyao government and UNESCO, have invited Tongji University to formulate two conservation guidelines, which will operationalize existing regulations and complement the *Incentives for the Conservation of Traditional Courtyard Houses in the Ancient City of Pingyao issued in 2012* in line with the implementation of *Convention Concerning the Protection of the World Cultural and Natural Heritage (hereafter referred as “Convention”), Principles for the Conservation of Heritage Sites in China, Cultural Relics Protection Law of the People's Republic of China, the Historical and Cultural City Town Village Protection Ordinance, Shanxi Provincial Regulations on the Conservation of the Ancient City of Pingyao, Pingyao Conservation Plan for Famous Historic Cultural Towns and Planning for the Protection and Control of the Ancient City of Pingyao*. The new conservation guidelines target those traditional courtyard

houses within the Ancient City of Pingyao that are not listed or inscribed as immovable cultural heritage and protected units under Pingyao level regulation.

This guideline, *Conservation Management Guidelines for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao*, was written foremost for government authorities, as well as for professional conservation teams, design and construction companies. The Conservation Management Guidelines outline the existing legal framework and local regulations, historic building conservation standards, principles and process of conservation work, and the practical details of traditional building conservation.

The other guideline, *Practical Conservation Guidelines for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao*, is a simpler version written to provide local residents with a better understanding of the “Do’s and Dont’s” of living in traditional courtyard residential houses.

It is hoped that these guidelines will serve as a model in Pingyao, and can also be of benefit to similar projects in other historic towns and cities in China and beyond.

## 1.2. Introduction to the Ancient City of Pingyao

### 1.2.1. Location and Development

Pingyao is located in the central plains of Shanxi province, 100 kilometres north of the provincial capital of Taiyuan and 616 kilometres southwest of Beijing (Figure 1.1).

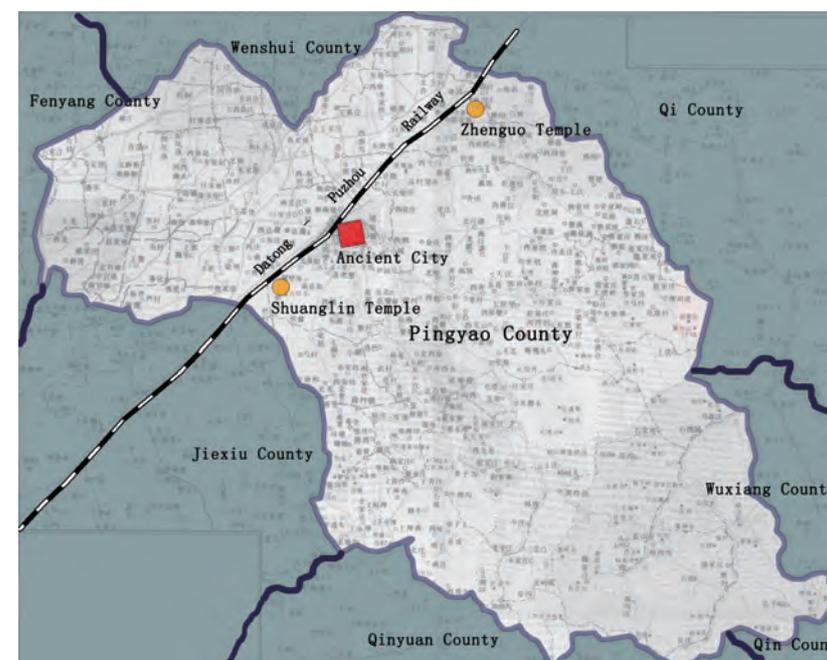


Figure 1.1: Ancient City of Pingyao in Pingyao County, Shanxi Province, China

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

The Ancient City of Pingyao was first established during the Western Zhou dynasty around 827-782 BCE. As a county -- in its current location -- it dates back to the Northern Wei dynasty around 424-448 BCE. The extant form of the Ancient City of Pingyao originates from the 14th century; it is a complete set of architecture comprised of historic city walls, streets and alleys, shops, houses and temples. Its layout reflected the urban development of a Chinese Han city over 7 centuries. It is one of the best surviving examples of a Chinese walled city, and today offers evidence of the historic scale and imposing form of traditional, and now rare, walled cities in China.

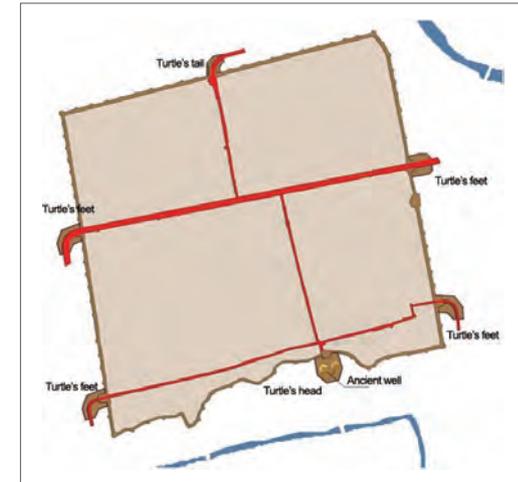
Commercial development in Pingyao can be traced back to the mid Ming dynasty (around 16th century) and reached its peak in Qing dynasty, when the remittance banking system, a vital component of long-distance, countrywide commerce, was created in Pingyao. The banking community of the city monopolized finance and business transactions throughout China from 1823, which brought substantial wealth to Pingyao from the second half of the 19th century to the early 20th century. The close to 4000 extant traditional commercial and residential houses that can be found throughout the Ancient City of Pingyao is testimony to this prosperity.

### 1.2.2. Architecture and City Layout

#### Defense System

The extant city walls were rebuilt on the foundation of an earlier

wall during the reign of the Ming emperor Hong Wu (1328–1398) to the current configuration of approximately 1.5 kilometres on each of the four sides, enclosing a city area of 2.25 square kilometres. There are six fortified gates and 72 large bastions along the walls. The eastern, western and northern walls are straight, while the southern side meanders



**Figure 1.2:** General layout of the Ancient City of Pingyao, showing the defense system with the six fortified gates and major streets

with the historic course of the Zhongdu River. This shape resembles a turtle, which is a symbol of “longevity and tenacity” in China (Figure 1.2).

#### Layout of the Architecture

Within the walls are traditional residential buildings, public buildings and temples (Figure 1.3). In line with the Han Chinese city tradition, the city has a symmetrical layout with the city tower located in the center, the Qingxu Temple (Taoist Temple), the Chenghuang Temple and the Confucius Temple are to the east and the Jifu Temple (Buddhist Temple), County Government and the Wu Temple to the west (Figure 1.4).

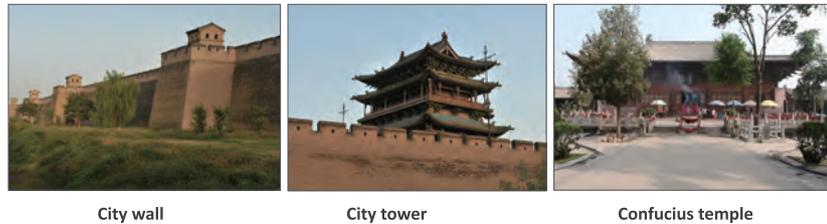
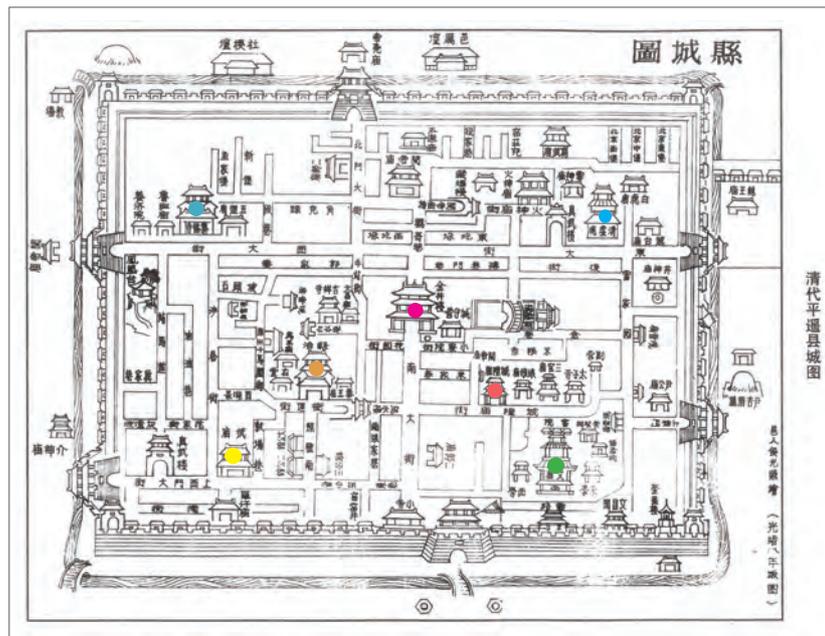


Figure 1.3: Buildings in the Ancient City of Pingyao



● Chenghuang Temple    ● County government    ● Confucius Temple    ● Wu Temple    ● Qingxu Temple    ● Jifu Temple    ● City tower

Figure 1.4: Location of landmark architectures in the Ancient City of Pingyao

### Street Layout

There is a large number of streets and lanes in the Ancient City of Pingyao, mostly straight north-south or east-west (Figure 1.5). There are four key streets – South Avenue, East and West Avenue, Chenghuang Temple Street and County Government Street – that together form a shape that resembles the Chinese character “土 (tu)” upside down (Figure 1.6). They are generally lined with commercial buildings, most of which were erected during the 17th to 19th centuries, although some were built in the 20th century.

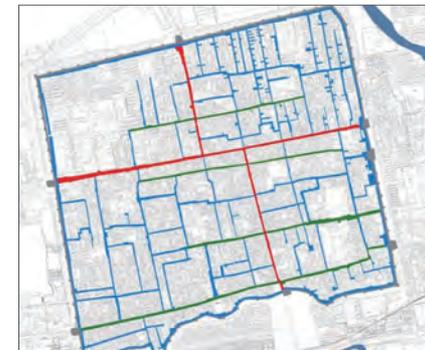


Figure 1.5: Street layout of Pingyao (red: avenues; green: streets; blue: alleys)



Figure 1.6: Commercial streets layout - the Chinese character “土 (tu)” upside down

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

### Architecture of Pingyao

The spatial arrangement of traditional architecture in Pingyao is deeply influenced by ancient beliefs and ceremonial protocols, of which the hierarchical relationship is clearly defined. All of the public, commercial and residential buildings are in courtyard form with clear axial lines and symmetrical layout. The roofs of the residential buildings form a slate colour horizontal plane with the glazed polychrome roofs of the important public buildings popping up, forming a skyline that is largely flat with slight variations. Architecture remaining today largely dates back to the Ming and Qing dynasties (Figure 1.7).



Streetscape

Rishengchang  
(first financial institute in China)

View from inner courtyard  
of a residential building

Figure 1.7: Architecture in the Ancient City of Pingyao

### 1.3. World Heritage Site - Ancient City of Pingyao

The Ancient City of Pingyao consists of three parts (Figure 1.8): the first is the ancient city (242.54 hectares) enclosed by the city wall and the buffer zone (88.29 hectares) around the city, totaling 330.83 hectares (Figure 1.9); the second is the Shuanglin Temple, 6 kilometres to the southwest of the city; the third is the Zhenguo Temple, 14 kilometres to the northeast of the city.

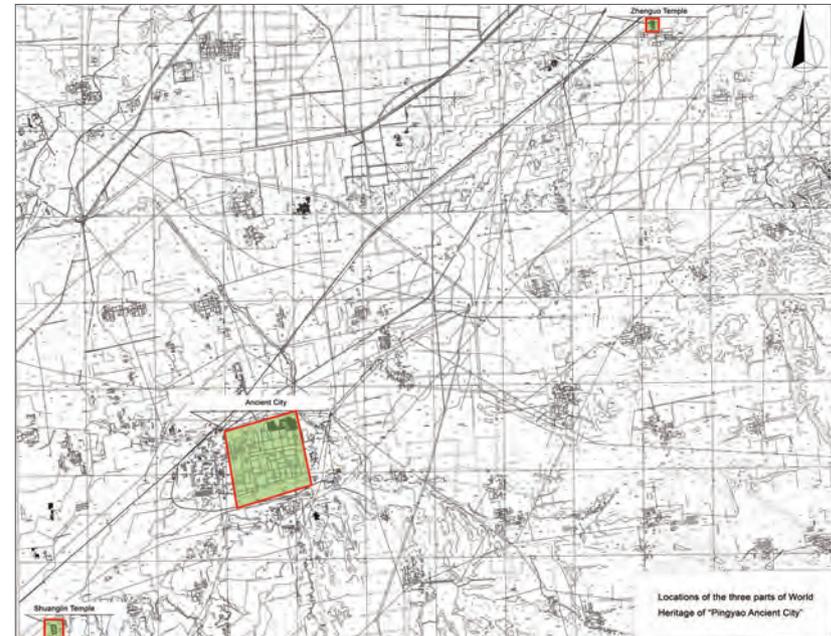


Figure 1.8: The three components that form the Ancient City of Pingyao World Heritage site (ref: Figure 1.1)

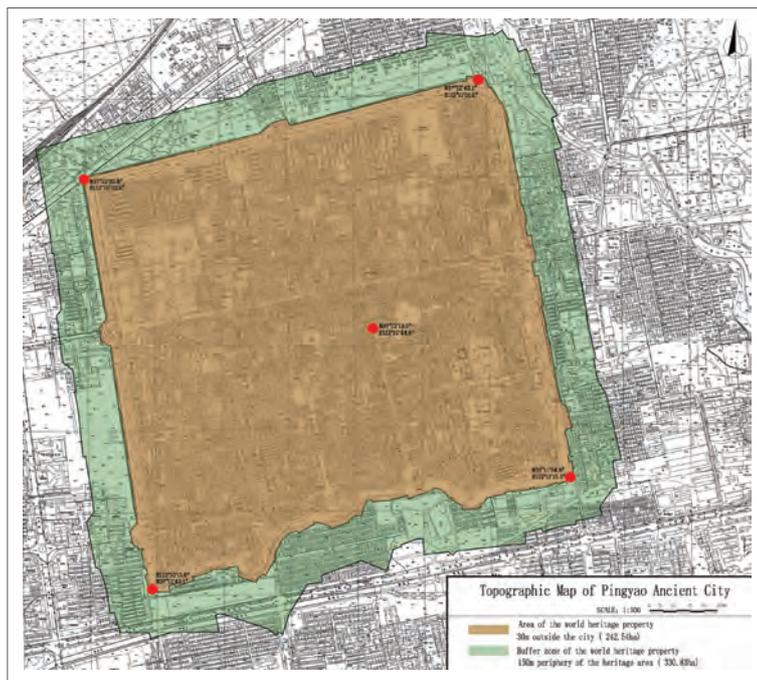


Figure 1.9: Topographic map of the Ancient City of Pingyao area

The Ancient City of Pingyao was declared a National Famous Historic and Cultural Town by the Chinese Government in 1986. It was inscribed as a UNESCO World Heritage site in 1997, meeting the following three criteria:

**Criterion (ii):** to exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design;

*The townscape of the Ancient City of Pingyao excellently reflects the consistent architectural styles of the Han cities and the development in urban planning, and demonstrates the city's social, economic, cultural, artistic, scientific, technological and industrial development.*

**Criterion (iii):** to bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared;

*The Ancient City of Pingyao was a financial center in China from the 19th century to the early 20th century. The business shops and traditional dwellings in the city are historical witnesses to the economic prosperity of Pingyao in this period.*

**Criterion (iv):** to be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history:

*The Ancient City of Pingyao is a complete ancient building complex as well as an outstanding example of the Han Chinese city of the Ming and Qing dynasties (14th–20th centuries) that has retained all its features to an exceptional degree.*

Once a site is inscribed as a World Heritage site, a series of commitments must be upheld under the Convention by all levels of government as well as the population at large to ensure the site's

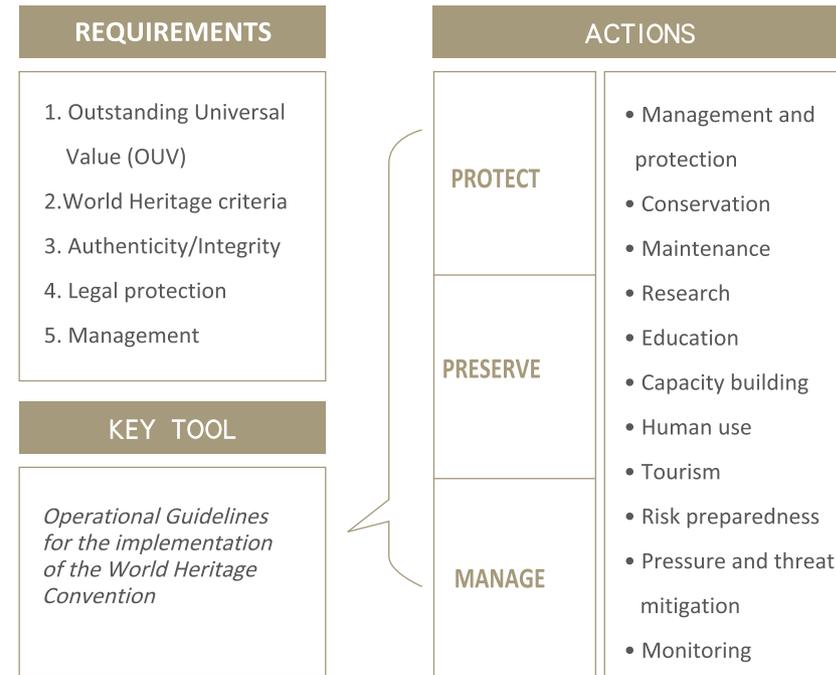
## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

long-term protection, preservation and sustainable management to maintain its Outstanding Universal Value (OUV) as well as its authenticity and integrity as outlined in the criteria (Figure 1.10).

*The Outstanding Universal Value of the property and all its attributes are under authentic and integrated conservation by making and implementing conservation and management plans, specific measures for intervention and maintenance of the fabric, and the improvement of the heritage setting. The site management body will strictly implement protection and management regulations, effectively control the development and construction activities in the heritage areas, curb the negative effects of various development pressures on the property, coordinate the demands of different stakeholders, and rationally and effectively maintain the balance between heritage conservation, tourism development and urban construction. The research, interpretation and communication of heritage value will be strengthened, and the roles of the property as a spiritual home and for cultural continuity will be realized, so that a sustainable and harmonious relationship between urban conservation and development of the historic city can be achieved.*

[Excerpt from UNESCO World Heritage Centre Website, 2013]



**Figure 1.10:** Overview of the actions of safeguarding the OUV of a World Heritage site

## 1.4. Conservation Challenges of the Ancient City of Pingyao

Since their World Heritage inscription, in order to accommodate modern living and local economic development, traditional courtyard houses are increasingly being changed to cater for tourism and commercial development without any improvement of living

conditions for the local residents who still remain within the walled city. If both economic development and tourism development are not well and sustainably well, Pingyao is in danger of losing its authenticity and integrity, which are key requirements for a World Heritage site to retain its Outstanding Universal Value.

Key issues of concern for the conservation of traditional courtyard houses in Pingyao are:

- Maintenance of the character of a 'living city'. The retention of people living and working in the walled city is challenged by increasing out-migration, tourism and commercial development, in response to which changes have been made to traditional courtyard houses and the streetscape.
- Lack of management regulations and funding for the conservation of traditional courtyard houses. Need for improvements in the living standards of existing residents and maintenance of buildings.
- Scientific and appropriate technical guidance for conservation of buildings is lacking.

Clear guidance on managing these issues will help ensure Pingyao in retaining its character as a living city and potentially its World Heritage values. Hence the importance of this set of Conservation Guidelines and their adoption and application.

## 1.5. Legislative Framework

The formulation of these guidelines is based on the following key international conventions, normative frameworks, national laws and local regulations:

### International

- UNESCO (1972). *Convention Concerning the Protection of World Cultural and Natural Heritage*. Available online at: <http://whc.unesco.org/en/conventiontext/>
- UNESCO (2013). *Operational Guidelines for the Implementation of the World Heritage Convention*. Available online at: <http://whc.unesco.org/archive/opguide13-en.pdf>
- International Congress of Architects and Technicians of Historic Monuments (1964). *The Venice Charter for the Conservation and Restoration of Monuments and Sites*. Available online at: <http://jikimi.cha.go.kr/english/img/sub06/multi/icomos01.pdf>
- ICOMOS (1987). *The Washington Charter for the Conservation of Historic Towns and Urban Areas*. Available online at: [http://www.icomos.org/charters/towns\\_e.pdf](http://www.icomos.org/charters/towns_e.pdf)
- ICOMOS (1994). *The Nara Document on Authenticity*. Available

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

online at: <http://whc.unesco.org/archive/nara94.htm>

- UNESCO (2005). *The Hoi An Protocols for Best Conservation Practice in Asia*. Available online at: <http://unesdoc.unesco.org/images/0018/001826/182617e.pdf>

### China

- China ICOMOS (2014). *Principles for the Conservation of Heritage Sites in China*. Available online at: <http://www.icomoschina.org.cn/dzhk/>; <http://australia.icomos.org/wp-content/uploads/Principles-for-the-Conservation-of-Heritage-Sites-in-China.pdf>
- Cultural Relics Protection Law (2007). P.R.C. Available online at: [http://english.gov.cn/laws/2005-10/09/content\\_75322.htm](http://english.gov.cn/laws/2005-10/09/content_75322.htm)
- Urban and Rural Planning Law (2008). P.R.C. Available online at: <http://www.lawinfochina.com/display.aspx?lib=law&id=6495&Gid=>
- The Historical and Cultural City Town Village Protection Ordinance (2008). P.R.C. Available online at: [http://www.gov.cn/zwgk/2008-04/29/content\\_957280.htm](http://www.gov.cn/zwgk/2008-04/29/content_957280.htm)

### Local

- Shanxi Provincial Regulations on the Conservation of the Ancient

City of Pingyao (1999). Shanxi. Available online at: <http://fgk.chinalaw.gov.cn/article/dffg/199811/19981100313716.shtml>

- Pingyao Conservation Plan for Famous Historic Cultural Towns (1989). Pingyao.
- Planning for the Protection and Control of the Ancient City of Pingyao (2014). Pingyao.
- Incentives for the Conservation of Traditional Courtyard Houses at the Ancient City of Pingyao (2012). Pingyao. Available online at: <http://www.pyonline.net/zjpy/info.asp?id=49775>

## 1.6. Objectives and Structure of the Guidelines

Through value analysis of traditional courtyard houses in Pingyao, the guidelines aim to:

- Raise the awareness of Pingyao authorities and local residents about the importance of the historic city, and particularly the traditional courtyard houses, which are a key to the significance of Pingyao.

- Introduce procedures for applying for, carrying out and evaluating restoration and conservation work – for both the applicant (resident) and authorities.
- Evaluate the qualifications of design and construction teams.
- Provide technical support and guidance for the adaptive reuse of traditional courtyard houses through the use of traditional restoration techniques and modern skills where appropriate.
- Promote adaptive reuse of traditional courtyard houses.

The target audience is:

- Local government officials
- Conservation architects
- Construction contractors/workers
- Owners of historic properties and tenants

### Structure of the Guidelines

**Chapter 1** provides a background and historical context of Pingyao.

**Chapter 2** outlines general conservation principles and procedures.

**Chapter 3** introduces Pingyao's traditional courtyard houses.

**Chapters 4 and 5** provide practical information on repair and maintenance of traditional courtyard houses, the means of improving building functionality and adaptive reuse of traditional courtyard houses.

**Chapter 6** covers the broad issues of the streetscape of Pingyao and how to protect its unique character.





# Chapter 2

## Conservation Principles and Processes

- 2.1. Introduction
- 2.2. The Conservation Procedure
- 2.3. Selecting Experienced Conservation  
Architects and Contractors
- 2.4. Works Requiring Government Authority  
Approval

# Chapter 2

## Conservation Principles and Processes

### 2.1. Introduction

Courtyard building conservation refers to the preservation, restoration and adaptive reuse of traditional courtyard houses to ensure their ongoing and future viability.

The goal of conservation is to maintain the cultural significance of the courtyard houses and their context. The cultural significance of a building can be defined by its historic, artistic and scientific values. These values are expressed in both the physical fabric of the building itself, as well as the relationship of the building to the customs and daily lives of its inhabitants and users.

In order to conserve the authenticity of a historic building, a “minimum intervention” approach is required, in which the owner undertakes as much work as required to maintain and upgrade the building without negatively impacting on its important values. This approach was first outlined in the *Venice Charter (1964)* and is still widely used as a basic principle by conservation professionals.

### THE FOLLOWING PRINCIPLES MUST BE FOLLOWED FOR THE CONSERVATION OF TRADITIONAL COURTYARD HOUSES IN PINGYAO:

- **Principle of Authenticity:** The *Operational Guidelines of the World Heritage Convention* require that the physical authenticity of a historic building and its context should be preserved in relation to design, materials, workmanship and setting. The use of traditional materials and building techniques maintains the physical authenticity of the place, in addition to the pleasing visual impact. The *Nara Document on Authenticity (1994)* raises the importance of authenticity in its socio-cultural context. The physical properties of traditional materials and techniques have been tested over generations for their effectiveness in keeping the building cool or warm, preventing damp and mold, and providing seismic stability. Respecting the traditional construction system will allow the building to be preserved for a long time. At the same time, using traditional materials and crafts generates employment for traditional crafts persons and workers, and also preserves the traditional knowledge in these fields.
- **Principle of Integrity:** It is important to maintain the organic relationship between all components of the courtyard buildings and its setting. The tangible and intangible value of a courtyard building is reflected in the character of a building, which must be maintained in its conservation. The context and setting of a place

is as important as its physical fabric. The location of a place forms part of its significance and value.

- **Principle of Continuance:** The original function of the building must be respected, and may be adjusted and adapted with consideration of environment, social and economic benefits.
- **Principle of Reversibility:** Conservation works must be reversible, which means that new/additional materials should be removable, replaceable or able to be retreated without any negative impact on the historic significance of the building.

In Pingyao, in terms of protection, courtyard houses are currently graded as Rank I, Rank II, and Rank III by the Pingyao authorities (ref: Appendix 2) .

The conservation of traditional courtyard houses should also meet the requirements of *Pingyao Conservation Plan for Famous Historic Cultural Towns (1989)* and *Planning for Protection and Control of the Ancient City of Pingyao (2013)*, Table 2.1 on the following page outlines the current requirements for the protection of Rank I, Rank II and Rank III courtyards based on the two documents.

## 2.2. The Conservation Procedure

### 2.2.1. The Process from Application to Completion

When residents/property owners decide to restore/conservate their courtyard houses, a **conservation request** must be submitted to the relevant administrative department of Pingyao before any action is taken. Relevant staff of the Urban-Rural Planning Bureau will make an **on-site investigation** and make a **preliminary decision on whether to approve** and support the conservation project or not, according to the *Planning for the Protection and Control of the Ancient City of Pingyao (2013)*.

When the conservation request is approved, a **conservation plan** (ref: 2.2.2) must be prepared based on a thorough understanding of the heritage value of the place and its elements. The history of the place and the changes that have occurred over time must be understood. The significant elements of a building must be identified so that informed decisions can be made about whether an element should be preserved rather than replaced. It is recommended that for key conservation projects, **information collection** including literature review, social survey, condition assessment, in-situ testing, etc. should be carried out by a suitably skilled professional such that appropriate conservation recommendations and treatments can be devised according to informed **analysis** and **assessment**.

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

Item	Rank I	Rank II	Rank III & Others
Overall layout	No changes allowed		
Original use	No changes allowed	The original use must be retained where possible (e.g. residential); appropriate adaptive reuse shall be approved by Pingyao authorities	Appropriate adjustments are allowed; adaptive reuse shall be approved by Pingyao authorities
Exterior façade	No changes allowed		
Interior façade	No changes allowed	Can be adjusted if the historic character is not affected	
Structure	No changes allowed		
Layout outline	No changes allowed		
Interior space	Can be adjusted if the historic character is not affected.		
Additions and alterations	Not allowed. Any addition or alteration that has taken place must be removed or reversed	Remove or improve appearance	
Process for design and approval	Follow the normal procedure strictly (ref: Figure 2.1-2.2)	Choose either the normal or simple procedure, depending on the situation (ref: Figure 2.1-2.2)	
There are penalties for violation which are outlined in the <i>Shanxi Provincial Regulations on the Conservation of the Ancient City of Pingyao (1999)</i> .			

**Table 2.1:** Requirements for the protection of Rank I, Rank II and Rank III courtyards

The conservation plan will be **submitted to an evaluation committee**, led by relevant government departments, experts (no less than 40% of the total members) and resident representatives. The evaluation committee will carry out an on-site investigation and conduct a **preliminary evaluation** to decide whether the **simple or normal procedure** should be applied, depending upon the protection rank of the courtyard house and the level of complexity of the proposed project.

After passing the evaluation, a public announcement will be made, after which the building planning permit will be issued according to the relevant procedure. For the **simple procedure**, the conservation project can proceed after **approval of the conservation plan**.

For the **normal procedure**, both a **preliminary design** (ref: 2.2.3) and a **construction design** (ref: 2.2.4) are required and need to be reviewed and approved by the relevant administrative department of Pingyao and professional design evaluation institution respectively before proceeding to the next phase.

In addition, an approved conservation plan by the evaluation committee is a requirement for applying for **conservation funding**.

The conservation plan needs to satisfy current design standards, and if such is in conflict with preserving the heritage value of the property - the Outstanding Universal Value of the property - the

relevant administrative department needs to organize an evaluation meeting and determine an alternative plan to be implemented. After the construction design drawings are approved, the owners of the property are allowed to implement the **construction work**. After completion, the work needs to be **reviewed by the relevant government departments**. During the whole conservation procedure, relevant government departments are responsible for the approval of the project, bidding and tendering, issuing a construction permit and evaluation of the whole project.

# Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

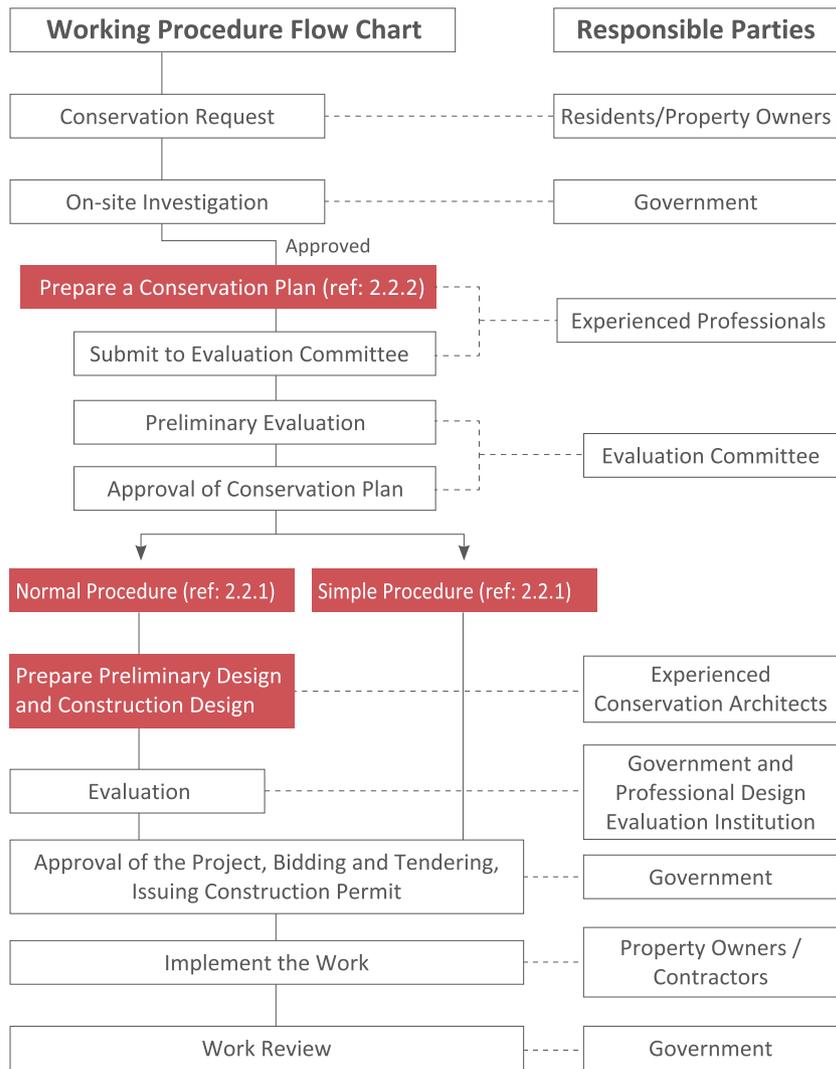


Figure 2.1: Working procedure flow chart and responsible parties

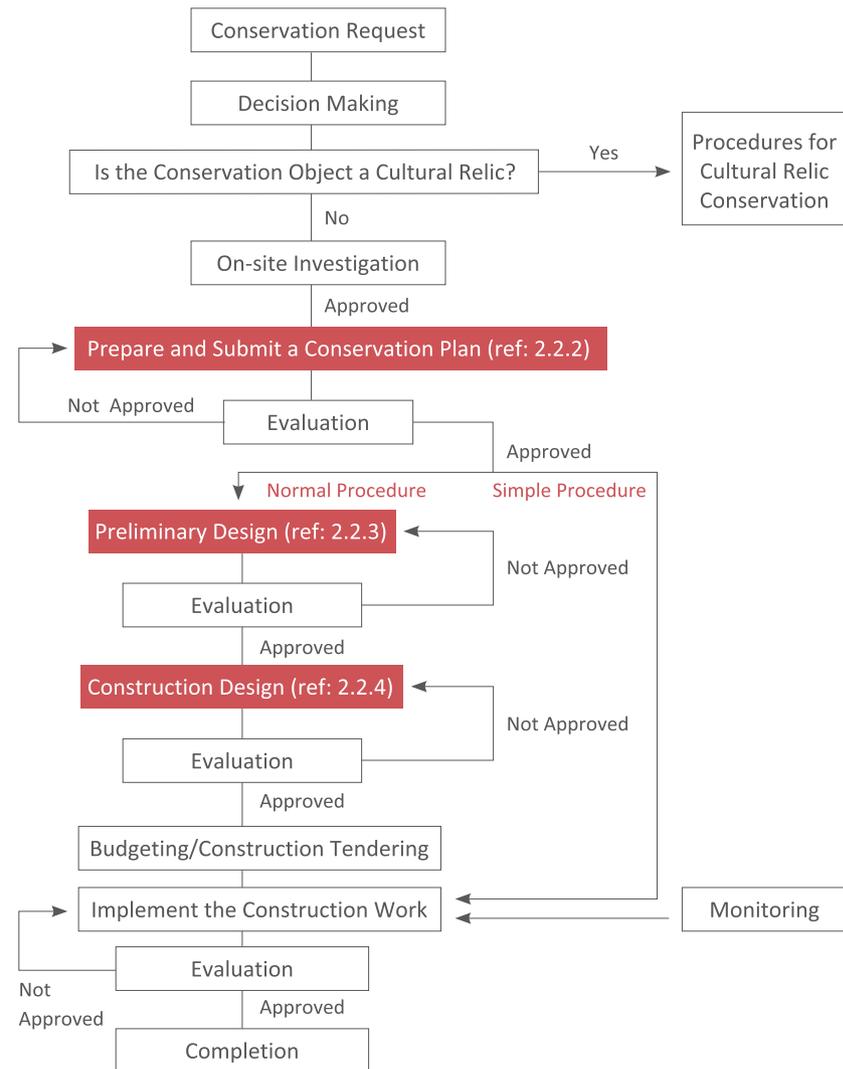


Figure 2.2: Detailed working procedure flow chart

## 2.2.2. Preparation of a Conservation Plan

The steps for preparing a conservation plan can be summarized as:

Step 1: **Collect Information** (Historical information and current status information)

Step 2: **Condition Assessment**

Step 3: Propose appropriate **Adaptive Reuse**

Step 4: **Impact Assessment**

### Step 1

In order to carry out a conservation plan, detailed research must be undertaken to **collect information** on the property via literature research, social survey, condition assessment, in situ testing, etc. The information must also include a description of the current condition of the building. This information will assist in understanding what is valuable and, therefore, worth conserving.

The information to be collected shall include the following:

I. Historical information:

- Construction and intervention history of the building (historical

images, changes in property ownerships and users, etc.)

- Original design of the building and its setting (including floor plan, exterior fittings, interior fittings, styles and patterns, etc.)
- The historic function of the building in Pingyao

Information may come from:

- Historic floor plans and architectural drawings
- Historic images
- Oral or written history of the building
- Government records, such as land title and building permit records
- Book, journal, newspaper and magazine articles
- Reports from local heritage bodies or conservation agencies

II. Information on current status:

- This must include information about the environment, how the building is being utilized, and detailed information on the conservation object, which includes the size and deformation of each component and of the overall object; type and condition of structure and material; construction practices as well as condition of kang, stove and drainage system, etc.

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

### Step 2

Based on the collected information, a careful **condition assessment** of the physical fabric and condition of the building must be undertaken. This will include identification and analysis of the conservation object, structural assessment, analysis of the building materials and the deterioration mechanism and causes.

### Step 3

Based on the information collection and condition assessment, appropriate **adaptive reuse** should be proposed.

### Step 4

Should there be any changes to the use of the historic property, the **impact assessment** of a new use on the significance of the building needs to be determined. Sometimes a proposed use is not appropriate as it may intervene too much with the historic fabric of the building. The proposed new use needs to be compatible with the established significance of the building.

Once the previous steps have provided the relevant information and data, the conservation plan can be prepared.

A **conservation plan** should include the following:

1. General status of the protection object.
2. Literature review, which shall provide information about original construction and intervention history, and provide as many photographic evidence as possible.
3. Drawings and photos from various historical periods (plan, elevation, section, site plan, etc).
4. Condition assessment drawings, photos and reports; damage condition should be reflected in drawings (plan, elevation, section, site plan, etc.). One of the key requirements is that damage (additions, deformations, cracks, etc.) shall be correctly identified and reflected in drawings.
5. Data analysis and assessment (identification of defining elements, deterioration mechanism and causes).
6. Conservation intervention (preservation/demolition, structural reinforcement, etc.) and relevant drawings (plan, elevation, section, site plan, etc.).
7. Adaptive reuse (function setting and layout, equipment upgrade).
8. Environment treatment (surrounding buildings, landscape, etc).
9. Techno-economic indicators.

In the **normal procedure** as outlined in Figure 2.1 - 2.2, a **preliminary design** and a **construction design** are needed after the approval of the conservation plan.

### 2.2.3. Normal Procedure - Preliminary Design Document

The preliminary design provides an overview of the conservation plan which includes various aspects of design, general analysis of the design and budget estimate. Proposed modifications to the building must be documented as well. The preliminary design document shall include:

1. **Site plan.** This shall include the building locations, conservation areas, the name of the building, exits and entrances, traffic and accessibility, environmental protection, fire safety layout, landscaping, grading, etc.
2. **Plan, elevation and section drawings of the proposed intervention.** This shall include measured drawings of the original condition, existing condition and proposed interventions. The plan shall indicate the overall dimensions and the axis lines; the section shall indicate the height of each storey and the total height.
3. Detailed design of key elements and spaces.
4. **Structural reinforcement design.** It shall include the test results of the extant structure, proposed structural reinforcement system,

seismic design, impact analysis of construction method and preventive measures. The key requirements for this design are the technical implementation of structural reinforcement and anti-seismic measures.

5. **Facility and mechanical system design.** This shall include the outdoor/indoor system and overall usage of the plumbing, ventilation, heating, electricity, lightening protection, security, communications, etc. Key requirements are the consideration of lightening protection and fire safety.
6. Detailed explanation of the intervention design and techno-economic indicators.
7. **Budget estimate,** in which the budget analysis is the key requirement.

The preliminary design document must also address energy conservation, traffic safety, security system, etc. After the completion of the preliminary design, construction design documentation drawings are required for the actual implementation.

### 2.2.4. Normal Procedure - Construction Design Document

Construction design describes the details of conservation implementation, which include:

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

### 1. **Construction overview, technical indicators and design specification.**

The key requirement for construction techniques and measures is their adaptation to the special conditions of traditional houses.

### 2. **Design of various aspects** (architecture, structure, plumbing, heating ventilation and electricity) of construction work. The key requirement is to ensure the implementation of the design concept during construction.

### 3. **Basic intervention:** conservation treatment of architectural components, water and moisture proofing, etc.

### 4. **Advanced intervention:** brick wall cleaning and restoration, window and door restoration, etc.

## 2.3. Selecting Experienced Conservation Architects and Contractors

Given the heritage significance of the traditional courtyard houses, drawings and specifications must be prepared by experienced professionals with knowledge of the conservation process and appropriate techniques.

## 2.4. Works Requiring Government Authority Approval

Residents and property owners are authorized to undertake some renovation work of their buildings in a certain range without requiring approval of the relevant administrative department of Pingyao. Contrarily, some other renovation work of buildings does need approval prior to implementation. Table 2.2 on the following pages provides a complete list of renovation work that does or does not require government approval.

Item	No government approval required	Government approval required
Courtyard Layout (ref: 4.2)	<ul style="list-style-type: none"> <li>- Removal of inappropriate advertising signage</li> <li>- Removal of modern and illegal additions</li> <li>- Landscaping within courtyard enclosure and weeding</li> </ul>	<ul style="list-style-type: none"> <li>- New construction activities in the courtyard</li> <li>- Rebuilding walls</li> <li>- Alterations to the entrance gates and their orientation</li> </ul>
Roof (ref: 4.3)	<ul style="list-style-type: none"> <li>- Cleaning of roof tiles</li> <li>- Clearing of gutters and down pipes</li> </ul>	<ul style="list-style-type: none"> <li>- Restoration of the roof structure through complete disassembly</li> <li>- Changing the appearance of the roof</li> <li>- Making any changes to the roof cladding and/or roof profile</li> </ul>
Walls (ref: 4.4)	<ul style="list-style-type: none"> <li>- Repair and replacement of damaged bricks</li> <li>- Brushing down and cleaning walls</li> </ul>	<ul style="list-style-type: none"> <li>- Constructing new walls</li> <li>- Cleaning and desalination</li> <li>- Inserting vapor barrier</li> <li>- All repointing that does not match the original workmanship – eg. using cement mortar</li> </ul>
Wood Members (ref: 4.5)	<ul style="list-style-type: none"> <li>- Replacement of functional wood members to match the original detail</li> <li>- Replacement of decorative elements to match existing ones</li> </ul>	<ul style="list-style-type: none"> <li>- Restoration and replacement of key structural components, such as arches, pillars, purlins and beams</li> <li>- Any external painting</li> </ul>

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

Item	No government approval required	Government approval required
Doors and Windows (ref: 4.7)	<ul style="list-style-type: none"> <li>- Replacement of glass panels</li> <li>- Replacement of defective wood members to match existing</li> <li>- Removal of non-original aluminum windows and replacing with timber</li> </ul>	<ul style="list-style-type: none"> <li>- Changing the pattern of doors and windows</li> <li>- Restoration and reshaping of the doors and windows</li> <li>- Closing up door and window openings</li> <li>- Insertion of new doors and windows</li> <li>- Removal of original door and window hardware, such as door knobs</li> </ul>
Entrance Gates and Entry Steps (ref: 4.6)	<ul style="list-style-type: none"> <li>- Painting/Re-painting</li> <li>- Maintenance of the entrance canopy and wood members</li> <li>- Repair of extant entry steps to match existing steps</li> </ul>	<ul style="list-style-type: none"> <li>- Reconstruction and installation of new entrance gates and steps</li> <li>- Replacement and reconstruction of key structural components, such as arches, beams, pillars, purlins and beams</li> <li>- Restoration of entrance gates through complete disassembly</li> </ul>
Paving (ref: 4.8)	<ul style="list-style-type: none"> <li>- Repairing part of the paving and re-paving to match existing</li> <li>- Clearing ground drains</li> </ul>	<ul style="list-style-type: none"> <li>- Creating any new paving</li> <li>- Installation of new pipe drains</li> </ul>
Living Facilities (ref: 5.3)	<ul style="list-style-type: none"> <li>- Upgrading existing internal kitchens and bathrooms, so long as no walls, windows or doors are changed</li> </ul>	<ul style="list-style-type: none"> <li>- Installation of new kitchens and bathrooms in a location different from the existing</li> <li>- Installation of air-conditioning units</li> <li>- Installation of solar-heating panels or satellite dishes</li> </ul>

Item	No government approval required	Government approval required
Decorative elements (ref: 4.10)	<ul style="list-style-type: none"> <li>- Protective paint coat of non-polychrome decorative elements</li> <li>- Partially restoring screen walls</li> </ul>	<ul style="list-style-type: none"> <li>- Restoration and replacement of decorative elements</li> <li>- Adding new decorative elements</li> </ul>
Lighting (ref: 6.5)	<ul style="list-style-type: none"> <li>- Replacement of interior light fixture bulbs or tubes</li> </ul>	<ul style="list-style-type: none"> <li>- Installation of new external light fixtures</li> </ul>
Signs (ref: 6.4)	<ul style="list-style-type: none"> <li>- Repainting existing signage</li> </ul>	<ul style="list-style-type: none"> <li>- Addition of new signage</li> </ul>
Infrastructure (ref: 6.6.2)	<ul style="list-style-type: none"> <li>- Maintenance of pipes connected to city infrastructure</li> <li>- Removal of outside air-conditioning or solar-heating units</li> </ul>	<ul style="list-style-type: none"> <li>- Connecting pipes to city infrastructure from street to courtyard</li> <li>- Installation of air-conditioning units on the façade facing streets</li> </ul>

**Table 2.2:** Work that can be undertaken by residents directly and work requiring government authority approval



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# Chapter 3

## Introduction to Pingyao Traditional Courtyard Houses

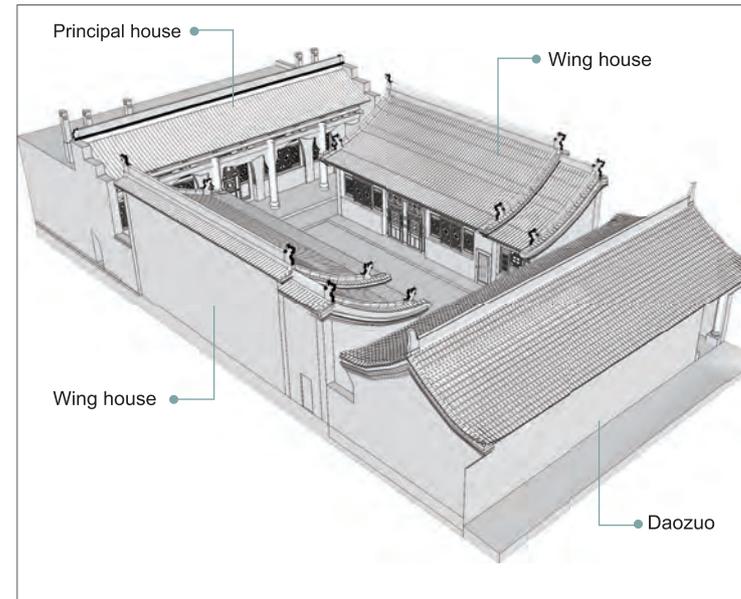
- 3.1. Introduction
- 3.2. Factors Affecting the Style of Pingyao Vernacular Houses
- 3.3. Features of Pingyao Traditional Courtyard Houses
- 3.4. Architectural Features of Courtyard Houses
- 3.5. Building Materials

# Chapter 3

## Introduction to Pingyao Traditional Courtyard Houses

### 3.1. Introduction

Most Pingyao traditional courtyards (Figure 3.1) are narrow si-he-yuan style (quadrangle), characterized by a clear axis, symmetrical layout and a distinct hierarchical order. Some residences comprise two or three entrance gates along the axis, arranged in the shape of the Chinese character “日 (ri)” or “目 (mu)”. The courtyards are separated by low walls with floral-pendant gates. In general, the principal house (usually facing south) has a yaodong structure (ref. the third point of Type of Pingyao Courtyard Buildings on page 34) with three or five rooms, as the ones shown in Figure 3.1, and has a wooden gallery in the front and a flat roof. The wing house and dao-zuo are of masonry-wood structure and have a single-slope or double-slope tiled roof. Generally, the entrance gate is located at the southeast corner of the yard and the dry latrine at the southwest corner.



With view to principal house

Figure 3.1: Typical Pingyao historic courtyard



Figure 3.2: Commercial courtyard houses



Figure 3.3: Residential courtyard houses

## Type of Pingyao Courtyard Houses

1. Pingyao is rich in architectural forms, the result of prosperous development of business relationships during the Ming and Qing dynasties. Buildings throughout the city can basically be divided into three categories, based on their function: commercial courtyard houses, workshop courtyard houses and residential courtyard houses.

- Commercial courtyard houses (Figure 3.2)

Generally the commercial courtyard houses have business premises in the front, facing the street, and the residential area in the back. The entrance to the commercial area is directly open to the street, while the entrance to the residential area is usually hidden, for privacy, in a side alley that is perpendicular to the main street.

- Workshop courtyard houses

Workshop courtyard houses share some characteristics with commercial courtyard houses and are a form of traditional housing that fulfills both living and productive functions. The principal house is the living space for the house owner while the wing houses and *daozuo* are used as workshop and storage areas. The courtyard is the common space between living and commercial activities. However, there are no strict rules about the production division of space, and it can be adjusted accordingly. There is usually a ramp at the main entrance to facilitate goods deliveries.

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

### • Residential courtyard houses (Figure 3.3)

Residential courtyard houses are the great majority of traditional courtyard houses in Pingyao. An alternative name for them is “compound houses”, which are luxury houses built by successful merchants for their families and descendants.

2. Traditional courtyard houses can be categorized as axial-connection, parallel-connection or mixed type based on the courtyard layout (ref. 3.3.1).
3. Traditional courtyard houses can be categorized as “yaodong” or masonry-wood construction based on the structure of courtyard houses (ref. 6.6.2).
4. Traditional courtyard houses can be categorized as single-storey or double-storey type based on the number of floors of the courtyard houses.

## 3.2. Factors Affecting the Style of Pingyao Vernacular Houses

### 3.2.1. Topography

Shanxi province is located on the Loess Plateau, with Mount Taihang

to the east and Mount Lüliang to the west. The topography of the central part of Shanxi, where Pingyao is located, is broad and flat with scattered mountain ranges. Most of the villages are located between the mountains and ravines (Figure 3.4).



Figure 3.4: Yaodong houses distribution areas

This topography led to a unique style of residential architecture in Shanxi and many of the residential houses are yaodong typewhich literally means cave dwellings. The primary building material of the yaodong houses is loessand usually dug into the loess land or cliff, using the surrounding loess landform as enclosure and structural support. Shanxi Yaodong can be found generally in three types: stand-alone, underground and back-on-the-cliff types (Figure 3.5).

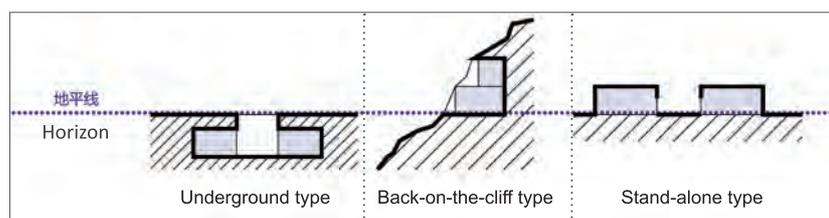


Figure 3.5: *Yaodong* types

The stand-alone yaodong is a stand-alone structure that is independent of the cliff landform; it is in fact an above-ground form of earth sheltering. The interior spaces are very similar to the yaodong that are dug into the loess land or cliff, with arched doorway and eave gallery on the front façade and no openings on the back wall. This building form retains the benefits of a yaodong structure and yet free of the constraints of the cliff landform. It is an important feature of Pingyao vernacular architecture where it integrates the traditional Shanxi vernacular building culture and the demands for an urbanized housing form and higher construction quality.

The yaodong structure referred to in this text is specific to the stand-

alone yaodong type, which is a common feature in Pingyao courtyard houses.

### 3.2.2. Traditional Building Materials

Mount Taihang is primarily sandstone, which was used for foundation or masonry works. Mount Lüliang is rich in loess, an earthen material that is exceptionally stable. Considering the dry climate in Shanxi, yaodong structure is a sensible choice. In addition, it offers good thermal performance, and keeps the house cool in the summer and warm in the winter.

In addition to stone, earth, brick and tiles, timber is also commonly used as building materials for Pingyao vernacular architecture due to relative abundance of forest and commercial growth of timber in the area.

### 3.2.3. Local Climate

Shanxi has cold winters, due to its location in a temperate zone. Locals traditionally value natural lighting and heating, and this is reflected in the layout and structures of their houses. In most cases, people choose to build houses that face south with relatively long and narrow courtyard spaces in order to maximize natural light. Bedrooms are generally equipped with a heating kang, which occupies a large area of the room. Pingyao courtyard walls are typically very high to provide protection from sand storms during

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

autumn and winter, with the added benefit of increased privacy.

### 3.2.4. Human Factors

The quadrangle used as basic courtyard format is an architectural style that reflects Confucian concepts and traditional Chinese ceremonial protocols. This unique style was also influenced by the patriarchal system. Confucian concepts such as ‘the three cardinal guides and the five constant virtues’ and ‘man is superior to woman’ are reflected in the quadrangle layout: the principal house is the most respected and used by the older generation, wing houses are subordinate to the principal house and used by the younger generation, *daozuo* are regarded as guest and service houses.

Another element integrated in architectural styles is the Fengshui theory, created by the ancient Chinese, which is about how to choose a living environment and how to live in it. According to the basic principles and patterns of Fengshui, the best site for a house is a place that is aligned with the principle ‘back against Yin and face with Yang’ (Yin and Yang, the two opposing principles in nature: the former feminine and negative, the latter masculine and positive), and ‘back against mountains and face with rivers’ (Figure 3.6). For site selection, this means ‘back to shadow and mountains, orientated to sunshine and waters’.

This principle is manifest in the Pingyao courtyard house in its orientation and building layout: by changing the number of floors

and building height and adjusting the ground level of different buildings in the same yard. The effect is to form a layout of courtyard that is low at the front and high at the back, with left and right wings around the central courtyard, to embody the Yin and Yang principles.

The courtyard layout is also related to the eight trigrams theory of Fengshui: North is superior to South, East is superior to West, courtyard main gate at Southeast and dry latrine at Southwest (Figure 3.7).

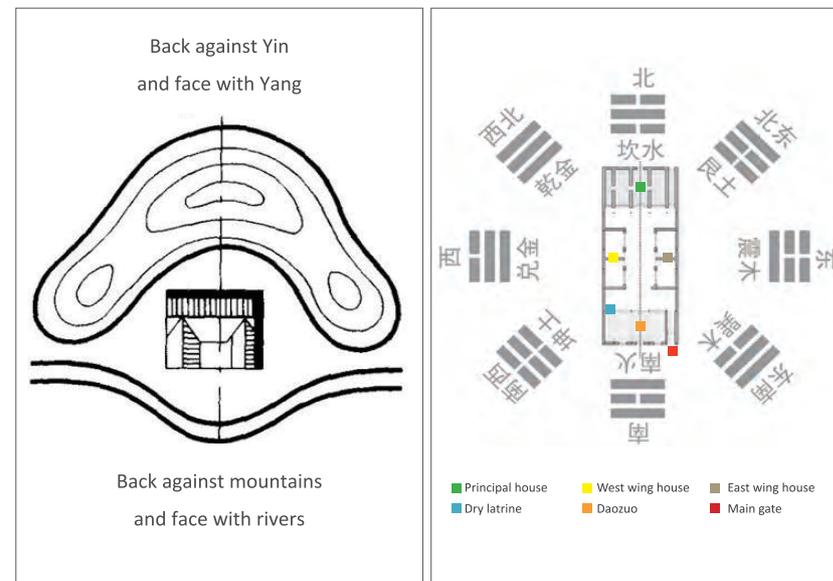


Figure 3.6: Fengshui theory in architecture

Figure 3.7: The eight trigrams theory of Fengshui in courtyard layout

## 3.3. Features of Pingyao Traditional Courtyard Houses

### 3.3.1. Courtyard Layout

Traditional Pingyao courtyard houses with two or three entrance gates consist of a principal courtyard and a secondary courtyard. Secondary courtyards were commonly used as parking for horse carriages, side yard, garden, living quarter for the servants, animal stables, etc., and is obviously of lower hierarchy than the principal courtyard. The form and scale of the courtyard houses largely depend on the status of the owner, and can be generally classed into the following three courtyard layout types:

#### (i) Axial-connection

The courtyards are joined along the main axis. The courtyard spatial relationship is expressed through variations in the form, scale and volume of the buildings along the axial line (Figure 3.8).

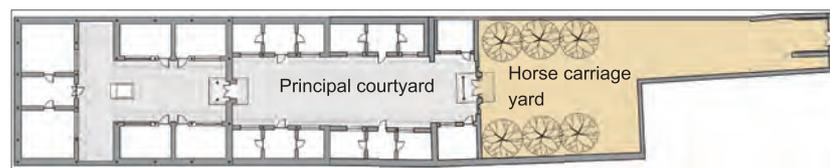


Figure 3.8: Axial-connection type of courtyard layout

#### (ii) Parallel-connection

The courtyards are parallel to each other, forming a group of courtyards with multi-axial lines. It is common to have a small door between the two courtyards to connect the two (Figure 3.9).

#### (iii) Mixed

The mixed type is common in large courtyards, with both axial and parallel connection type features (Figure 3.10).

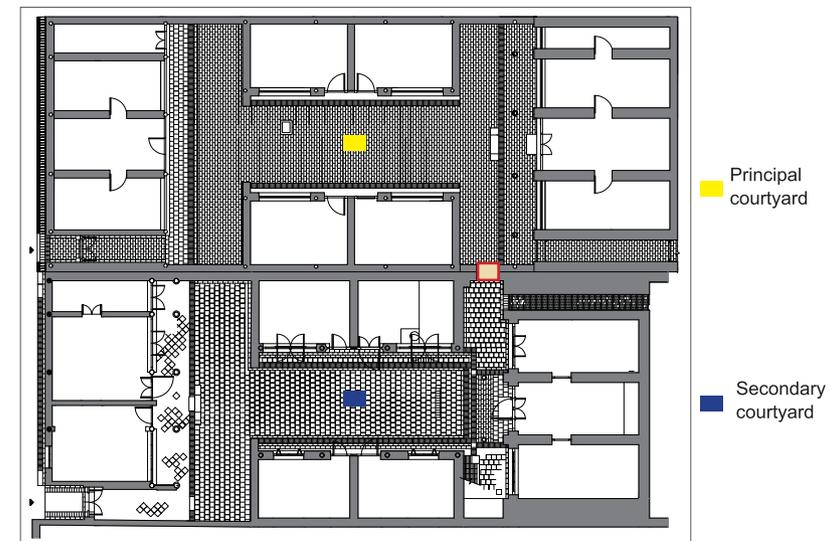


Figure 3.9: Parallel-connection type of courtyard layout (red box: the small door connects the two courtyards)

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

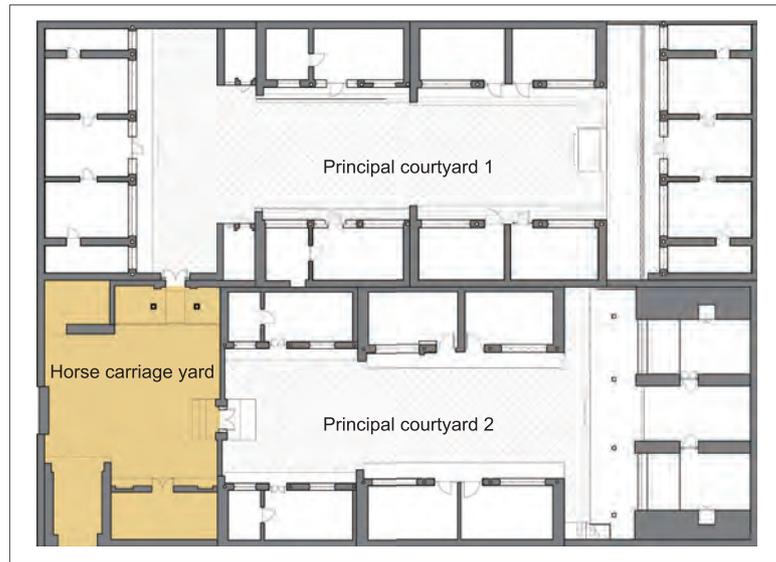


Figure 3.10: Mixed type of courtyard layout

### 3.3.2. Principal Courtyard Overall Scale

The typical length-width ratio of the courtyard in Pingyao is 2:1, although it can reach up to a maximum of 3:1-4:1. This length-width ratio creates a narrow and long courtyard shape to save land usage.

### 3.3.3. Building Layout of a Principal Courtyard

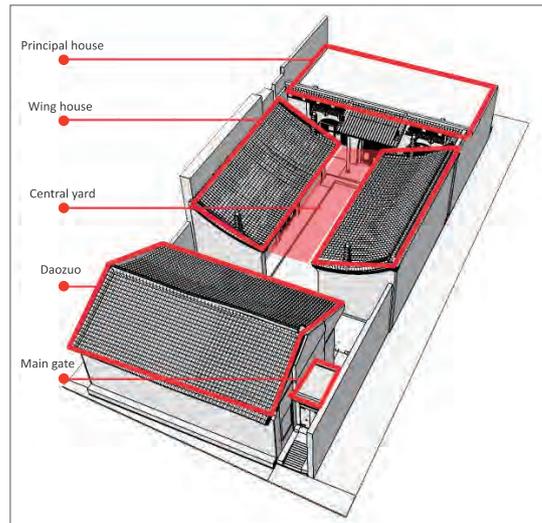
Pingyao courtyard houses are typically enclosed long narrow yards. The width of the open yard space narrows as one progresses from the front yard to the back. There are different scales and various patterns of quadrangle in Pingyao, but there are some basic

elements shared by most courtyards: main gate, dao-zuo, central yard, wing house and principal house. Large quadrangles consist of a floral-pendant gate or a hallway connecting the front and back yard. An archetypal quadrangle has the principal house located at the north end, orientated south, wing houses arranged on both sides and dao-zuo situated opposite the principal house. Some courtyards with low status do not contain a dao-zuo. These elements surround and enclose the courtyard. The outer walls of these houses form the fence walls of the quadrangle. The courtyard houses are appropriately laid out with a clear axis and in symmetry.

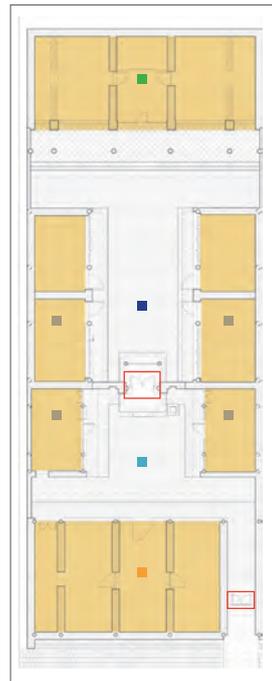
For houses with more than one entrance gate, building height gradually increases from the main gate to the principal house. This also indicates the increasing status of the buildings.

The courtyard with one entrance gate usually connects dao-zuo, central yard and principal house (Figure 3.11). The main gate is usually located at the southeast corner of the courtyard.

Houses with two entrance gates usually comprise of dao-zuo, front central yard, middle gate, back central yard and principal house (Figure 3.12). The middle gate (or middle hallway) is usually located in the center of the courtyard and is often of floral-pendant gate form. The front central yard is wider, more open and public, with lower buildings; the back central yard is more enclosed and private, with taller buildings.

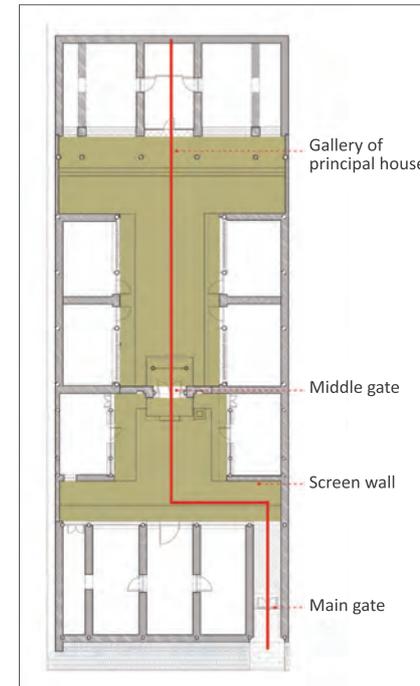


**Figure 3.11:** Basic elements of a one-entrance gate courtyard in Pingyao



**Figure 3.12:** Typical layout of a two-entrance gate courtyard in Pingyao

- Principal house   ■ Wing house   ■ Back central yard
- Front central yard   ■ Daozuo



**Figure 3.13:** Interior circulation flow line of a courtyard

### 3.3.4. Courtyard Circulation Flow

The interior circulation flow of the courtyard starts with the main gate and gradually unfolds a sequence of spaces as the courtyard ground level continues to rise; the sequence is described as following Figure 3.13 and 3.14.



**Figure 3.14:** Gradually rising ground level and building height in Pingyao traditional courtyard houses

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

### **Main Gate (between street and daozi)**

The main gate serves as the demarcation point between street and courtyard. The long and narrow space, after entering the main gate, serves as an overture before entering the central yard.

### **Screen Wall or Shrine (between daozi and front central yard)**

The screen wall (or sometimes shrine), facing to the main gate, not only has an important spiritual function, but also adds a layer effect to the courtyard space. While walking through the long and narrow main gate space, gloomy turns to bright and the narrow space starts to open to a wide area. The transition from public to private space unfolds progressively and enhances the sense of security in the yard.

### **Middle Gate or Middle Hallway (between front and back central yard)**

For a two-entrance gate house, the middle gate or the middle hallway is a transition zone between the front and the back central courtyard, as well as a dividing point between them. The front central yard is usually for guest activities and the back one is for residential activities. The middle hallway is actually also a form of "gate" in concept, stretched out in volume. Usually a screen will be installed at the end of the center room of the middle hallway, acting in the same way as a screen wall, enhancing the privacy of the back central yard.

### **Gallery of Principal House (between back central yard and principal house)**

The gallery is formed by overhanging roof eaves that visually directs the focal point of the viewers to the principal house. The fine decorations on the timber structure components of the eaves emphasize the importance of the principal house. The gallery also serves as a transition symbol between exterior and interior space, as after passing through which is the entrance of the principal house.

## 3.4. Architectural Features of Courtyard Houses

### 3.4.1. Courtyard Boundary Walls

Security was a main concern because of frequent warfare in Shanxi during ancient times. Courtyard boundary walls, enclosing the courtyard, which are often made of bricks and built without windows, create a strong sense of fortification and appear secure. Height variations of the courtyard boundary walls break up the monotony of the streetscape, forming a rich outline.

Courtyard walls separate courtyards or courtyard complexes (Figure 3.15). The elevation and craftsmanship of the courtyard walls are determined by the importance level of the courtyard. The more important a courtyard is, the higher and more refinedly built the courtyard walls are.

Courtyard boundary walls usually contain four parts: coping, brick coping, brick wall, wall skirting (Figure 3.16).



Figure 3.15: Courtyard boundary walls



Figure 3.16: Components of courtyard boundary walls with a wall-like main gate

### 3.4.2. Main Gate

In addition to functioning as an entrance and connecting different spaces, the main gate is also regarded as a symbol of the owner's social identity. However, according to traditional Chinese Fengshui theory, the main gate is important for the entry of Qi (luck). An inappropriately located main gate could lead to poverty and misfortune. Therefore the setting of a main gate must be carefully considered.

The main gate of Pingyao traditional courtyards can be divided into two types: wall-like type (Figure 3.16) and building-like type (Figure 3.17).

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

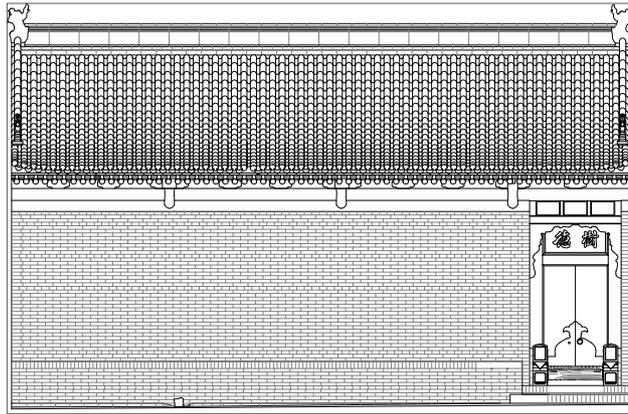


Figure 3.17: Building-like gate

Wall-like main gates, commonly a floral-pendant gate, are typically located on the central axis and are found in courtyards with a courtyard with low status or with limited/restricted land area that does not have a dao-zuo.

Building-like main gates are usually located at the southeast corner of a dao-zuo, as this is regarded as an auspicious location. The gate has several steps in the front and drum-like stone or stone lions on both the left and right side (Figure 3.18). The gate is equipped with door frames and thresholds, with decorative brick wall panel sat both sides.

The building-like main gates of secondary courtyards usually are wide archway and a ramp in the front instead of steps, for the convenience of transporting goods (Figure 3.19).



Figure 3.18: The main gate



Figure 3.19: Archway and ramp

There is a close connection between screen walls (or shrines) and main gates in Pingyao traditional courtyards. In most courtyards, screen walls, set on the gable walls (ref. 4.4 walls) of wing houses, are first seen after the main gate and therefore function as a part of the main gate for more privacy. In Chinese, 'Yingbi' (screen wall)



Figure 3.20: Screen walls and shrines

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

sounds close to 'yinbi', meaning hidden, to prevent a direct view of the inner courtyard, which is also believed to be effective in warding off evil energies. The shrine is also located on the gable wall of the wing house facing the main gate, and is visible at once when one enters the courtyard.

### 3.4.3. Daozuo

The roof of daozuo is typically of single-slope or double-slope type (ref. 4.3 roofs) and is of one floor, or sometimes two in the case of large courtyards. The street facing façade of daozuo is usually tall and plain with few decorations and openings, whereas the internal courtyard facing façade usually has decorative wooden elements such as gallery, carved pillar cap, wood lattice windows, etc. (Figure 3.21).

Usually there are five rooms in daozuo: the eastern room is used as the main gate, the central room as guest room for important events or festive celebrations. There are some rare cases where the main gate was set in the central room, the rest was used as a living room.

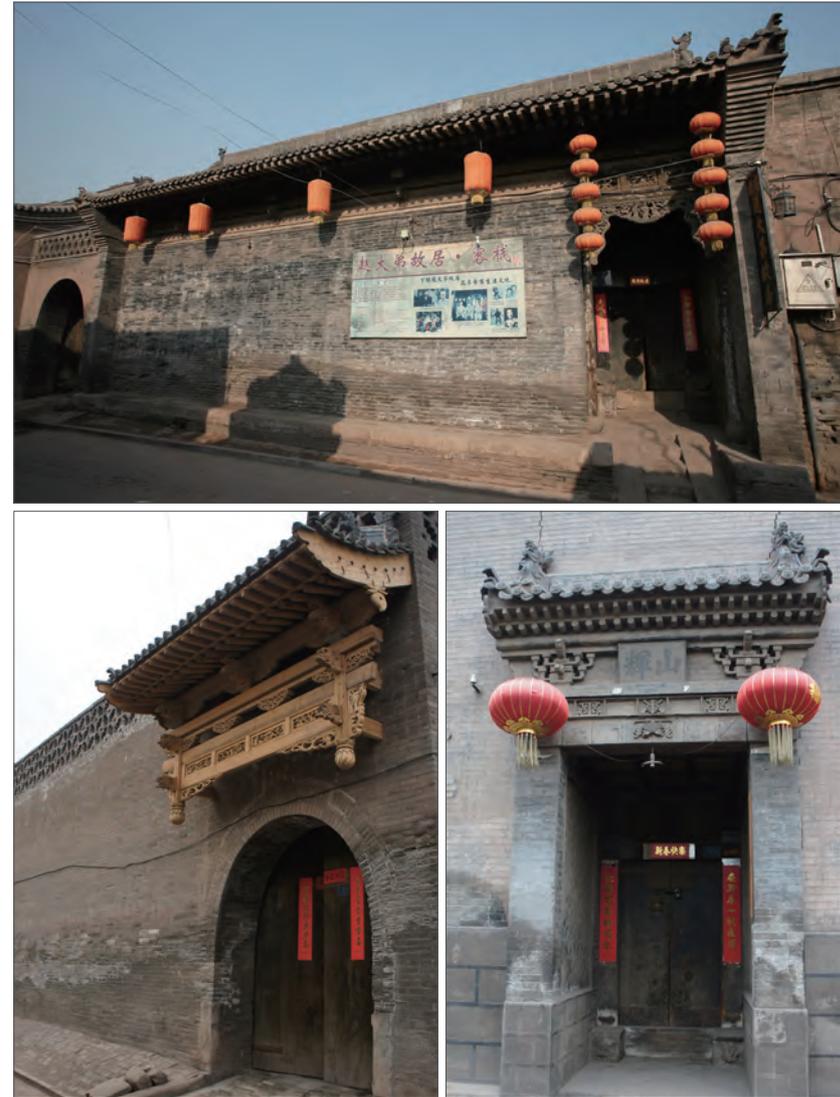


Figure 3.21: Daozuo and decorations of the main gate

### 3.4.4. Paving and Flower Rail

The inner central yard of a courtyard is typically paved with square bricks laid in straight and diagonal stretcher course (Figure 3.22) with different paving for finishing the edges (ref. 4.8), and barely decorated with any plants. However, bricks will be replaced with rectangular stone slabs to pave the drainage outlet area of the principal house to prevent water erosion, as well as in front of the doors to the principal house, wing house and dao zuo to prevent abrasion.



**Figure 3.22:** Square bricks laid in straight and diagonal stretcher course

The ground level of the central yard rises from the main gate to the principal house with steps or ramps. The wing house is also one step higher than the ground level of the central yard. The paving methods and patterns will vary with changes in ground level height.

A flower rail is a low brick wall with hollowed out pattern that can sometimes be found close to the principal house and dao zuo. The wall is usually covered with potted plants.



**Figure 3.23:** Paving and flower rail

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

### 3.4.5. The Middle Gate (or Middle Hallway)

The middle gate or middle hallway is often located on the axis and its main purpose is to separate multiple courtyard spaces. It creates an increased sense of privacy, which enhances the transition from outside to inside.

The middle gate is generally made in a floral-pendant style. It serves not only as an element to divide space, but, similar with the main gate, also as a symbol of wealth. The refineness of the middle gate reflects the owner's identity and social status. Every floral-pendant gate consists of two doorways. There is a screen gate behind the middle gate which opens to the back yard and only opens for weddings, funerals, or when an important person visits.

The floral-pendant gate usually has a double-slope roof with two asymmetrical slopes. The front slope is shorter than the back one. The pillars on the back side of the screen gate reach the floor, while the external one hangs in the air, with an end in the shape of a lotus. Various kinds of decoration patterns and carvings on the gate reflect the different preferences of the owners.



Figure 3.24: Middle gate

### 3.4.6. Wing House

Wing houses of Pingyao traditional courtyards are generally used as spaces for living (Figure 3.25).



Figure 3.25: Wing house

Wing houses usually are three-room type, in the form of ‘three rooms into two rooms’ (Figure 3.26). That is, a partition wall is built to divide the original three-room layout into two-room layout, each with a door and windows which open outwards. A kang (a brick bed with heating) is usually included due to the living function of the house, and is placed next to the window (Figure 3.27).

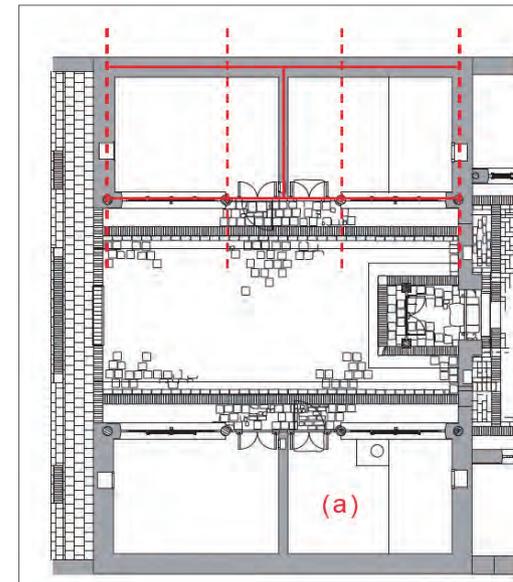


Figure 3.26: Three rooms into two rooms (dotted line: original three rooms; full line: new two rooms; layout of room (a) is illustrated in Figure 3.27)

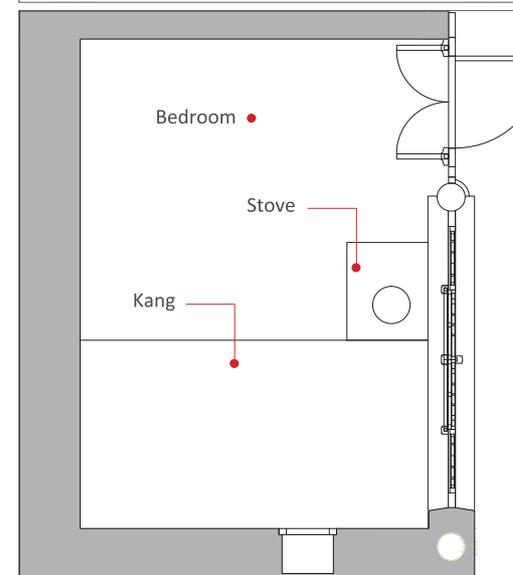


Figure 3.27: Layout of room (a) of Figure 3.26

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

For the two-entrance gate courtyards, wing houses in the back yard are usually the owner's bedrooms and higher than the front wing houses. The wing houses in the front yard are usually used as servants' room or storage room (Figure 3.28). The eastern wing house, is considered to be of a higher status compared to the western one, and is usually taller and a little set back.



Figure 3.28: Elevation and layout of front and back wing houses

The wing houses of Pingyao traditional courtyards are generally masonry-wood structures with a single-slope roof sloping to the inner courtyard. There is no gallery space and the decorations are manifest in the openings and architrave. Of the four walls of the wing house, the back wall is a courtyard boundary wall. The front wall has eaves with a projection of 1-1.5 meters (Figure 3.29).



Figure 3.29: Eave walls of a wing house

Some wing houses in the courtyard with high status are of yaodong structure type with a single-slope roof.

### 3.4.7. Principal House

In a typical Pingyao residence, the principal house is generally built in the form of one 'open' room and two 'hidden' rooms (Figure 3.30), or three 'open' rooms and two 'hidden' rooms (Figure 3.31). 'Open'

in this context refers to public space and 'hidden' to private space. The central part of the principal house is public space, it is not for living purpose and only used for ancestor worship. The private space on both sides of it is living space, usually the bedroom of elders or parents. The open rooms do not have a kang and the hidden rooms do.

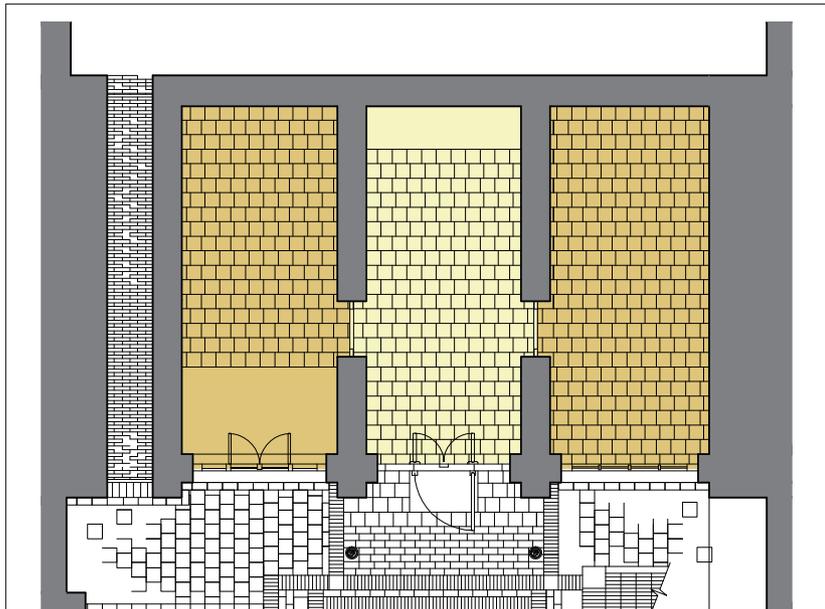


Figure 3.30: One 'open' room with two 'hidden' rooms

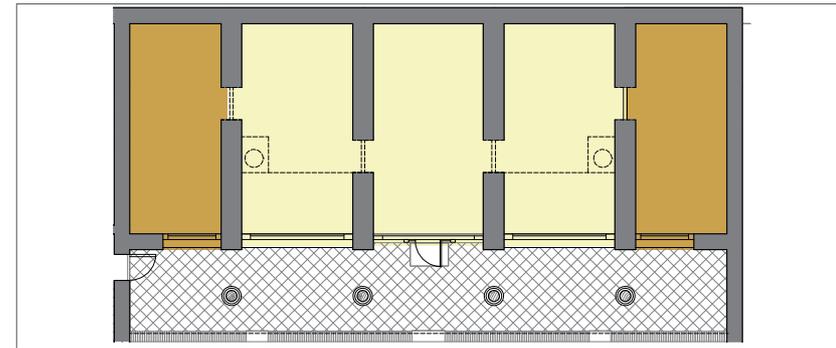


Figure 3.31: Three 'open' rooms with two 'hidden' rooms

Yaodong structure type principal houses in Pingyao generally have a flat roof, which is often used for drying grains (Figure 3.32). The flat roof of a principal house usually incorporates a sloped eave that forms a gallery in the front (Figure 3.33). The eave has two layers of rafters. A half turned staircase leading to the rooftop is always located on either one or both sides of the principal house. Some of the stairs are brick and include a storage room underneath. In other cases, there are removable ladders to save space.

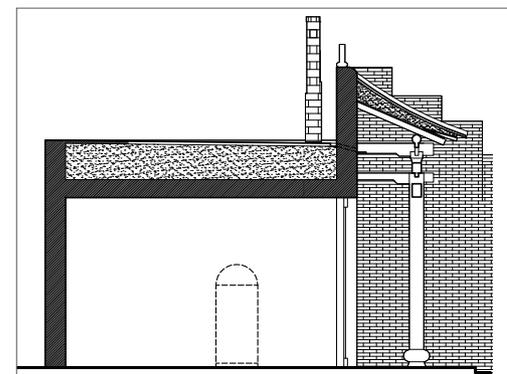


Figure 3.32: Section of a yaodong structure type principal house

# Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao



**Figure 3.33:** *The eave gallery of a principal house*

The eave gallery is tied to the yaodong with wooden beams that are slotted on to the wood pillar on one end and into the masonry wall on the other end. The eaves also connect with the parapet wall of the roof as the ridge. The pillars stand on a stone base in either plain or carved drum-like surfaces (Figure 3.34). The eave gallery is considered as a good way to show the wealth of the owner. Houses owned by people of higher status will have exquisite carvings and even brackets (Figure 3.35).

Masonry-wood structure type principal houses usually have single-slope or double-slope roofs.



**Figure 3.34:** *Stone base carved drum-like surfaces*



**Figure 3.35:** *Brick carving surfaces*

## 3.4.8. Roof and Screen Wall

The roofs of traditional Pingyao courtyard houses create a uniform magnificent picture with rich outlines (Figure 3.36). In general, traditional Pingyao courtyard houses have flat or slope type roofs. Flat roofs are paved with bricks on the top earth layer of the building's arch. Slope roofs are constructed with purlin, rafter, roof boarding and tiles on the buildings with a traditional wooden structure. Both roof types are made in similar grey color tone.



**Figure 3.36:** *View over the roofs of traditional Pingyao courtyard houses*

Fengshui screen walls and shrines are usually set on the roofs of traditional residences in Pingyao (Figure 3.37). In line with local traditions, Fengshui screen walls are usually built at the center of roofs of principal houses for luck. However, for principal houses that are not south-oriented as typical ones due to the setting restrictions of streets or main gates, screen walls are placed to the side instead of at the center of roofs.



**Figure 3.37:** Fengshui screen walls with a shrine in the middle on the roof of a principal house

### 3.4.9. Interior Layout

There are generally two types of interior layout of traditional residences in Pingyao: those for yaodong principal houses and those for wing houses or dao zuo.

The hall of the yaodong principal house is the most luxurious one of the courtyard. Traditionally the center room of the yaodong is only used for ancestor worship or hospitality.

A large yaodong is divided into inner and outer rooms with a partition wall in the middle. The furniture in the structure is generally



**Figure 3.38:** Interior layout of a principal house

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

not high, to suit the curved walls of houses (Figure 3.38).

The wing houses are usually bedrooms and have smaller surface area compared to the principal houses. Traditionally, the bedroom of wing houses consisted of three parts: the kang for sleeping, the stove for cooking and the floor for family activities (Figure 3.39).

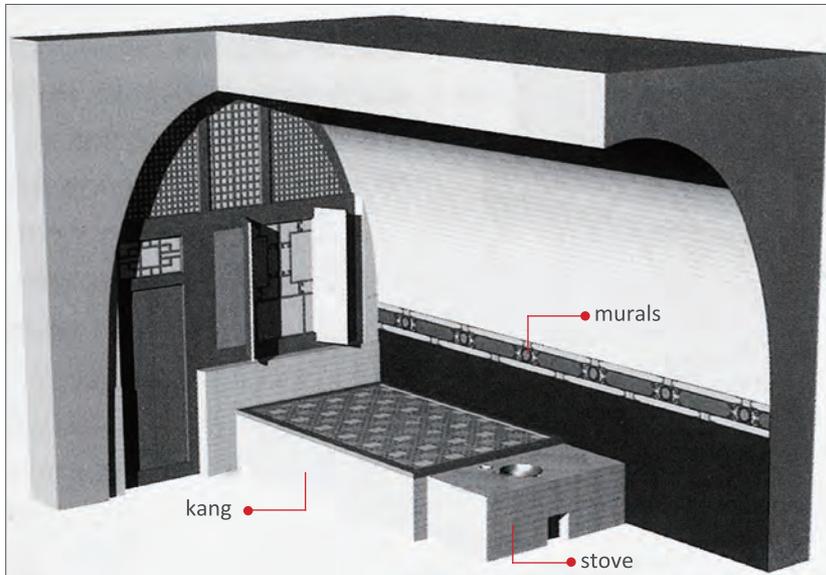


Figure 3.39: Traditional bedroom interior layout

A kang usually covers about one third or two thirds of the whole room. The stove was connected to the kang to allow smoke to be discharged through the chimney. In the traditional way of life of the residents in Pingyao, the spatial arrangement, furniture, interior decorations, etc. all center around the kang. The kang is not simply

a bed; it also supplies most of the requirements of daily life and was the center of family activities. Firstly, it is built next to a window to gain direct daylight, thus occupying the best position in the room. Secondly, a kang is often decorated with delicate murals on the surrounding walls (Figure 3.40), which decorates the room and provides a protective coating for the wall.

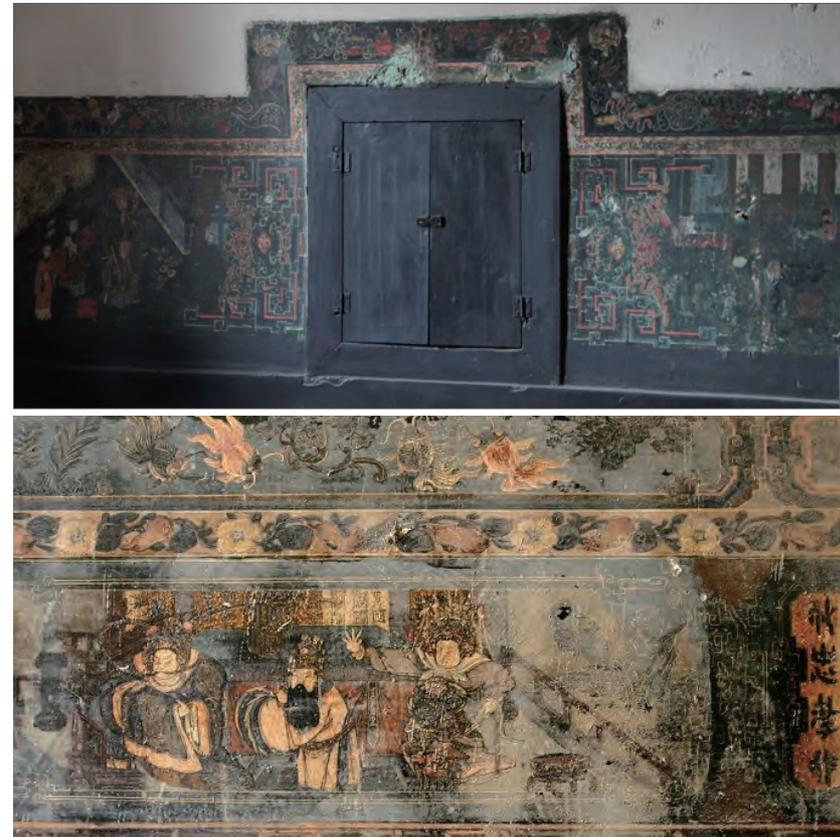


Figure 3.40: Murals on the surrounding walls of a kang

### 3.4.10. Doors and Windows

Doors and windows of traditional Pingyao houses usually comprise of several panels, some of which are removable. The doors and windows are required to be airtight for security and privacy purpose. One of the ways to maintain privacy is to paste paper over the windows to block visibility; this also helps keeping the house warm. Paper cuttings are also pasted over the windows for decorative purpose.

In Pingyao's courtyards, there are rules for the selection of different types of doors and windows. Different doors and windows indicate different status as well as meeting the different functions of different spaces, and are integral to the overall façade design of the courtyard.

#### Doors and Windows of the Principal House

Doors and windows are usually embedded in the arch of the yaodong structure principal houses and divided into: top and bottom parts (Figure 3.41-3.42).

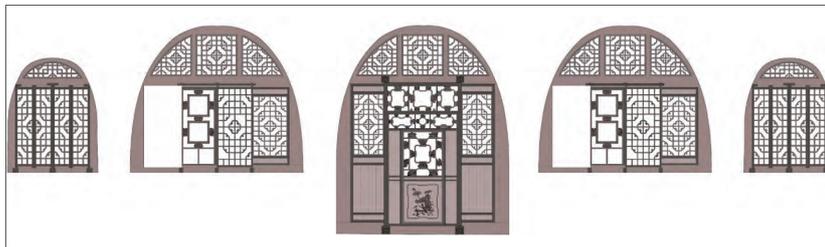


Figure 3.41: Typical doors and windows of a yaodong principal house with five rooms



Figure 3.42: Doors and windows of a yaodong principal house

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

The upper part is an arched high window, about one third to one seventh of the total height of the window. Generally it consists of three panels; each has double layers of windows. The outer layer window is fixed with mullion and can not be opened. The inner layer is paper pasted and opens inward for ventilation.

The lower part could be either windows or doors. If the lower part is designed as a window, it is usually a rectangular four-panel window with three layers. The outer layer window can be opened or removed, while the inner layers are timber windows and can be opened, the middle layer can not be opened.

If the lower part is designed as a door, it is usually a three-panel door. The two fixed side panels are paper pasted and can not be opened. The middle panel, usually decorated in a complex manner, is a single swing door.

The doors and windows of masonry-wood structure type principal houses are similar with the lower part of the ones of yaodong type.

### Doors and Windows of Wing Houses

Most of the wing houses are ‘three rooms into two rooms’ type (ref. 3.4.6). Each room has one door and one window, positioned on an equal distance from the partition wall. Doors are placed at the center and windows at the side. The windows reach from the top of the brick sill to the beam; doors reach from the floor step up to the beams (Figure 3.43).



Figure 3.43: Doors and windows of a wing house

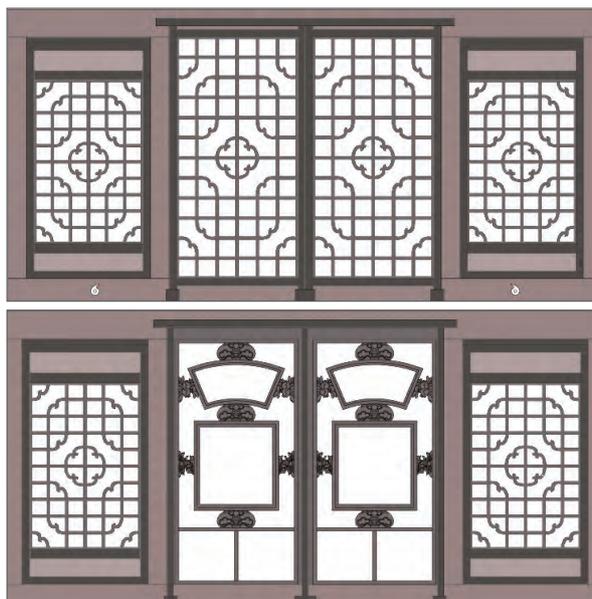


Figure 3.44: Typical windows of a wing house

The windows in wing houses are usually rectangular four-panel windows with three layers, similar to the lower part windows of principal houses (Figure 3.44). Each sash has double layers. The outer layer window can be opened or removed, while the inner layers are timber windows and can be opened, the middle layer, decorated with bat-shaped wood carvings, can not be opened.

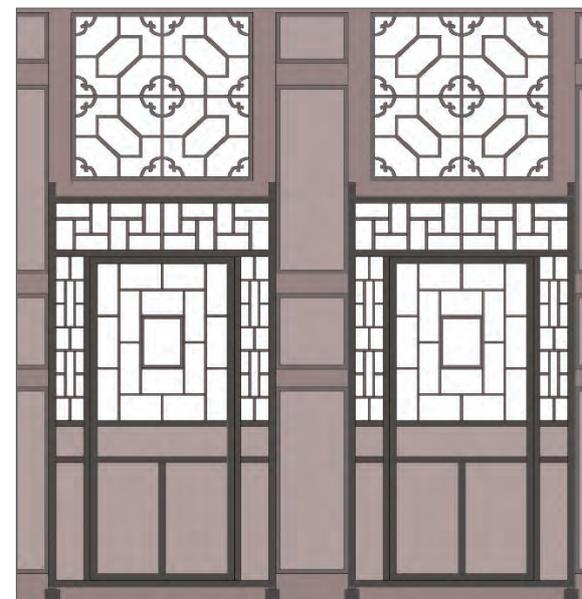


Figure 3.45: Typical doors of a wing house

Wing-house doors are single panel, with an upper and lower part (Figure 3.45). The upper part is a rectangular double-layer high window, with an outer layer which can not be opened and inner layer which opens inwards. The lower part door is with an inner layer opening inwards.

# Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao



Figure 3.46: Doors and windows of traditional residences in Pingyao

## 3.4.11. Carving

Carving can be classified by material: wood, brick or stone. There are wood carvings on beams, doors and windows, such as decorative overhangs; brick carving, such as Wen-Shou, was undertaken on the main ridge and hip of the roof, the chimney cap, tiles and screen walls; stone carving occurs on the base of columns, drum-shaped stone blocks and stone lions (Figure 3.47-3.59).



Figure 3.47: Wood carving on dougong



Figure 3.48: Wood carving on bean head



Figure 3.49: Wood carving on windows



Figure 3.50: Wood carving on gualuo



Figure 3.51: Wood carving on floral-pendant gate



3.52: Brick carving on staircase railing



Figure 3.53: Brick carving on screen wall



Figure 3.54: Brick carving on middle gate



Figure 3.55: Stone carving on staircase sheathing



Figure 3.56: Stone carving on column base



Figure 3.57: Brick carving on screen wall



Figure 3.58: Stone carving on shangmashi

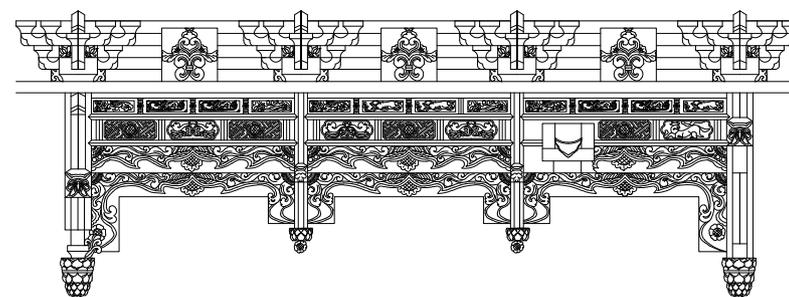


Figure 3.59: Brick carving on eave gallery of a principal house

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

All carvings are embodied with rich meanings. For example, many bat-shaped carvings can be found on doors and windows, as the pronunciation of the word for 'bat' in Chinese is 'Fu', which also means 'blessing'. Different auspicious words are carved on the beam head of buildings. Timber sills above doors and windows are usually lotus-shaped with stories carved on it.

### 3.5. Building Materials

#### Brick

Grey bricks are commonly used in Pingyao residences with a masonry-wood structure and are usually used as enclosure components (such as walls). In a brick laid arched yaodong structure, the brick walls are both structural and enclosure components. Some subsidiary structures such as staircases are also built with brick.

Use of brick in paving and decorative elements will include brick carvings, flower rail, Fengshui screen wall, screen wall and roof ridge decorations, etc.

Due to lack of standards in brick making, and difference in construction periods, the brick size often differs. Table 3.1 shows the sizes of common bricks in Pingyao residences.

Item	Type	Size (mm)
Walls	Rectangular brick	Length: 270-280; width: 130-140; height: 55-65.
Paving	Rectangular brick	Length: 255-270; width: 130-140; height: 55-65.
	Square brick	Length: 260-270; width: 260-270; height: 55-65.

**Table 3.1:** Types and sizes of bricks used in residences

#### Timber

Timber is usually used for structure components for eave projection, supporting components, doors and windows, as well as decorative components in Pingyao residences. The sizes of the wood components vary according to architectural form and techniques.

#### Earth

The uses of earth in Pingyao can be divided into two forms: rammed earth and adobe bricks. The first one is commonly used to build the foundation and to infill the top and span of the arches in Yaodong structure. The latter is to be either laid directly as adobe brick wall or used as infill covered with grey brick wall on the outside.

#### Tile

Tile is a common material for roofs in Pingyao. Table 3.2 shows the types and sizes of the common tiles.

Type	Sizes (mm)
Tong tile	Length: 270-280; width: 100-110; height: 11-12.
Ban tile	Length: 210-230; width: 110-120; height: 11-12.
Di-shui tile	Length: 210-230; width: 100-110; height: 11-12.
Gou-tou tile	Length: 270-280; width: 100-110; height: 11-12.
Ji-zuo tile	Length: 210-250; width: 210-230; height: 70-80.

**Table 3.2:** *Types and sizes of tiles*

### Other Materials

Other materials such as stones are usually used for wall foundation, paving column base, steps, or independent decorative components such as stone lions placed in front of the main gate.

Lime: used as mortars for brick wall, laying roof tiles, etc.

Plant fibers: Used as fillers between the roof tiles and supporting wooden structure underneath.

Metals: hardware, gutters, etc.



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# Chapter 4

## Restoration and Maintenance Improvement of Traditional Courtyard Houses

- 4.1. Introduction
- 4.2. Courtyard Layout
- 4.3. Roofs
- 4.4. Walls
- 4.5. Timber Components
- 4.6. Courtyard Gates
- 4.7. Doors and Windows
- 4.8. Paving
- 4.9. Living Facilities
- 4.10. Decorations
- 4.11. Periodic Maintenance
- 4.12. Scientific Material Conservation  
and Performance Enhancement

# Chapter 4

## Restoration and Maintenance Improvement of Traditional Courtyard Houses

### 4.1. Introduction

The purpose of these guidelines is to provide local authorities with clearer and better defined approaches for the conservation, restoration and maintenance of traditional courtyard houses. Simultaneously, for the first time there is a set of guidelines to assist property owners to understand the historic character and significance of the Pingyao traditional courtyard houses and to better appreciate those elements of the building that make up that character. Pingyao courtyard houses have a range of periods and styles, which retain a high degree of intactness, but some have been altered over time. When adapting and upgrading these houses to accommodate improved contemporary and commercial uses living standards, it is important that their integrity and authenticity as a heritage site are not lost.

As outlined in Chapter 2, photographs of the existing condition of the building, as well as measured drawings of the existing layout are required before making changes to an existing building. Moreover, it is essential to understand its history and heritage significance. The date of construction, the degree of intactness, the courtyard layout, materials, details and original elements must all be studied. Where original details have been removed, one has to refer to similar buildings to help determine what these elements may have looked like. As outlined in Chapter 2, pending on the size and intrusiveness of a restoration work certain steps need to be followed and certain entities involved. Even for small-scale work, property owners or residents should consider seeking professional help, especially that of professional construction teams who have experience with heritage buildings.

This chapter introduces the architectural elements of Pingyaotraditional houses, outlining recommended approaches to building repair, adaptation and maintenance (section 4.12 is mainly for professionals). As outlined in Chapter 2, there are certain principles and processes to adhere to or consider before anywork is made.

#### Basic Principles:

1. Conservation decisions should be carried out based on the specifics of the courtyard house's protection rank (ref. Table 2.1), feature and key protected elements, and be drafted according to

the material properties and deterioration mechanism.

2. An assessment and a sample test of conservation materials and techniques should be carried out before any conservation work is implemented.
3. Conservation materials must be harmless, practical and effective.
4. The historical features of the courtyard must not be affected when conservation work to the material and structure of the courtyard are undertaken to meet contemporary functional needs. The historic features and components of the courtyard must be retained and must not be permanently removed, covered or altered.
5. Periodic maintenance should be carried out after the conservation work is completed (ref. Table 4.1).

## 4.2. Courtyard Layout

Pingyao courtyard houses vary in scale and plan layout as described in Chapter 3. This may include the single courtyard house and the courtyard complex with both principal and secondary courtyards. In terms of courtyard complexes, the principal courtyard is traditionally

a living quarter for the owners whereas the secondary courtyards are auxiliary buildings such as horse carriage yard, side yard, garden, animal stables, servant quarters, etc. The scale and building hierarchy of the secondary courtyard has a lower status compared to the principal courtyard. The traditional single courtyard components include the courtyard gate, dao-zuo, wing houses and principal house (ref. Figure 3.11). A courtyard with higher status has a middle gate (ref. Figure 3.12).

There are many variations to a courtyard layout, as shown in the following diagrams (Figure 4.1).



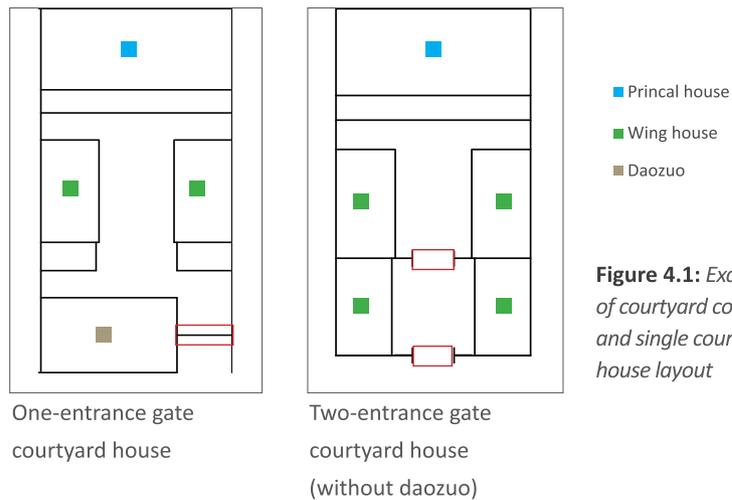
Three-entrance gate courtyard house with adjoining secondary courtyard

Two-entrance gate courtyard house with adjoining horse carriage yard

**Figure 4.1:** Examples of courtyard complex and single courtyard house layout

# Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao



**Figure 4.1:** Examples of courtyard complex and single courtyard house layout

## Guidance Notes

**1. Protecting Feature Elements:** The original courtyard space and configuration are important feature elements of traditional courtyard houses and therefore need to be conserved and retained. This may include the constituent architecture and their relationship to each other, scale and boundary of the architecture, location of the entrance, orientation, courtyard boundary and elevation, etc.

Ad hoc extensions/additions are not allowed in courtyards. Illegal ad hoc extensions disrupting the original spatial layout should be removed.

An assessment of the architecture (removed or extant) must be carried out for seriously damaged courtyards, thereby guiding the repair, restoration, replacement or other conservation decisions.

**2. Documentation and Analysis** of the courtyard components such as the architecture paving and the drainage system, elevation as well as space ratio, conservation status and overall style must be carried out before any changes to the courtyard configuration are implemented.

## 4.3. Roofs

### Type of Roofs

The roof profiles, materials, chimneys and decorative elements are all important elements for the Pingyao city-scape. There are clear views of roofs when walking along the city wall and they contribute significantly to the vistas of the city, and are part of the value of the Ancient City of Pingyao World Heritage site.

There are three types of roofs used in courtyard houses: double slope, single slope and flat (Figure 4.2). Daozuo and principal houses built on the axis of the courtyard usually incorporate a double slope roof, daozuo sometimes has a single slope roof facing the courtyard. Wing houses usually are of masonry-wood structure, incorporating a

single slope roof facing the courtyard. For a masonry-wood principal house, a double slope or single slope roof is commonly used; for a yaodong principal house, a flat roof which usually incorporates a sloping eave is used.

Chimneys are required when there is a kang inside the house.

Traditional sloping roofs are constructed top-down with purlin, rafter, roof boarding, roof bedding mortar and tiles; traditional yaodong flat roofs are constructed top-down with vault brick, earth, cushion and brick facing.

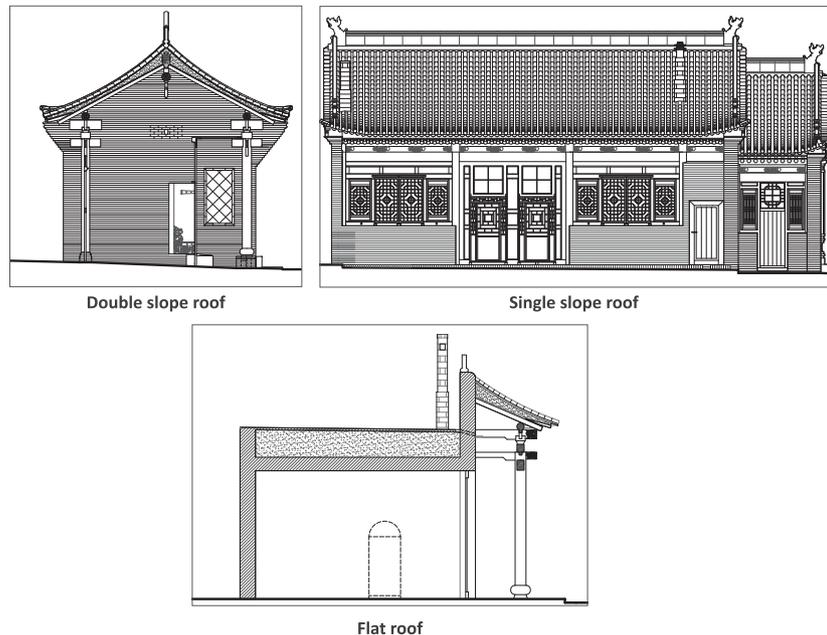


Figure 4.2: Roof types

## Guidance Notes

- 1. Protecting Feature Elements:** The historic roof is an important feature element of traditional courtyard houses and therefore its key features such as roof form, slope, and curve need to be conserved and retained, and must not be permanently removed, covered or altered.
- 2. Documentation and Analysis** of the existing condition of the roof such as dimension, style and material, as well as the conservation status of the roof such as roof structure, roofing layers, materials, installation of the tiles, roof ridge, and decorative elements, drainage, etc. must be carried out before any changes to the roof are implemented.
- 3. Drainage:** The original drainage system should be retained if possible. Any changes to the drainage system must not damage the value or feature elements of traditional courtyards, and should be in harmony with the overall function and appearance of the architecture.
- 4. Structure:** When there has been roof damage caused by loss, missing, displacement or deformation of structural components, the causes of deterioration must first be eliminated and a damage impact assessment of the water-discharge function and architecture forms should be carried out in order to inform the conservation decision.

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

**5. Waterproof:** If the original water-proofing system for the roof meets the conservation objective, traditional materials and techniques should be employed in the repair and maintenance of the roof. Modern materials are allowed when the traditional water-proofing system fails to satisfy the conservation objective, but the possible impact on the porosity and thermal insulation of the roofing should be thoroughly considered. See repair and maintenance measures no.5 for suggested treatment.

**6. Thermal Insulation:** If the thermal insulation system meets the conservation objective, traditional materials and techniques should be applied to the repair and maintenance of the roof. If the conservation objectives are not met, a new thermal insulation layer should be added, following an evaluation of its compatibility with the existing roofing layers.

**7. Roof Load:** Unless special structural work is undertaken, external equipment required for air conditioning, solar heating and satellite communications must not be installed on the roof (ref. 5.3.2) as their weight may damage it.

**8. Material:** Traditional materials should be used during roof repair, modern materials such as cement and corrugated metal that are incompatible with the historic features shall not be used. Cement shall not replace lime mortar in roof ridge repair and laying of roof tiles.

**9. Chimney:** Record of the location of the original chimney should be conducted. Adaptive reuse of the courtyard should integrate the chimney and interior function such as kitchen and bathroom exhaust.

**10. Conservation Treatment:** Original fabric should be retained and repaired only if the original roof is relatively well preserved.

**11. Restoration:** When roofs have been seriously damaged, restoration shall be carried out if there is reliable evidence or traces of original roof forms. If there is no reliable basis, roof form and material of other traditional buildings within the same courtyard can serve as reference to inform the restoration. The restoration should be in harmony with the overall appearance of the courtyard.

### Repair and Maintenance Measures

**1. Tile Maintenance:** Main objective is to prevent leaking, requires periodic action.

(a) Weeding: Should be removed entirely and regularly by hand. If chemicals are used, they should not be harmful to humans, animals and the traditional buildings and should have a long term effect.

(b) Regular cleaning and clearing of tile surface and gutter.

#### 2. Tiled Roof Repair

When water leakage is serious or the roof requires restoration through partial or complete disassembly, all tiles on the roof need to be numbered and recorded before removal. The roof tiles and other elements need to be removed, the wooden roof structure (大木 *damu*) repaired, then the bedding mortar and tile layers reinstalled and reset following the original techniques. Damaged tiles must be repaired or replaced with similar tiles. Once the roof frame has been repaired, all tiles need to be put back on the roof according to the original style.

### 3. Tile Replacement

When the tiles are damaged beyond use, replacement with duplicate copies is allowed.

### 4. Tile Repair

When repairing broken or damaged decorative tile elements, the treated cracks or joints need to be cleaned. Adhesive should be applied on both broken faces and let to penetrate into the tile pieces. Another layer of adhesive should be applied after the first coat dries up, applied with pressure or tie with a rope to the treated tile elements. The piece should not be removed until the adhesive dries completely.

### 5. Two Suggested Repair Methods (with modern materials)

(Figure 4.3).

- (a) Tiles, roof bedding mortar, steel wire mesh, waterproofing material, roof boarding and rafter;
- (b) Tiles, roof bedding mortar, linoleum, roof boarding and rafter.

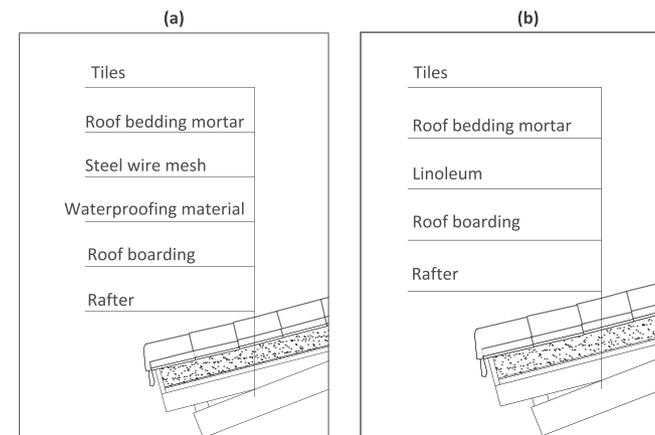


Figure 4.3: Two suggested repair methods (with modern materials)

## 4.4. Walls

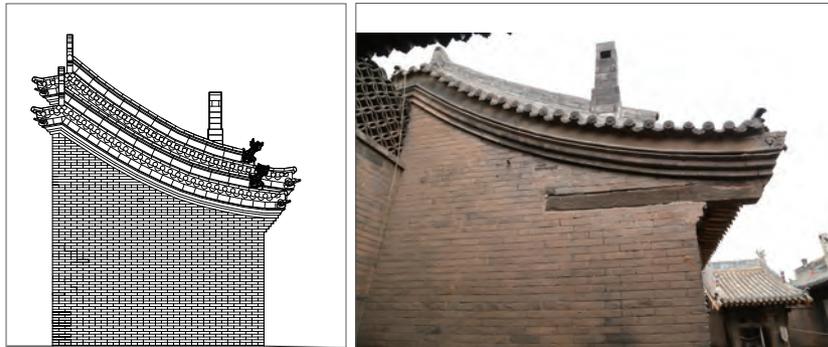
### Type of Walls

Walls can be categorized into four types: gable walls, sill walls, eave walls and courtyard boundary walls (Figure 4.4). The gable wall is the wall that defines the building's depth on both sides. Sill walls are located underneath the windows and stretch across the width

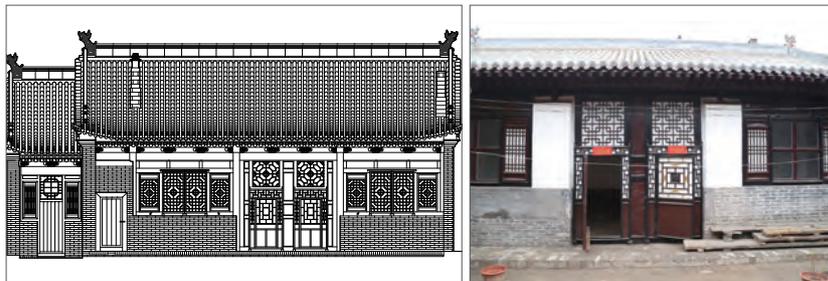
## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

of the building's front façade, the wall thickness is not smaller than the diameter of the column. Eave walls are the walls that define the length of the building on both the front and back. The front eave wall is the sill wall, the back eave wall usually do not have openings on it. Courtyard boundary walls separate courtyards or courtyard complexes (ref. 3.4.1).



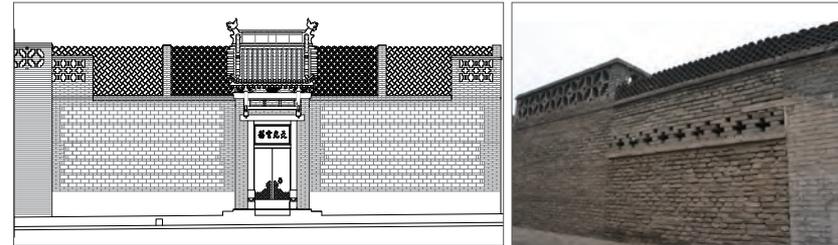
Gable wall



Sill wall



Eave wall



Courtyard boundary wall

Figure 4.4: Types of walls

The eaves on the northern and southern gable walls of wing houses are often different; the north gable wall projects with a wood structure, whereas the south gable wall projects with layered bricks. The thickness of the gable walls is consistent from top to bottom and the middle section is often constructed with earthen bricks on the inside and grey bricks on the outside. The sill walls under the windows are usually laid with grey bricks. Courtyard boundary walls are typically built with grey bricks and have little decoration. The top part of the courtyard boundary wall often has hollowed out decorative patterns laid with tiles.

## Guidance Notes

- 1. Protecting Feature Elements:** The historic wall is an important feature element of traditional courtyard houses and therefore its key features such as thickness, height, brickwork, brick size, decoration and structure need to be conserved and retained, and must not be permanently removed, covered or altered.
- 2. Documentation and Analysis** of the materials, dimension, style, color, construction methods, ornaments, as well as the conservation status of the walls must be carried out before any changes to the walls are implemented.
- 3. Wall Cleaning** should exclude surfaces that are deemed to contain historic values, such as murals and writings. Wall cleaning should only be carried out on stains left on the walls. It must only be undertaken using non-destructive technique and equipment, which must be primarily tested on sample areas of the partial walls. Water must not be used in excess for wall cleaning due to the fact that historic walls contain a lot of salt. All used cleaning materials must be discarded appropriately.
- 4. Wall Material:** Traditional materials such as grey bricks, earthen bricks and mortar should be used in the restoration of the walls. Modern materials such as red bricks, cement and concrete must not be used as replacement materials. For severely damaged or missing earthen brick walls with grey-brick covering the outside, red bricks could be used to replace the inside earthen bricks if necessary. Strong cement mortars must not be used to replace lime mortars for pointing. The restoration materials should be less durable than the original material, in order to avoid further damage on the original fabric. Highly durable materials like cement should be avoided.
- 5. Conservation Treatment:** For well-preserved or slightly damaged walls, the original fabric should be maintained and repaired in situ as much as possible; relaying of large surface should be avoided.
- 6. Restoration:** Processes must be carried out in situ and temporary reinforcement should be applied to the walls where immediate repair is not possible. When walls have been seriously damaged, restoration shall be carried out with traditional materials and techniques, using reliable evidence or similar extant walls as references. The new material needs to be compatible with the performance requirement and visual effect. If there are no reliable evidences, other traditional buildings in the courtyard may serve as a reference. The style should be in harmony with the overall appearance.

## Repair and Maintenance Measures

### 1. Replacement and Repair of Brick Walls

- Wall surfaces with salt efflorescence and erosion up to 2 centimetres and above require removal of the damaged areas

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

and replacement with brick pieces or relaying the identified area.

- Any severely damaged bricks should be removed and replaced by bricks of the same size. If a large section in a lower part of a wall needs to be replaced, a timber mortise and mechanical jack should be used to avoid any damage to the wall. When large areas of a wall are to be replaced, the work should be carried out in phases, with adequate time and distance between them.
- If there is deformation in the earthen-grey brick wall, the inner adobe materials may be replaced. The grey bricks on the surface should be carefully removed and preserved and then the interior earthen bricks. If there are timber brackets within the earthen wall, a temporary brace should be added to support them. Once the earthen bricks have been removed, red bricks can be used as replacement material if necessary, as they will be covered when the original grey bricks are returned to their position in the wall.

### 2. Structural Reinforcement of Brick Walls

- Cracks in the walls caused by tensile or shear force can be treated with installation of rebar inside the wall, adding a cement mortar layer of steel mesh or carbon fibers and grouting.
- The compressive strength of the walls can be improved by partial replacement of materials and adding extra structure components. Wall bracing system to correct deformation and leaning can also help to increase the strength of the wall.

- The corner of the wall is always the area where deformation and stress is most likely to occur. This can be rectified or mitigated by replacing corner bricks with concrete bricks and timber strips as well as installation of anchor bolts reinforcement.

### 3. Brick Wall Moisture Treatment

- The sidewalk adjacent to traditional courtyard houses should avoid using imporous materials such as cement or concrete to prevent splashing and moisture migration onto the courtyard walls.
- Periodic maintenance should be carried out for the roof tiles, eave ends, gutters and drainage pipes; the traditional drainage system can be adjusted if necessary to prevent or mitigate moisture absorption of the brick wall. Addition of drainage pipes and gutters should not impact the façade design.
- A vapor barrier can be added if necessary (ref. 4.12.3).

## 4.5. Timber Components

### Type of Timber Components

Timber structure components can be divided into the roof frame and column. Columns are supporting members of the building and the roof frames are the horizontal extension members. Pingyao masonry-wood structure houses with a sloped roof usually are of

simple post and lintel construction, the main components consists of the beam, purlin, tie-beam, short post, etc., and employ mortise and tenon joint as the main connecting method to form the spatial structural system (Figure 4.5). Its basic form the columns erected on the building foundation, then the beams on the top of the columns, which ties them together. The eave purlins sit directly on the top of the beam, and the middle purlin transfers the load to the beam through a combination of short posts and secondary beams.

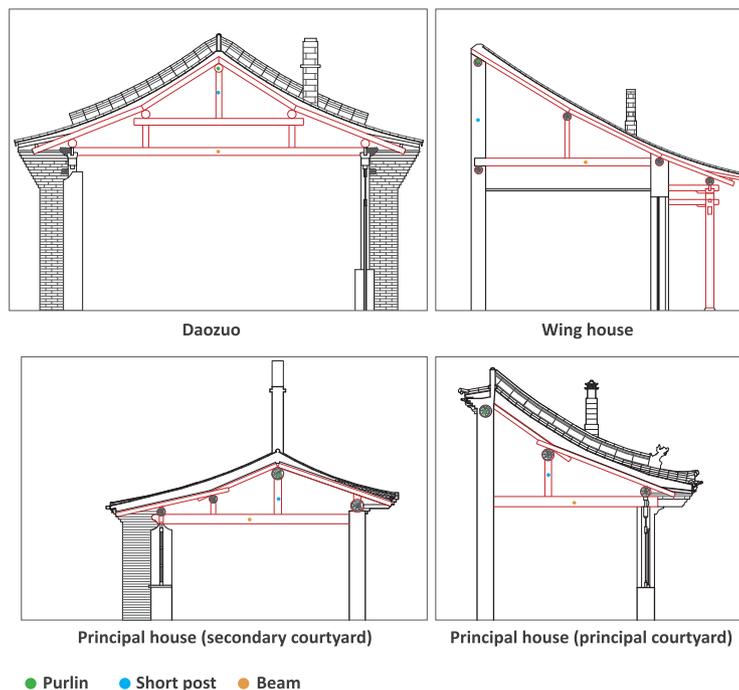


Figure 4.5: Post and lintel construction

## Guidance Notes

- 1. Protecting Feature Elements:** Historic timber structure components such as beams, columns, rafters, purlins and brackets and their surface finishes are important feature elements of traditional courtyard houses and therefore need to be conserved and retained, and must not be permanently removed, covered or altered.
- 2. Documentation and Analysis** of the roof frame's material, structural form, dimensions of the timber components as well as deterioration and causes of timber structure components must be carried out before any changes to those components are implemented.
- 3. Conservation Treatment:** For the well-preserved original timber structure components without negative impact on overall building structure, the original fabric should be retained and repaired in situ if necessary.
- 4. Restoration:**
  - Replacement of Components:** For timber components that have been seriously damaged and affect the overall structural stability of the building, the causes of damages should be eradicated, and repair and/or replacement should be carried out to prevent further damages. The replacement should be compatible with the original fabric both visually and performance wise. If there is no reliable basis, the restoration should reference similar architecture typology or similar timber components of other traditional buildings within the same courtyard.

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

**Restoration through Disassembly:** For seriously damaged timber structure where in situ repair or partial replacement is insufficient to fulfill the conservation goal, restoration through disassembly is permitted with relevant governmental approval. Documentation and numbering of each component should be carried out before disassembly. Temporary reinforcement of seriously damaged timber structure should be carried out before repair/restoration is possible. All permanent and temporary methods used need to be both functionally and visually in harmony with the original components.

**5. Replacement:** Structural components with major damage that cannot be repaired or replaced in situ should be replaced. The dimensions, forms, performances, connecting methods and details of the replaced structure component should be both functionally and visually in harmony with the original component. Replacement materials should be recognizable. Replacement of repairable components is not allowed.

### Repair and Maintenance Measures

#### 1. Timber Elements that are Slightly Damaged:

- Decay

If the decay happens only at the surface, the rotten part can be scraped clean and treated with preservatives. The removed areas to

be replaced with dried timber that matches the original dimensions and appearance and bonded with water resistant adhesive.

For decay that is beyond surface deep, the rotten part can be removed entirely and replaced with new timber; this approach is normally used for consolidation of the column base. The attachment between the old and new materials should be carefully considered.

- Cracks

If the horizontal cracks on the beam and the vertical cracks on the column due to shrinkage are relatively small, the cracked area can be filled up with wooden strips held in place with water resistant adhesive, and then bonded tightly with two or more metal or glass fiber rings. For larger cracks that may affect the structural stability, replacement of the damaged element may be considered.

- Bending or splitting

Propping can be installed for bent or split elements. If there is an architrave underneath the wooden beam, a wood pillar can be installed at the architrave as additional support. If there is no architrave under the wooden beam, a metal hook connection can be installed on the side of the beam, with one end nailed into the beam and the other end nailed into the neighboring structural frame.

- Leaning, deformed and loosened parts or joints

If any of the phenomenon occurs, temporary support should be erected to support the entire structural frame, and then reinstate the leaning, deformed or loosened elements and joints. Seriously damaged beam, architrave, purlin, rafter and ceiling boards should be replaced or repaired in situ.

### 2. Replacing and Maintaining the Wooden Structural Elements:

If elements of the structural frame are gravely compromised and have to be replaced, the damaged elements and areas should first be treated, replaced and reinstated in place. The overall structural frame should be reinforced during reinstatement.

### 3. Enhancement of the Structural Rigidity:

For buildings that have exceeded their load carrying capacity or unbalanced distribution of load due to serious deformation of the structure, but the main wooden structural components are still in good condition, propping should first be installed to the structural frame such that the leaning, displaced and disjointed parts can be reinstated. New materials such as steel mesh and flat steel plate can be used for structural reinforcement together with wooden nails, wooden pillars, and diagonal wooden props.

## 4.6. Courtyard Gates

### Type of Courtyard Gates

Front gates are categorized into building-like gates and wall-like gates (Figure 3.16-3.17) according to the style of the courtyard houses. They are made of either brick or timber. Usually building-like gates are located at the eastern room of dao-zuo, although they sometimes occur in the middle room or parallel with dao-zuo. Wall-like gates are often located in the outer walls of courtyards that do not have dao-zuo. Wall-like gates can be categorized into several groups: complex and simple brick gates, ordinary timber structures and floral-pendant gates. The outer faces of the front gates always have eaves that are either undecorated or floral-pendant style.

Middle gates are usually built in the floral-pendant style, although they can be found in a number of other styles, similar to the wall-like front gate, including complex brick style, simple brick style and the ordinary timber structure type.

Floral-pendant gates consist of two sets of doors, in addition to the door panels set between the partition walls, there is another screen door on the inner courtyard side.

There are a small number of steps outside the building-like gates, with stone drums or stone lions on both sides. Inside the building-

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

like gate, there is a frame, a high threshold, and screen walls on both sides. There is an archway under the building-like gate into the vehicle and horse courtyard, which is usually wide with a sloping ramp instead of steps.

### Guidance Notes

- 1. Protecting Feature Elements:** Historic courtyard gates are important feature elements of traditional courtyard houses and therefore need to be conserved and retained, and must not be permanently removed, covered or altered.
- 2. Documentation and Analysis** of existing condition of the gate such as its location, form, style, dimension, material and damage status must be carried out before any changes to the gates are implemented.
- 3. Conservation Treatment:** For the relatively better preserved gates, the original fabric should be retained as much as possible, and minor restoration is allowed to be carried out in situ if necessary.
- 4. Restoration:** For seriously damaged or missing gates, restoration or replacement can be undertaken if there is reliable evidence or traces of the original fabric. If there is no reliable basis, the restoration must be based on other similar types of courtyard or the overall style of the original courtyard, and the original parts must be identifiable. Any restoration work should be both

functionally and visually in harmony with the original gate.

For repair and maintenance measures, refer to section 4.3, 4.4, 4.5 and 4.10.

## 4.7. Doors and Windows

### Type of Doors and Windows

Traditional doors and windows have two layers or multiple layers with timber frames, and vary in style according to the different status and forms of the houses. The principal house is the key component of the courtyard, thus, its doors and windows, usually multi-panel and partially removable, are wider than those in the wing house, which are supposed to be of a lower status than the principal house. Doors and windows for the wing house are usually better insulated due to safety and privacy requirements. Daozuo shares a similar lower status with the wing house compared to the principal house, therefore its doors and windows are relatively simpler and smaller, with fewer panels.

The doors and windows of the yaodong principal house are embedded in the arch, which can be divided into top and bottom parts. The top part consists of bow-shaped high windows. Shaped

to match the arch curve, they are up to one third to one seventh of the overall height of the arch. The lower part consists of one or three panels, and each panel has an inner and outer layer. The inner layer consists of fixed wood lattice windows set in the window frame, the outer layer consists of paper lined wood lattice windows, and can be opened outwards or from the outside.

The window height of the masonry-wood structure wing house normally extends from the top of the sill wall to the bottom of the beam and the height of the doors is from the top of the steps to the bottom of the beam. The doors and windows are usually level on top, underneath the architrave. Windows in the wing houses are normally divided into four rectangular panels. Each panel has two layers: the two end panels consist of fixed wood lattice windows set in the window frame on the outside; the inner layer is sealed with paper and can be opened inwards. The two middle panels also have wooden lattice windows set in the window frame, with removable parts that can either be opened outwards or be removed; the inner layer consists of fixed wood lattice and bat motif decorative panels, sealed.

### Guidance Notes

- 1. Protecting Feature Elements:** Historic doors and windows and their key components such as window frame, glass, hardware including all metal parts on the windows, sun-shading devices and their elevation locations are important feature elements of traditional courtyard houses and therefore need to be conserved and retained, and must not be permanently removed, covered or altered.
- 2. Documentation and Analysis** of the existing condition of doors and windows such as their locations, forms and patterns, size, materials, opening directions and sun-shading methods must be carried out before any changes to the doors and windows are implemented.
- 3. Improving Efficiency:** The air-tightness, energy efficiency of doors and windows can be improved by repairing, restoring and reassembling components, as well as adding seal taps. The doors and windows of traditional buildings must be assessed on the basis of energy efficiency to determine whether or not to replace the glass and window frames for thermal insulation effectiveness. Newly added glasses, screen windows, seal taps must not negatively impact the overall appearance of the courtyard.
- 4. Conservation Treatment:** For the well-preserved doors and windows, the original fabric should be retained as much as possible, and minor restoration is allowed to be carried out in situ if necessary.
- 5. Restoration** of seriously damaged or missing doors and windows

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

must be undertaken with government approval (ref. Table 2.2), using reliable evidence or traces of original fabric as references. If there is no reliable basis, the restoration must be based on other similar types of doors and windows.

Restoration of windows or doors should retain the original dimensions, locations, forms and decorative features. A newly created opening where it did not exist before or filling of openings that are featured elements should be avoided. Window and door openings facing the street should not be inserted where they did not exist in the past, as this would destroy the character of courtyard walls.

**6. Replacement:** Traditional timber component and hardware should be used. Modern materials that do not match historic features of the courtyard must not be used. No new windows or doors with fussy detailing shall be used in place of the original doors and windows of courtyard buildings.

### Repair and Maintenance Measures

1. For repairable, able to be opened and fine air-tight doors and windows, restoration shall be undertaken. For irreparable ones, replacement with duplicate copies is allowed.
2. Studies of patterns, decorations and sizes, etc. should be carried out before restoration.

3. In order to ensure restoration and replacement parts are enclosed tightly and solidly with the original fabric, the damaged components shall be removed and the original part shall be cleaned first during restoration.

4. Anti-corrosion measurements shall be undertaken in order to prevent the erosion of timber.

5. There are three recommended conservation models for the improvement of historic timber windows, depending on their preservation status (Figure 4.6-4.8).

### Recommended Conservation Model 1

When the original windows are relatively well preserved, they can be maintained through minor restoration. Improvement method: the original timber frame shall be retained, new swing window screen and fixed glasses shall be added; new timber window opening inwards shall be installed on the inside of the original window.

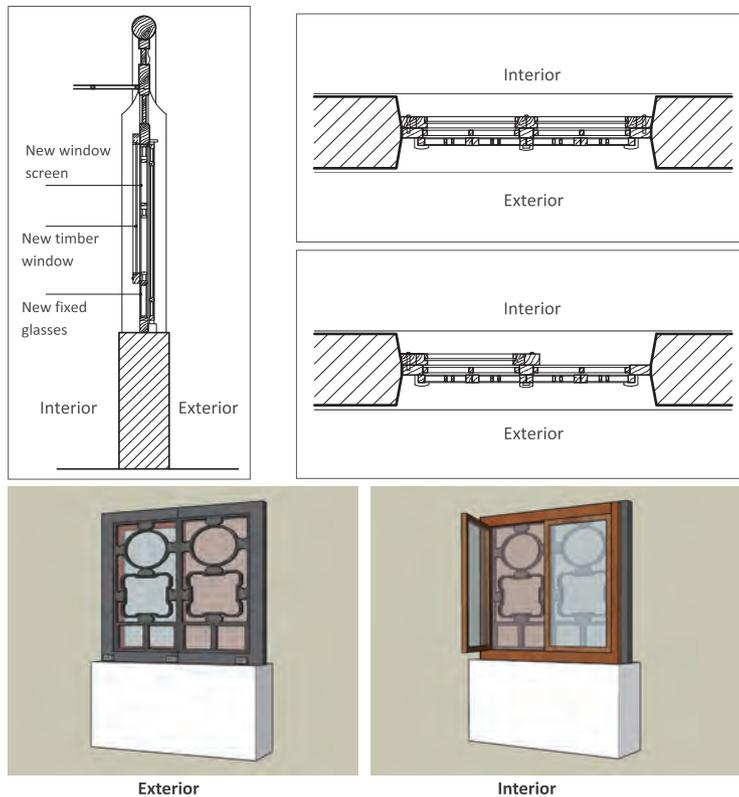


Figure 4.6: Model 1

### Recommended Conservation Model 2

When the status of preservation of the original window is relatively poor, a new window can be added on the inside. Improvement method: the original timber frame shall be retained, new screen windows shall be added at the exterior. A new airtight sliding window shall be added on the original one at the interior.

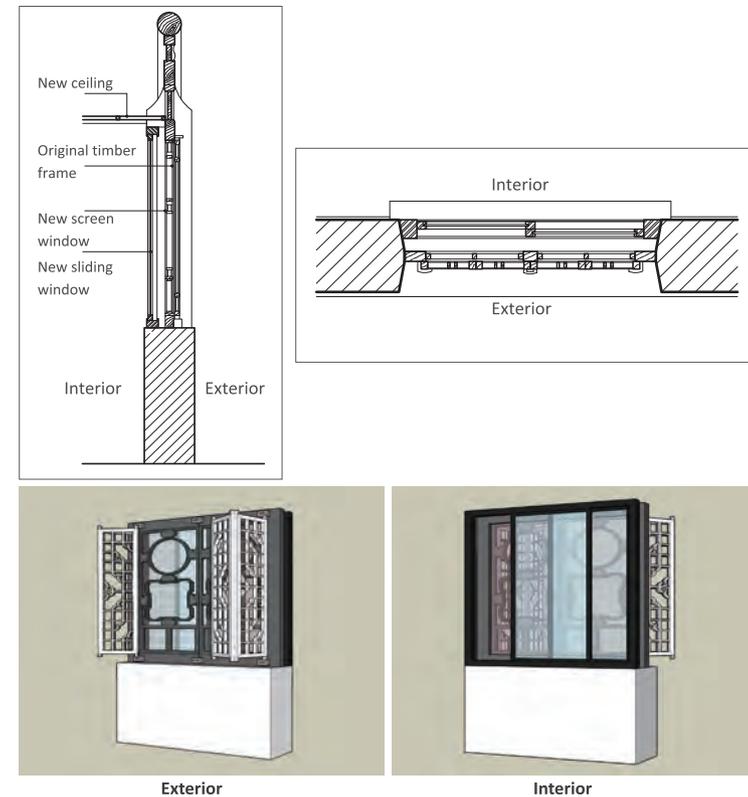


Figure 4.7: Model 2

# Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

## Recommended Conservation Model 3

When the original timber window is in very poor condition or if it does not exist anymore, new windows of reliable references can be installed in place of the original one part of which can be opened.

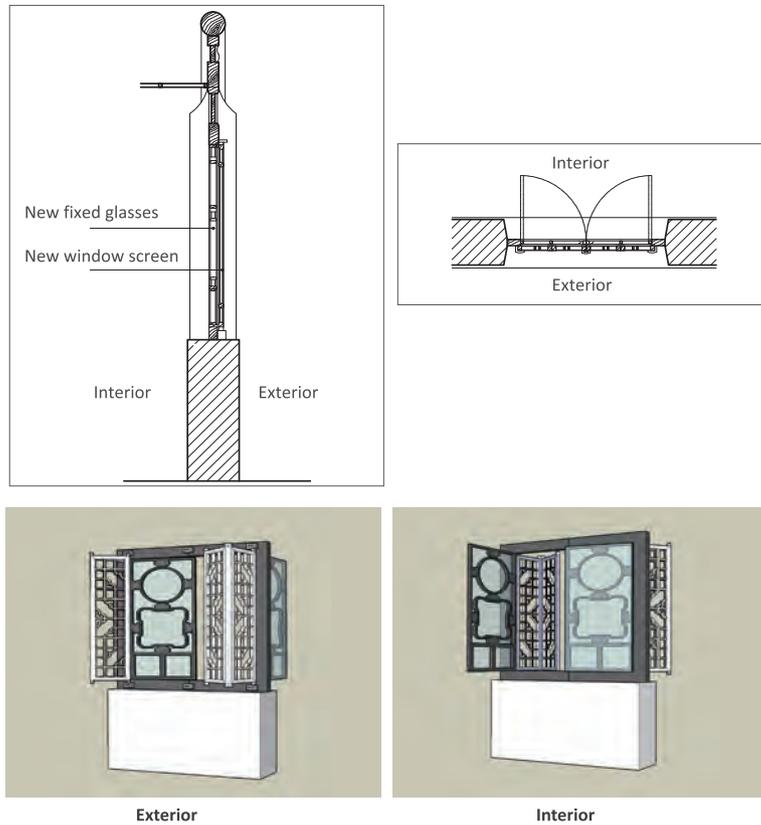


Figure 4.8: Model 3

## 4.8. Paving

### Type of Paving

Traditional paving materials include stones, square bricks and rectangular bricks. They are laid in patterns such as straight stretcher, diagonal stretcher, and shiner. Brick laid in straight and diagonal stretcher courses are commonly used in the center of a courtyard, under the eaves of principal house, wing house and dao zuo (Figure 4.9); rectangular bricks laid in shiner are used to finish the edges (Figure 4.10). Stones are usually used as stepping stones at entrances, middle gates, front gates and rain collecting area.

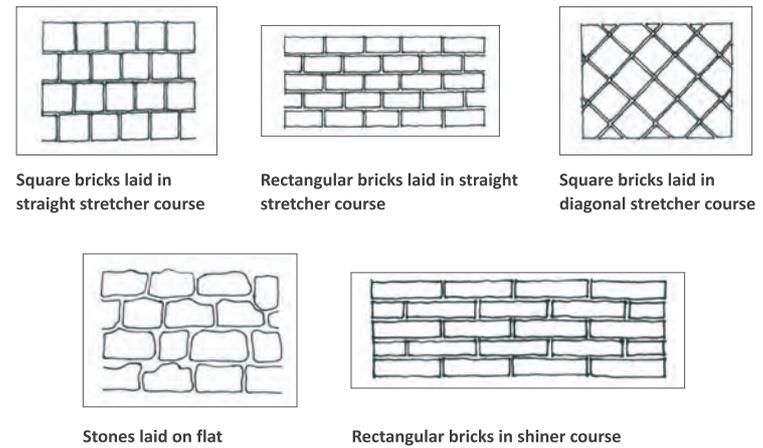


Figure 4.9: Types of paving

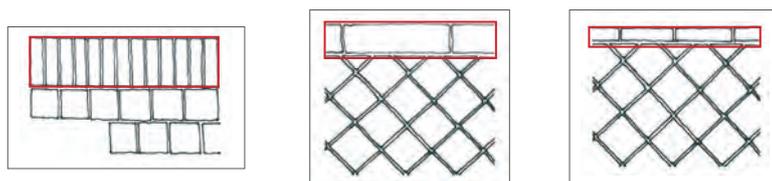


Figure 4.10: Types of paving for finishing the edges

## Guidance Notes

1. **Protecting Feature Elements:** Paving is an important feature element of traditional courtyard houses and therefore needs to be conserved and retained, and must not be permanently removed or altered.
2. **Documentation and Analysis** of the materials, dimensions, paving patterns, bonding materials, surface run-off drainage method and damage status must be carried out before any changes to the paving are implemented.
3. **Grading** of the original courtyard must not be altered without government approval (ref. Table 2.2). Any change to the grading of courtyard needs to be in accordance with the relationship of the interior ground level, street ground level and the bottom elevation of drainage pipe.
4. **Drainage System** of the original traditional courtyard must not be

altered without government approval (ref. Table 2.2). Any change in water drainage systems must not destroy the value and special features of the historic buildings, and must be in harmony with the overall appearance of the building.

5. **Material:** Traditional materials such as grey bricks and stone must be used in the restoration of paving. Cement is not to be used as mortar for laying the grey brick paving. Cement bricks, red bricks or concrete or any other modern paving materials and methods shall not be used, as they are incompatible with historic characteristics.
6. **Conservation Treatment:** For the relatively better preserved paving, the original fabric should be retained as much as possible, and minor restoration is allowed to be carried out in situ if necessary.
7. **Restoration:** For seriously damaged or missing paving, restoration can be carried out if there is reliable evidence or traces of the original fabric. For cases of extreme damage in which the original patterns are unidentifiable, the restoration must be based on other similar types of courtyard paving; the new paving must be in harmony with the overall appearance.

## Repair and Maintenance measures

1. **Removal of Paving:** Damaged paving should be documented in situ before careful removal following the coursework and piece by piece. The removed pieces should be inventoried based on type

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

and damage condition; any remaining mortar traces should be removed before relaying the paving.

- 2. Relaying:** Before large areas of re-paving, flashing should be done, and the ground level height clearly marked; the actual gradient should refer to the overall grading changes in the courtyard.
- 3. Consolidation:** Raw tung oil can be applied to the surface of the brick paving for consolidation purpose; this technique is called “Zuan sheng”.

## 4.9. Living Facilities

### Guidance Notes

- 1. Protecting Feature Elements:** Original living facilities such as water drainage pipes, dry latrine, chimneys, kitchen stove and kang are important features of a traditional house’s functionality. In this context for residential houses, water, electricity and heating systems should meet the living requirements of residents while fulfilling the conservation requirements.
- 2. Documentation and Analysis** of the current grading, drainage gradient and heating systems layout of the courtyard must be

carried out before any changes to the facilities are implemented.

- 3. Modern Living Facilities** such as air conditioning, clothes-drying racks and lighting systems, though not original to the traditional courtyard house, are necessary items for normal modern living. Appropriate steps must be taken to reduce the impact of such facilities on the historic features.

Newly added facilities should be hidden as much as possible, and should not appear on key parts of the building, such as front façade. Wiring for cable TV, air conditioner, electricity and other facilities should also be installed hidden, exposed wiring that are randomly routed are not allowed as they will affect the overall appearance of the courtyard.

- 4. Restoration:** The existing facilities that are still in use should be retained during renovation; any added new metal, PVC pipes and chimneys shall be replaced with materials that are in harmony with the existing components. Dry latrine that do not meet the basic requirements of modern living are encouraged to be modified into contemporary flush toilets, and waterproofing of the toilet and bathroom walls and floors should be carried out.

## 4.10. Decorations

Decorations in traditional Pingyao residences can be divided into two types: carved and painted decoration (Figure 4.11). Carved decorations can be subdivided into wood carving, brick carving and stone carving based on their materials: wood, brick and stone carved decoration. Brick carvings include the carved beast motif pieces on the roof ridges, capping on the chimney, drip tiles at the eave end, decorations on the screen wall, etc. Wood carvings include decorations on the tie beam, architrave and door and window. Stone carvings include carved column base, drum stone, and stone lions. Painted decorations are mainly the polychrome paintings on the timber structure components and mural paintings.



Wood carved decoration



Brick carved decoration

Stone carved decoration



Painting on the timber structure components



Mural painting

**Figure 4.11:** Decorations in traditional Pingyao residences

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

### Guidance Notes

**1. Protecting Feature Elements:** Decorations are important feature elements of the traditional houses and therefore need to be conserved and retained, and must not be permanently removed or altered; they are an integral part of the building's heritage value.

**2. Documentation and Analysis** of the patterns, materials and damage condition of the carved decorations, including how the carvings and decorative materials are being attached to the base layer or other architectural elements. Analysis of the paint layers, period dating, color and material component of the painted decorative element must be carried out before any changes to the decorations are implemented.

**3. Conservation Treatment and Restoration of Carved Decorations:** Relatively well preserved carvings that have only incurred minor damage must be retained; restoration and consolidation is only required on the bonding between the carved element and the architecture.

For seriously damaged carvings, restoration should be carried out if there is reliable evidence or traces of original forms. Restoration materials must be similar in function and appearance to the original material.

**4. Conservation Treatment and Restoration of Painted Decorations:** The surface painting of exterior timber structure components must

be retained to prevent damage from moisture and UV. Polychrome paintings found on timber components should be preserved; surface dirt should be cleaned, timber components repaired and a clear coat of paint should be applied for protective purpose.

For multi-layer polychrome paintings, the value of all paint layers should be assessed to determine the layers that should be preserved. Reliable and gentle measures should be employed to clean the pigments on the required layers and then apply with protective coat.

Traditional materials should be used when applying new polychrome paint, plaster layers, and surface finishes. Paint colors must be in harmony with the overall color scheme of the building and the street.

### 4.11. Periodic Maintenance

**Periodic maintenance** refers to regular maintenance measures that help prevent building deterioration without any change to the current courtyard structure, façade, decoration, material, etc. and should mainly be carried out by residents. Residents can undertake periodic maintenance for any conservation subjects, especially for the courtyard paving, roof, timber structure components, doors

and windows, etc. Relevant maintenance regulations must be developed in order to ensure that the continuous monitoring and documentation of conservation subjects shall be recorded before the implementation of maintenance. Maintenance of historic buildings must be carried out according to the regulations. The following key elements must be assessed when undertaking periodic maintenance of a traditional courtyard:

- If there is any deformation, decay or cracks on timber structure components and connecting joints; working condition of the crucial structural nodes;
- Settlement and deformation of the floor foundation;
- Cracked, weathered, moisture or effloresced condition on the walls;
- Leakages, weeds or broken tiles on the roof;
- Deformation or loose condition on the doors and windows;
- Condition of the painted decorations;
- Deformation, broken bricks or puddles on the paving;
- Moisture insulation measures for walls;
- Fire, corrosion, and pest prevention measures for timber components;

- Condition of previous repair activities.

A **periodic maintenance cycle**, usually once a year, must be implemented for the building. Special items may need a shorter maintenance cycle, usually every 6 months, including: building and courtyard environment; deterioration, decay and settlement of foundation; major deformation and cracking of load bearing structural elements. Thorough assessment should also be carried out after any major natural disaster.

See Table 4.1 on the following pages for a detailed checklist of the building maintenance items and their according maintenance cycle.

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

Element	Inspect for	Frequency (years)	Action
<b>Setting of the Building</b>			
<b>Setting</b>	- Rubbish and combustible material	0.5	- Clear away rubbish from courtyard
<b>Vegetation</b>	- Feral plants and pests	1	- Undertake regular weeding and remove weeds and pest plants
<b>Wall</b>	- Rising damp and masonry damage	1	- Eliminate cause of dampness, repair where necessary
<b>Environmental issue</b>	- Water pollution, weeds, damaged roads	1	- Check the function condition of drainage pipes and sanitation facilities. - Ensure storm water is redirected away from paved areas.
<b>Structure</b>			
<b>Foundation</b>	- Subsidence, structural deformation, cracking of brick wall, animal burrowing, stability of floors and walls above foundations. - Inspect bottom part of the wooden column, column base and foundation for termites and rot.	0.5	- Stabilize the structure and/or undertake remedial action as required
<b>Timber framing element</b>	- Warping, misalignment, splitting, rot and termites in horizontal wooden structural members. - Curvature and damaged condition of the yaodong arch. - Alignment, splitting and cracking in wooden column; displacement, cracking, bulging and detachment of wall; check connection between column and horizontal timber members.	1	- Replace and repair defective elements. - Structure shall be reinforced if necessary.
<b>Roof frame</b>	- Warping, misalignment, splitting, rot and termites in beams, rafters, purlins and battens. - Check connection between vertical structural members.	1	- Remove, replace and repair defective components of roof frame.

Element	Inspect for	Frequency (years)	Action
<b>Rainwater</b>			
<b>Gutters and box gutter</b>	- Leaf litter, leaks, dislodged or missing components.	0.5 – and after storms	- Re-attach loose gutters. Clean gutters. - Replace gutters if necessary. - Repair leaks where possible.
<b>Down pipe</b>	- Blockages, connections to gutters, discharge away from building, leaks, dislodged or missing components.	0.5 – and after storms	- Re-attach loose down pipes and connections. - Clear blockages. Repair leaks where possible. - Ensure down pipes discharge away from the building.
<b>Discharge and drain</b>	- Check discharge gradient of flat roof, leakages on sloped roof. - Check drainage lines and open channels.	0.5 – and after storms	- Ensure adequate site drainage. - Clear open drainage channels.
<b>Water supply</b>	- Inspect water supply systems.	1	- Look for leaks, broken plumbing, leaking taps etc.
<b>External Elements</b>			
<b>Walls and façade</b>	- Check for signs of water penetration and rising damp. - For masonry walls, check for damaged brick and stone work – including rising damp, salt damage and eroded mortar joints. - Check for cracking, leaning or bulging masonry.	1	- Identify and remove sources of moisture where possible. - Re-attach loose elements. - Replace missing elements to match existing. - Undertake masonry repairs without the use of hard cement mortar. - Obtain specialist structural advice if necessary.
<b>Roofing</b>	- Built-up tile debris and leaf litter. - Check for wind impact damage, including loose tiles and roof boarding, leaks, corrosion and fall off condition.	Depending on weather condition or 0.5	- Clean as necessary. - Re-attach loose elements. - Replace missing elements to match existing. - Retain existing tiled roofing as much as possible and replace irreparable tiles to match existing.
<b>Door and window</b>	- Closing and fixing of hinges and latches. - Check for loose and missing components and damaged or rotting boards.	1	- Retain traditional door and window hardware. - Replace and repair defective timber elements to match existing.

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

Element	Inspect for	Frequency (years)	Action
<b>Paving</b>	<ul style="list-style-type: none"> <li>- Check for weeds, rain puddles, cracks, loose or damaged bricks and paving level.</li> </ul>	0.5 – and after storms	<ul style="list-style-type: none"> <li>- Clean weeds and replace the damaged bricks.</li> <li>- Remove the damaged bricks and adjust the original grading before partial replacement if necessary.</li> </ul>
<b>Internal elements</b>			
<b>Floor</b>	<ul style="list-style-type: none"> <li>- Signs of water penetration.</li> <li>- Check bricks for loose, missing, damaged or rotting flooring.</li> <li>- Check floor tiles for soundness, wear and tear.</li> </ul>	1	<ul style="list-style-type: none"> <li>- Identify and remove sources of moisture where possible.</li> <li>- Consolidate loose bricks. Repair and replace damaged bricks to match the original.</li> </ul>
<b>Wall lining and finishes</b>	<ul style="list-style-type: none"> <li>- Signs of water penetration, mold or staining.</li> <li>- Check for living organisms inside earthen wall.</li> </ul>	1	<ul style="list-style-type: none"> <li>- Identify and remove sources of moisture where possible.</li> <li>- Consolidate loose bricks. Repair and replace damaged bricks to match the original.</li> </ul>
<b>Ceiling</b>	<ul style="list-style-type: none"> <li>- Check for loose or missing components, borers or termites and any other damage.</li> </ul>	1	<ul style="list-style-type: none"> <li>- Repair and replacement of damaged or missing timber structure component.</li> </ul>
<b>Painted decorations</b>	<ul style="list-style-type: none"> <li>- Check condition.</li> </ul>	1	<ul style="list-style-type: none"> <li>- Do not paint any unpainted surfaces.</li> <li>- Apply a protective coat for timber structure components where necessary to prevent corrosion.</li> </ul>
<b>Other issues</b>			
<b>Environmental</b>	<ul style="list-style-type: none"> <li>- Limit use of pesticides or chemicals.</li> <li>- Preferable means of preventing pest damage include the use of naturally durable hardwoods, treated timber, earthen and metallic materials.</li> <li>- All replacement material and activity should be documented.</li> </ul>		
<b>Historical</b>	<ul style="list-style-type: none"> <li>- Materials for repairs to structures should preferably be of similar age and style to those being replaced.</li> <li>- Traditional construction techniques shall be used as much as possible.</li> </ul>		

**Table 4.1:** Periodic maintenance items for traditional Pingyao courtyard houses

## 4.12. Scientific Material Conservation and Performance Enhancement

### 4.12.1. Material Conservation Guidance Notes

The conservation of historical building materials must meet the goals of presenting and enhancing the value of the historical buildings, helping to sustain them and further enhance their functionality. Material conservation as defined in this context will include the elimination of causes of deterioration, and also on the restoration of the material performance and appearance. Technical solutions must be formulated based on the protection rating of the courtyard (ref. Table 2.1) and feature characteristics and specific to the material characteristics and deterioration mechanism. Testing of the conservation and restoration materials and techniques that apply to the intended specific working condition, performance and application period must be carried out. Sample in situ tests on the conservation object or on similar building types should be carried out.

Timber, brick and earth are the most common materials used in the construction of Pingyao courtyards. The use of timber is a direct influence and inheritance of the traditional Chinese wooden structural system of Chinese buildings, while brick and earth are based on the specific geographical characteristics of the Loess Plateau.

### Chinese Wooden Structural Traditional Materials and Proposed Conservation Treatment

#### 1. Brick

- Weathering

Weathering is one of the most common form of brick deterioration, and is mainly demonstrated by loss of material quality and aging. Depending on the extent of weathering, common conditions include powdering, crusting, peeling and holes and even major loss (Figure 4.12).

**Treatment Recommendation:** Conservation treatment may include removal of damaged fabric, laying of surface brick tiles or in fill of brick powder to compensate loss, and preserve as it is based on the damage condition of the bricks.



Figure 4.12: Weathered bricks

- Efflorescence

Efflorescence, the salination condition, can cause serious damage to the bricks and can lead to other implicated damages. The main condition is whitening, normally in patches of large areas on the

# Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

brick wall, and the affected area is associated with dampness (Figure 4.13).

**Treatment Recommendation:** Cleaning and desalination (ref. 4.12.4).



Figure 4.13: Brick efflorescence

- **Moisture**

Moisture damage is caused by water and it appears with a large area of darkening bricks as they absorb the water and humidity in the air (Figure 4.14).

**Treatment Recommendation:** Eliminate sources of moisture, cleaning and desalination (ref. 4.12.4).



Figure 4.14: Moisture damage to bricks

## 2. Wood

Common forms of timber deterioration include cracking, decaying and detachment of surface plaster layers.

(a) Wood cracking usually appears at the point of greatest load and occur in the direction of the wood grain (Figure 4.15).

Wood decaying is commonly found in areas that are exposed to frequently alternating wet and dry conditions, such as the rafter end.



Figure 4.15: Wood cracking

**Treatment Recommendation:** Filling of cracks and voids, component replacement, structural reinforcement.

(b) Detachment of surface plaster layers. Surface peeling is normally found on the surface of load-bearing components such as pillars, beams and architrave, especially at their edges (Figure 4.16).



**Figure 4.16:** *Detachment of plaster layers of column (left) and stairs (right)*

**Treatment Recommendation:** Surface treatment.

### Basic Principles for Material Conservation

1. Traditional techniques and materials should be used for the restoration of the protected surfaces of traditional buildings.
2. Replacement materials can be used only under the following conditions:
  - When traditional materials and techniques no longer exist;
  - When traditional materials and traditional techniques would not achieve the conservation objectives;
  - When traditional materials and traditional techniques would have a negative impact, including environmental impacts;

- When traditional materials and traditional techniques cannot meet current building specifications.
3. The use of replacement materials must be controlled and limited, as their application on large areas would impact the integrity and authenticity of the protected object.
  4. The use of replacement materials must not affect the durability of the material used in the original construction.



**Figure 4.17:** *Improper use of replacement materials*

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

5. When new structural reinforcement and materials are used, attention must be given to their impact on protected surfaces. Grouting material such as cement that contains salt or other harmful composition may impact the surface of the decorative elements and must be used cautiously.
6. A test sample area should be carried out by an experienced technician after the conservation plan has been drafted. A report on the sample test must be submitted to the evaluation committee and professionals will be consulted before application on a large area.

### 4.12.2. Façade Cleaning

Cleaning is a conservation undertaken to remove the mulch, dust, stains and harmful components on the surface without damaging the integrity or sustainability of the key architectural features of the historic buildings. Façade cleaning techniques, materials and objective employed for traditional courtyard houses are different from the cleaning and renovation of other general buildings.

If the surface material or dirt is not deemed harmful to the historic fabric after survey and assessment, then façade cleaning is a selective conservation whose main purpose is to restore the historic appearance, and may or may not be conducted depending on the circumstances.

1. Before cleaning the building façade, survey and assessment of the wall material, the degree of pollution and its causes should be carried out, and testing undertaken on a small sample area.
2. The purpose of the tests is to determine the chosen cleaning materials and techniques can achieve the desired effect. Verification from relevant authorities needs to be obtained before work begins.
3. Cleaning methods include physical, chemical and combined physical and chemical methods. In view of the high level of saline in the brick walls of Pingyao residences, brick wall and wood structure must not be washed with water and wet sand. Common physical methods appropriate for cleaning brick walls in Pingyao courtyard houses include:
  - **Brushing:** surface dust and other adherents on the walls may be brushed off with hard and soft brushes; this method is suitable for cleaning all types of enclosure surfaces.
  - **Sandblasting:** Dry sandblasting is appropriate for cleaning hard stone wall surfaces. This method involves spraying fine sand and other small particles such as shreds of hard seeds, etc. onto the surface of the wall using high-pressure air to remove the dirt via surface abrasion. The abrasion of surface material caused by sandblasting is irreversible, therefore this method is not to be used on brick walls or painted surfaces.

- **Mechanical Grinding:** Involves the use of small machetes, chisels and angle grinders to remove surface adherents on historic fabric and is appropriate for use on stone wall surface made of relatively thick natural stone that has little decoration.



**Figure 4.18:** A wall having stains and covered with improper material which needs to be cleaned urgently

### 4.12.3. Installation of Vapor Barrier in Walls

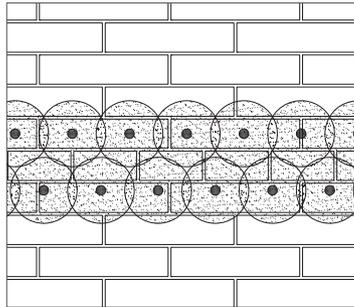
Installation of vapor barrier of a wall involves the installation of a moisture barrier, without replacing the foundation, or the mechanical and chemical methods to prevent or reduce the rise of capillary water. If testing proves that the wall damp is due to the rise of capillary water, and the moisture level has jeopardized the safety of the structure or functional use of the building, vapor barrier

should be installed if the foundation will not be replaced.

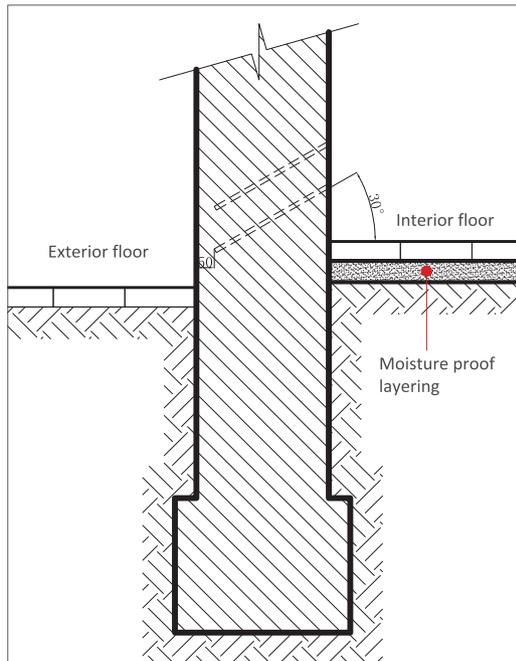
1. Before installing the vapor barrier, priority should be given to other methods for reducing rising capillary water that do not disturb the original structure of the traditional building, in order to reduce damage to the wall.
2. The installation of a vapor barrier may involve mechanical, physical or chemical injection methods. The most appropriate method to use shall be determined based on the wall structure, the moisture condition, structural safety and importance of the building.
3. After the installation of the vapor barrier, efflorescence may appear during the drying process. The method for treating efflorescence is described in section 4.12.1-(1)-(b) and 4.12.4.
4. Physical repair methods of the vapor barrier include the extraction brick (stone) displacement method and V cutting.
5. Chemical injection repair methods of the vapor barrier involve punching the surface of the wall and injecting a waterproofing agent that will prevent capillary water from rising (Figure 4.19-4.20). Only materials that have been tested shall be used. This method must only be applied by a professional construction team.

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao



**Figure 4.19:** Two rows of holes shall be punched, so that a waterproofing agent can be non-pressure injected



**Figure 4.20:** The section of the double-row-hole punch (eg. 370mm thick walls)

### 4.12.4. Removing Efflorescence

Water-soluble salts inside wall body, which damage masonry and other inorganic materials through crystallization and deliquescence, are one of the causes of deterioration of traditional buildings.

If a significant amount of water-soluble salts is detected in a wall, the affected material must be replaced or measures must be taken to discharge the salt. Salt discharge may involve lossy salt discharge and/or no-loss salt discharge. Lossy salt discharge is a method of replacing the materials damaged by the salt. It reduces the integrity of the traditional building because original materials are removed. No-loss salt discharge uses the capillary action of water-soluble ions to bring the salt to the surface layer, from where it can then be removed.

The poultice cleaning method is a commonly used no-loss salt discharge method. A paste-like poultice, either prefabricated or prepared onsite, is applied onto the surface of the masonry and other porous inorganic materials. It absorbs dirt and draws out water-soluble salt, reducing their quantity in the masonry and other inorganic materials and, thereby, helping to preserve historical materials. An alternative is the use of sacrificial lime plaster (without cement) to absorb the salt; this lime plaster must be removed after a suitable period (generally 12 months) to re-expose the original wall surface.



**Figure 4.21:** *Brick wall face with moisture and efflorescence*



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財星高照平安樂

人順家順萬事順



# Chapter 5

## Traditional Courtyard Houses Performance Enhancement

5.1. Introduction

5.2. Adaptive Reuse

5.3. Guidance Notes for Living Facilities Upgrade

## Chapter 5

### Traditional Courtyard Houses Performance Enhancement

#### 5.1. Introduction

With changes in custom, family structure and lifestyle, the original function layout and spaces of traditional Pingyao courtyard houses are faced with the issue of how to adapt to modern living needs (Figure 5.1). These issues include the addition of kitchen and bathroom facilities (Figure 5.2) into the courtyard spaces in an ad hoc manner and need for increased privacy due to change from single family to multi-family ownership in a single courtyard; as well as addition of modern equipment such as air conditioning, solar panel, satellite dishes, etc. Inadequate fire safety measures poses potential hazard for the inhabitants and the traditional building.

This chapter provides recommendations for the conservation of the functionality, facilities and materials of the traditional buildings, incorporating reconcilable approaches for modern living while retaining the traditional character of the courtyard houses.



Figure 5.1: Ad hoc additions into the courtyard spaces disrupt the traditional layout



Figure 5.2: The most common kitchen and bathroom in traditional courtyard

## 5.2. Adaptive Reuse

Adaptive reuse is the sustainable use of the traditional courtyard houses, such that it can continue their original functions or reuse for new functions, with the pretext of protecting the traditional buildings. In the context of a living World Heritage site, continuing residential use, accommodating existing families, is appropriate and encouraged. It is acknowledged that services and facilities need to

be upgraded to reconcile modern conveniences in a suitable way for traditional buildings.

### 5.2.1. Standards of Adaptive Reuse

1. Priority must be given to maintaining the traditional functions of Pingyao traditional courtyard houses.
2. With the pretext of maintaining the authenticity and integrity of the traditional buildings of Pingyao, any new adaptations must not:
  - a) change, damage or weaken the historic features and protected elements
  - b) cause noise, odor, vibration or visual impact on the surroundings
  - c) damage the structure and material of traditional buildings
  - d) compromise the cultural significance, authenticity and integrity of traditional courtyard buildings in the context of the Ancient City of Pingyao World Heritage site
3. Different uses are appropriate for different kinds of streets, based on the evaluation of adaptive reuse of Pingyao traditional courtyard houses, as shown in Table 5.1.

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

Street	Item	Adaption
Commercial street	Appropriate	Guest house, traditional arts workshop, food and beverage outlet, shop, tourism business, museum, residential
	Inappropriate	Factory, large-scale commercial enterprise
Non-commercial street	Appropriate	Residential, guest house, traditional arts workshop, community center, community shops, museum, kindergarten, clinic
	Inappropriate	Factory, tourism business, food and beverage outlet

**Table 5.1:** List of appropriate and inappropriate adaptive reuse

### 5.2.2. Guidance Notes for Residential Functions

1. When traditional courtyards are used as residences, the original space arrangement and local customs should be respected.
2. Feature elements, such as the kang, stove and chimney, should not be removed, repositioned or covered.
3. When courtyards are home to more than one household and thus compromise the living conditions, the number of families may be reduced through relocation, merger by acquisition if circumstances allow for such.
4. Spaces that are owned by more than one household should be properly rearranged to improve integration and privacy.

5. Modernization of kitchen and bathroom facilities: refer to 5.3.1.

6. Any alterations to the structure or exterior of buildings, such as repositioning of door or window openings, removal of load-bearing walls and arches and the addition of new openings should be examined and approved by the authorities (ref. Table 2.2).

7. The requirements for each architectural element are as follows:

**Floor:** original brick floors that have not sustained damage should be maintained. A waterproofing layer can be added below the brick and covered by repaving. Damaged floors should be repaved with reference to the original.

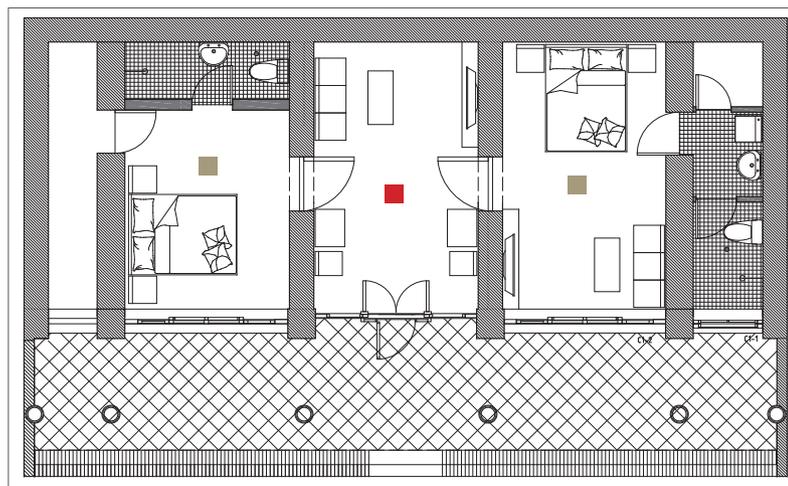
**Wall surface:** Lime plastering should be applied as surface materials. Do not use impermeable paint.

**New partition wall:** use light-weight partitions or light-weight block walls.

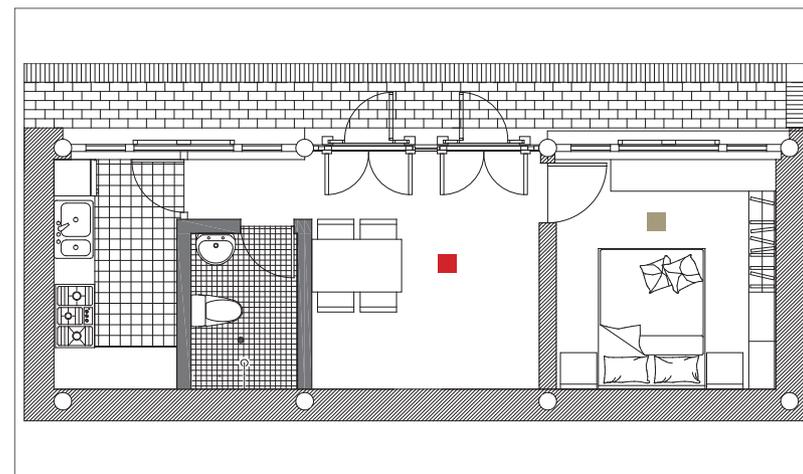
**Ceiling:** expose the interior roof frame if they are considered a feature element; non-feature elements can be covered with a ceiling.

**Doors and windows:** refer to 4.6.

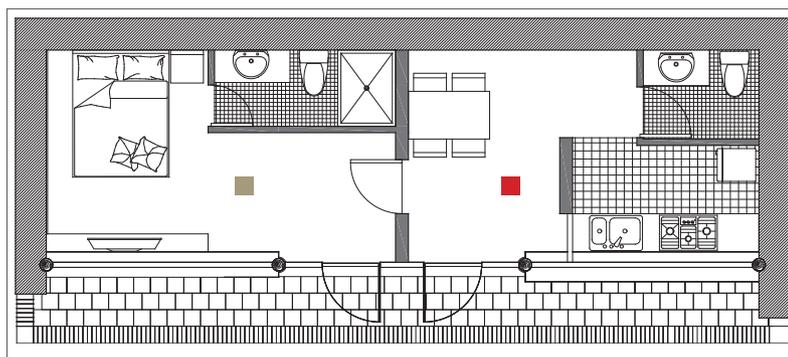
Figure 5.3 shows some examples of residences integrating modern living condition (for the location of each space within the courtyard, refer to Figure 3.11).



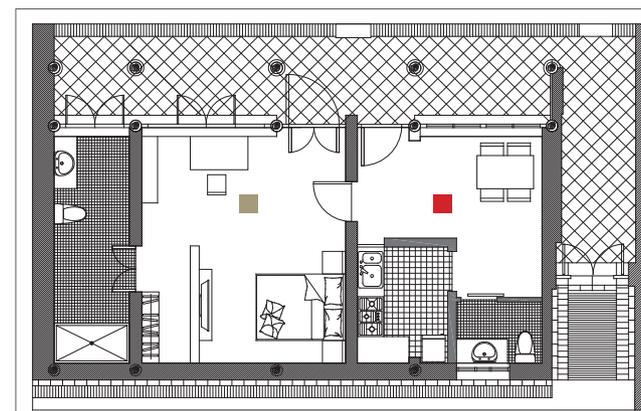
Principal House



Wing House



Wing House



Daozuo

■ Living room

■ Bedroom

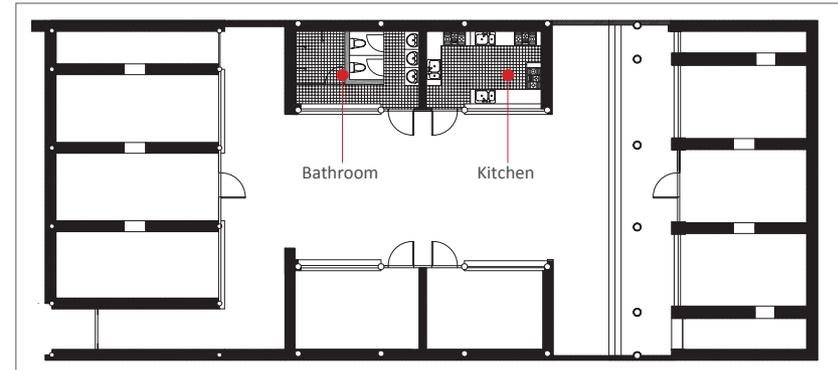
Figure 5.3: Examples of residences integrating modern living condition

## 5.3. Guidance Notes for Living Facilities Upgrade

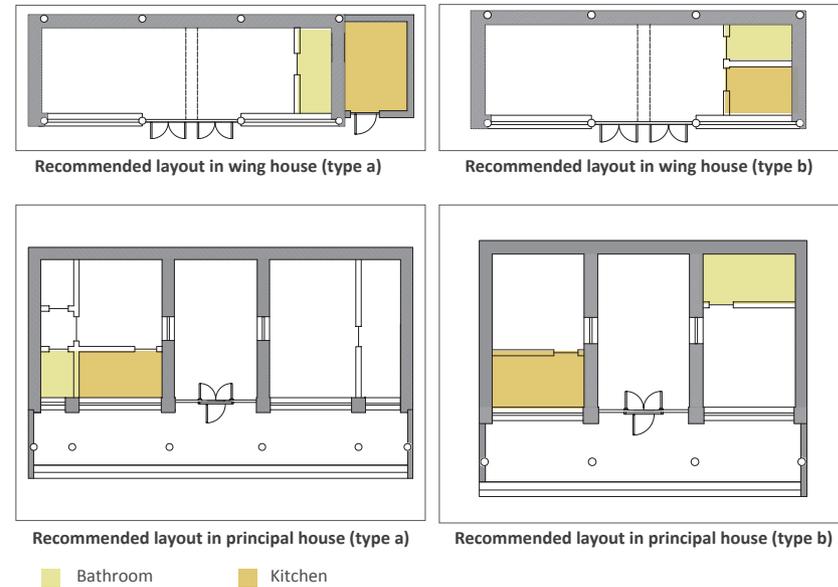
### 5.3.1. Bathroom and Kitchen

1. When the location and size of the original bathroom and kitchen meet modern requirements without negative effects on the traditional courtyard houses, they can be renovated in the original location.
2. When the location and size of the original bathroom and kitchen do not meet modern requirements, they can be changed in accordance with the requirements included in this section.
3. The bathroom and kitchen should have mechanical ventilation.
4. The bathroom wall and floor should have a waterproof layer, and ceilings should be of water-resistant material.
5. The bathroom should be separated into wet and dry areas, and the shower should best be enclosed.
6. The wall and floor of the kitchen should have a waterproof layer.
7. For kitchen exhaust, existing exhaust systems and/or chimneys should be used. Do not discharge smoke towards the courtyard.

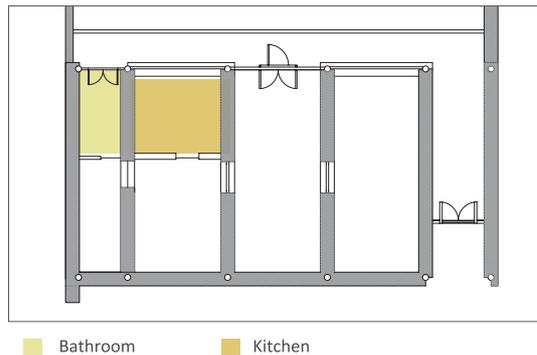
Figures 5.4-5.6 show some recommended models of bathroom and kitchen.



**Figure 5.4:** Recommended model for public/shared bathroom and kitchen within a courtyard building



**Figure 5.5:** Recommended models for the installation of private bathroom and kitchen in wing house and principal house



**Figure 5.6:** Recommended model for the installation of private bathroom and kitchen in dao zuo

### 5.3.2. Guidance Notes for Installation of Air Conditioning and Energy Source Selection

1. To reduce pollution, coal or honeycomb coal should not be used as fuel for heating and cooking. Centralized heating systems or gas/electricity boilers for heating and gas or electric stoves for cooking should be used if possible.
2. VRV or geothermal heat pump air-conditioning systems should be used to reduce the impact on the façade instead of split air-conditioning systems.
3. The condensing unit and pipelines of a split unit should be discretely installed and the condensing unit can be covered with a framed box that fits the appearance of the courtyard if a split unit is necessary (Figure 5.7).



**Figure 5.7:** Location of air conditioning condensing unit

### 5.3.3. Guidance Notes for Disaster Prevention

1. Each courtyard should have a fire extinguisher in a prominent location.
2. Rank I protected courtyards (ref. Table 2.1) should have automatic fire alarm and linkage control system.
3. Non-combustible and fire rating material should be used for building maintenance and construction work. Key wood components should be fireproofed.
4. If a building is damaged by fire, any dismantling installation and replacement of the building structure (load-bearing walls, columns, beams and arches) should be reported to the authorities for approval before implementation (ref. Table 2.2).
5. Lightning rod protection devices should be installed on top of the building.

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# Chapter 6

## Streetscape Management

- 6.1. Introduction
- 6.2. Street Façade
- 6.3. Steps, Ramps, Paving and Platform
- 6.4. Commercial Signage
- 6.5. Street Lighting
- 6.6. Outdoor Business Areas and Infrastructure

# Chapter 6

## Streetscape Management

### 6.1. Introduction

The streets are an important component of the Pingyao World Heritage site, and are the principal components of the environmental improvement work. The streetscape improvements are based on needs of local residents and visitors of the city, granted that any conservation carried out do not detract from the historic character of the city. There are three basic principles to streetscape improvement: integration and harmony with the overall setting; protection of feature elements; and joint use of traditional techniques and modern technology, to ensure that no inappropriate operations are undertaken that detract from the character of the streetscape. The streets can be categorized into commercial and residential streets taking into consideration factors such as function, grade, style, interface, openness, etc. of the streets. This guideline provides guidance in the following six aspects:

- Street façade (ref. 6.2);

- Steps, ramps, paving and platforms (ref. 6.3);
- Commercial signage (ref. 6.4);
- Street lighting (ref. 6.5);
- Outdoor business areas (ref. 6.6.1);
- Infrastructure (ref. 6.6.2).

There are 199 streets and lanes in the Ancient City of Pingyao, mostly straight and orientated either north-south or east-west. These streets cover an area of 184,000 square metres, with a total length of 39,300 metres.

There are 84 streets (6 commercial streets and 78 residential streets, Figure 6.1) identified as protected streets based on the *Planning for Protection and Control of the Ancient City of Pingyao (2012)*.



**Figure 6.1:** Layout of the Ancient City of Pingyao, the commercial streets are shown in red, the residential streets are shown in blue

## Commercial Streets

The South, North, East, West Main Streets, Chenghuang Temple Street and Yamen Street (indicated in red in Figure 6.1) are the six main commercial streets, constituting the main framework of the road system of the Ancient City of Pingyao forming a continuous commercial architecture interface. Most of these streets are 4-5 metres in width, although some sections of North Main Street are 8 metres wide. Most buildings along the commercial streets have one or two storeys, each 4-6 metres in height. The height-width ratio is approximately 1:1 (Figure 6.2).

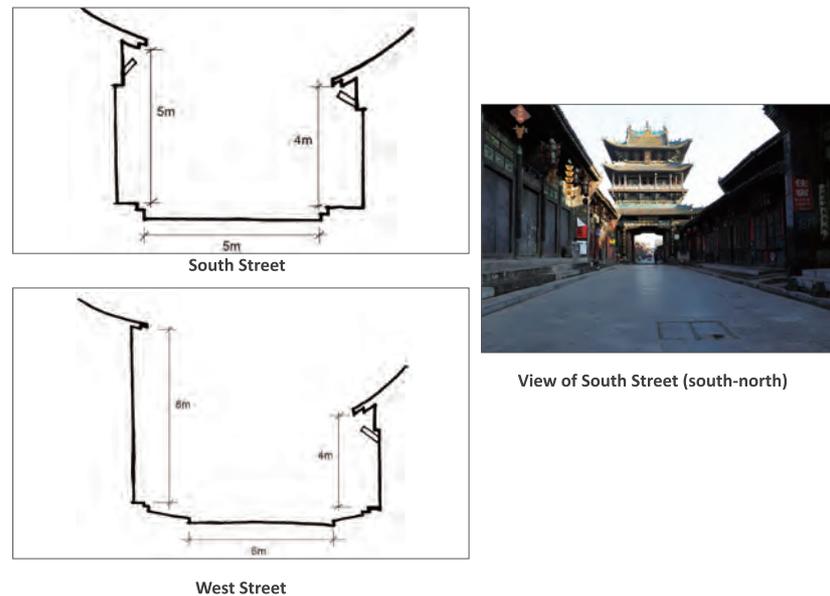


Figure 6.2: Typical section of commercial streets

## Residential Streets

There are 78 residential streets and lanes in the Ancient City of Pingyao. The street interface are basically lined with residential buildings, the street/lane width varies from 2-6 metres. Residential buildings are mostly one or two storeys of 3-6 metres height. The height-width ratio ranges from approximately 1:1-2:1 (Figure 6.3).

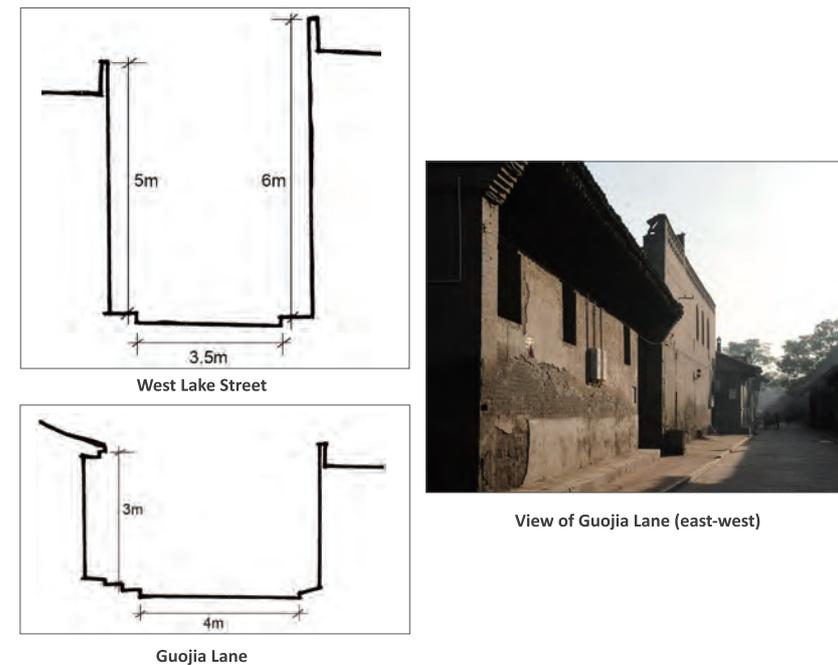


Figure 6.3: Typical section of residential streets

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

### 6.2. Street Façade

#### 6.2.1. Commercial Street

##### Type of Façade

Most of the buildings on commercial streets are commercial buildings. With three main types of façades: hallway type, gallery type, and storefront type. Hall type is the most traditional and therefore most preferred, the gallery type and frontage type are later modern alterations since roughly 1980s.

**Hallway Type:** There is a hallway in the center with screen door panels. Customers can only access the side rooms via the hallway. The side rooms have store counters that back face the street on one side, and on the other side have doors that lead to the store offices, which are the east and west wing houses of the front yard.

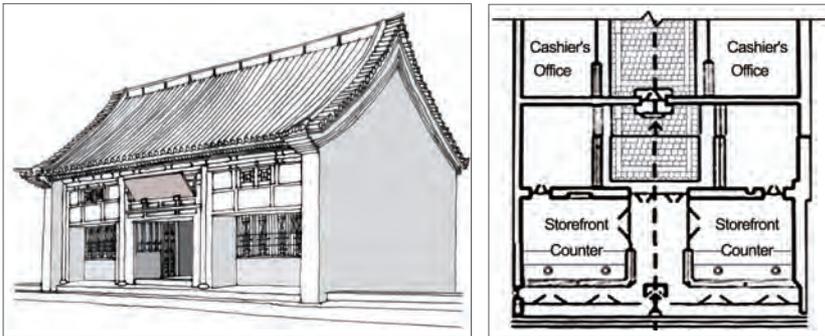


Figure 6.4: Hallway type

**Gallery Type:** The storefront is set back by one-column span distance creating an open gallery space.

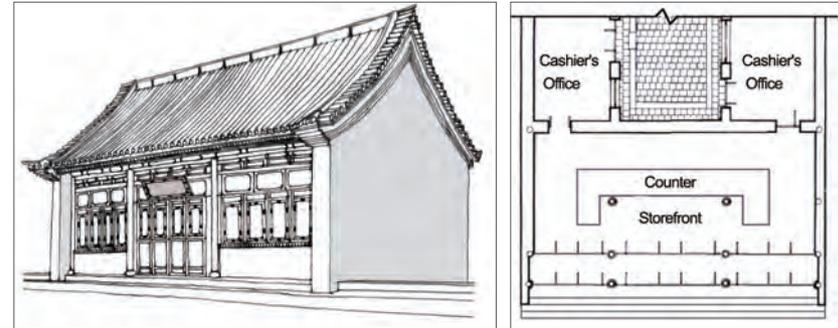


Figure 6.5: Gallery type

**Storefront Type:** The storefront opens directly towards the street, and is the most commonly found commercial façade used in the Ancient City of Pingyao.

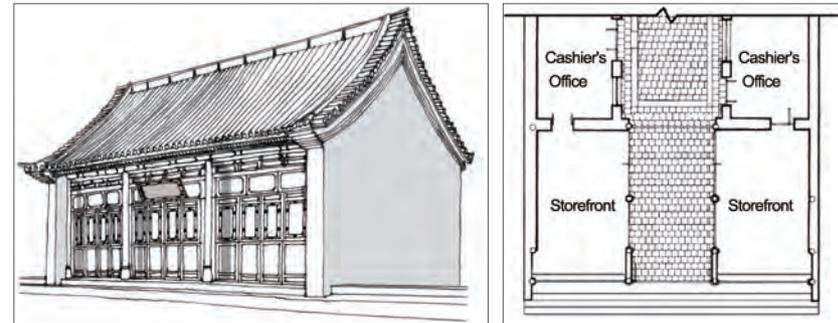


Figure 6.6: Storefront type

## Guidance Notes

To protect the historic features of the street façade, relevant measures must be undertaken to control and guide the façade type, dimension, modular unit, materials and colors.

1. Traditional hallway type façade is recommended for commercial buildings.
2. The building module should be of odd number, either three or five.
3. Traditional building materials and elements shall be used on the exterior façade. Modern materials or elements must not be used.
4. Street interface colors should be kept simple and elegant. The building color should be controlled and guided by the primary and secondary color tones of the architecture. Important buildings that use special colors should be reviewed by professionals.

For painted timber structure components, traditional colors like green, yellow and white can be used. Purple and gold must not be used on the wooden painted walls.

- **Walls:** Grey brick walls should be kept in light cyan or light grey tones, plastered walls in white, and wooden painted walls in dark red tone.

- **Doors and windows:** Similar with wooden painted walls, dark red tone shall be used for painting.

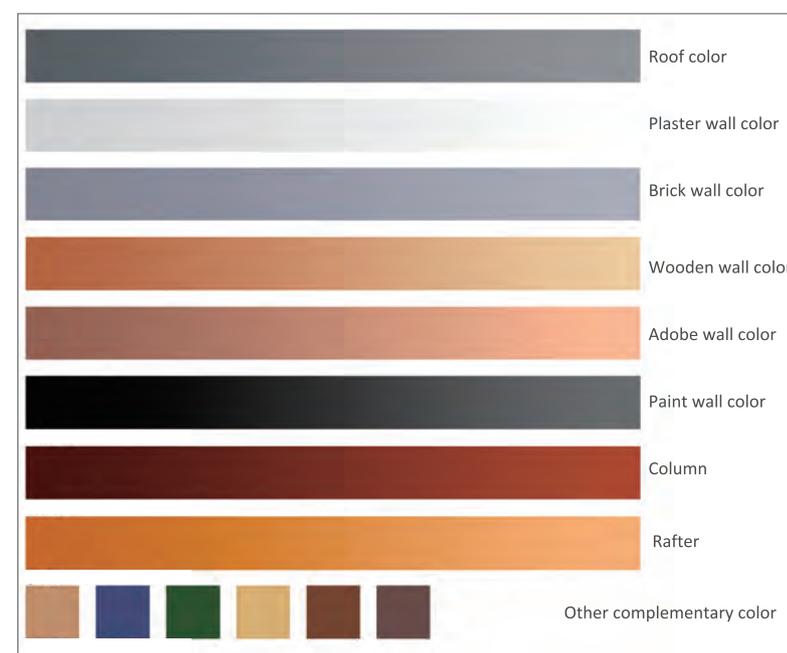


Figure 6.7: Recommended color schemes for Pingyao traditional architecture

## 6.2.2. Residential Streets

### Type of Façade

Residential streets are mainly lined with residential buildings with the exception of a few streets such as Confucius Temple Street, Southwest Mentou Street where a small quantity of commercial buildings are located on some sections of the street (see 6.2.1 for

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

the guidance notes on these buildings). There are two main façade types for residential streets: main entrance type and courtyard wall type. Based on the structure, the main entrance type façade can be divided into the masonry-wood structure type (Figure 6.8) and Yaodong structure type (Figure 6.9). The masonry-wood type can be subdivided into single-slope and double-slope roofs.

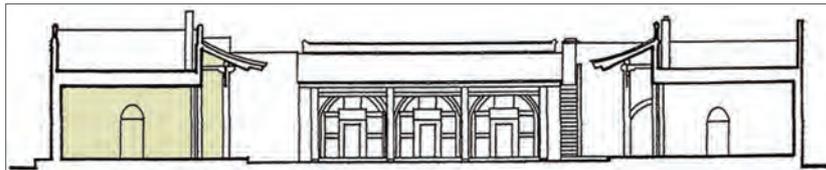


Masonry-wood structure type: double-slope roof



Masonry-wood structure type: single-slope roof

**Figure 6.8:** Sections of residential building with wood structure main entrance type façade



**Figure 6.9:** Section of residential building with Yaodong structure main entrance type façade

### Guidance Notes

1. To ensure that the type of façade is maintained, no historic elements are to be removed.
2. The adaptive reuse of residential buildings as commercial buildings should be strictly controlled.
3. The relatively enclosed quality of traditional Pingyao courtyard house façade should be maintained. Any form of enclosure wall penetration is not allowed, addition of window openings and random paintings or graffiti on street facing facade is not allowed.
4. Traditional materials and elements must be used on exterior façade, no modern building materials or elements should be allowed.
5. For façades that face the street, the color should be kept simple and elegant, with black, white and grey as principle color tones. A small number of elements of the building can be more colorful (ref. Figure 6.7).

## 6.3. Steps, Ramps, Paving and Platform

### 6.3.1. Commercial Streets

#### Type of Steps

There are usually three to five steps in front of traditional commercial buildings, which are made of stones or bricks and serve as a transition between the street and the interior spaces. The color of the steps and paving are consistent. The length of the steps can span the length of the entire building façade (Figure 6.10) or the length of one room module (Figure 6.11).



**Figure 6.10:** Steps that span the entire length of the building façade on commercial streets



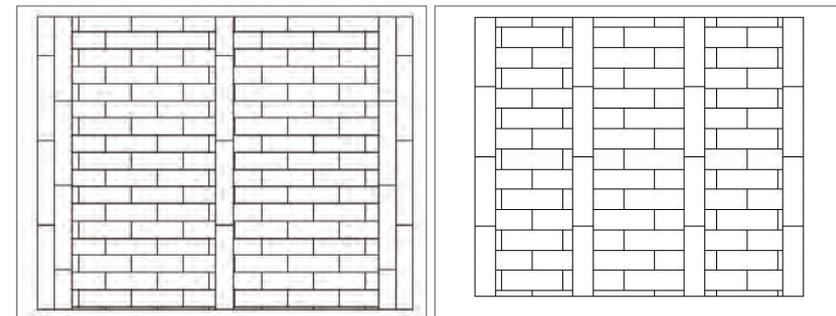
**Figure 6.11:** Steps that span the length of one room module of the building on commercial streets

#### Guidance Notes

1. The steps must have simple paving forms, as shown in Figure 6.12.
2. Steps are typically made of bricks or stones; modern materials such as cement are not allowed to be used (Figure 6.12).
3. Steps and paving must be well maintained. Any damage must be repaired quickly.
4. Figure 6.13 shows the recommended paving styles in commercial streets.



**Figure 6.12:** Paving layouts and materials of steps in commercial streets



**Figure 6.13:** Recommended paving styles in commercial streets

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

### 6.3.2. Residential Streets

Bricks or stones are used to pave the steps and the ramps at the entrance of traditional residential buildings which are as wide as the entrance. Traditional residential houses usually have multiple steps at the entrance and a platform that levels with the building foundation and entrance that spans the rest of the façade to protect the wall footing. The platform is a transition between the street and the building; its depth is determined by the building and street. It is filled with rammed earth on the inside, finished with bricks on top and vertical bricks or cut stone on the edges.

Some of the residential street paving are brick and stone, and some are of earthen road surface, depending on the function, hierarchy, importance and width of the street.

#### Guidance Notes

1. The traditional form of the steps must be maintained; conversion of steps into ramps is not allowed.
2. The steps, ramps and platform must have simple paving forms, as shown in Figures 6.14-6.15.
3. Steps and ramps are typically made of local traditional materials such as bricks or stones; modern materials such as cement are not allowed to be used (Figures 6.14-6.15).

4. The street paving should reflect the hierarchy and importance of the street. Figure 6.16 shows the recommended paving styles for residential streets.
5. Steps and paving must be well maintained. Any damage must be repaired quickly.



Figure 6.14: Paving methods and materials of steps and ramps in residential streets



Brick laid, finished with cut stone

Brick paving

Figure 6.15: Construction methods and materials of platform in residential streets



Figure 6.15: Construction methods and materials of platform in residential streets

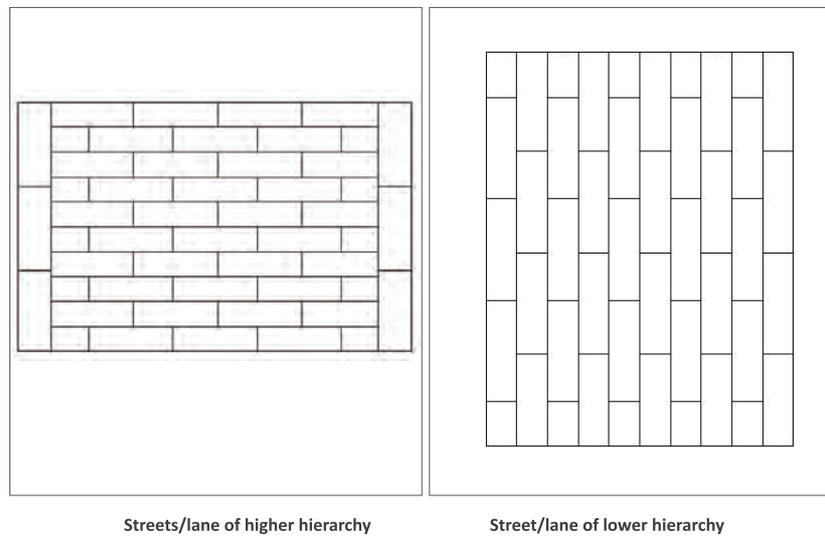


Figure 6.16: Recommended paving styles for residential streets

## 6.4. Commercial Signage

### Type of Signage

There are two main types of signage: under-the-eave style and detached style. Under-the-eave wall style signage often takes the form of a plaque or a plaque with couplets (Figure 6.17). The plaque is installed under the eaves and above the lintel. Detached style signage is often separately placed on the steps or against the façade of the building.



Figure 6.17: Traditional under-the-eave style signage

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

### Guidance Notes

1. The position of a shop's exterior wall style signage as well as its form, style, color, material, quantity, size and orientation must be carefully controlled and be in accord with the historical surroundings and streetscape.
2. Handwritten fonts are preferred. Refer to Figure 6.20 for complimentary colors for the plaque and the writing.
3. Wood material is preferred for signage. Modern materials such as metal, plastic and other inappropriate materials should not be used.
4. The size and style of the signage should be in harmony with the building and in consistency with other signage on the same street; this is especially so along commercial streets as they have a large quantity of signage. Signage for residential streets should be low key and plain in order to maintain the quiet, subdued atmosphere of the residential street.
5. Under-the-eave signage is preferred for both commercial and residential streets; the detached style signage should only be used as a supplementary form. For commercial streets, the under-the-eave signage should be installed between the eave and door lintel, with the bottom edge not more than 0.5 metres above the lintel.

The detached signage should be placed within 0.8 metres of the exterior façade. For residential streets, the under-the-eave signage should be placed between the eave and door lintel of the entrance, and not directly installed onto the wall. The detached signage should not exceed the boundary of the steps and platform.

Figures 6.18-6.19 show the recommended position of the signage on commercial buildings in commercial and residential streets.

6. The amount of signage should be strictly controlled. Each shop should limit to only one signage.
7. Indirect lighting of signage is preferred to avoid excessive flashiness, in case lighting is used.

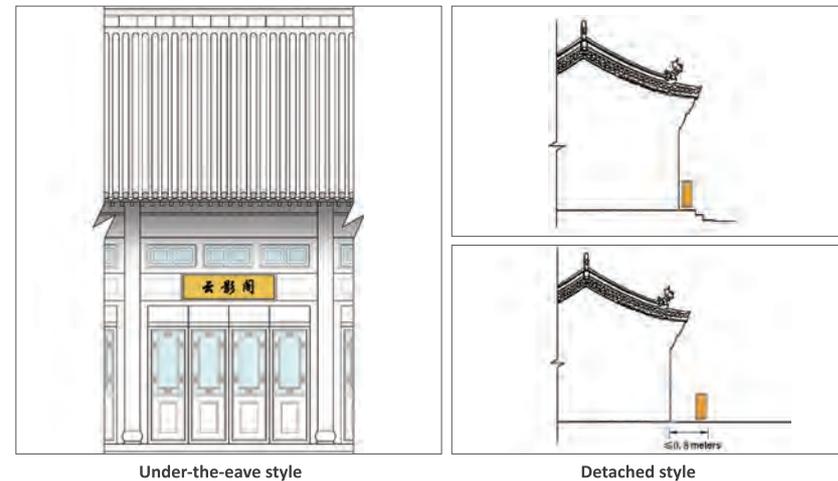


Figure 6.18: Recommended position for commercial signage on commercial streets



Figure 6.19: Recommended position for commercial signage on residential streets

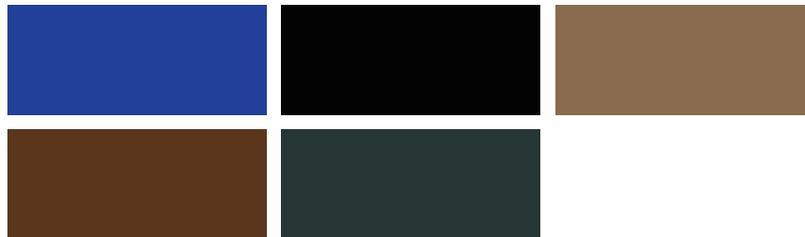


Figure 6.20: Recommended plaque and writing colors

## 6.5. Street Lighting

Lighting on commercial streets in the Ancient City of Pingyao includes lanterns, wall lamps and lamp posts (Figure 6.21). With the exception of the lamp posts that are installed by the government,

all other lighting fixture installation should follow this guideline. The commercial streets are traditionally lit by lanterns that hang from the building eave. The lantern should be in simple style as shown in Figure 6.22. The luminosity requirements for commercial streets will be higher than residential.



Figure 6.21: Wall lamp and lamp post



Figure 6.22: Recommended lantern styles

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

### Guidance Notes

1. Lanterns in commercial streets must not be complex in style, and their position, quantity, light and style must be coordinated with the environment. There must not be more than three different lantern styles on the same street.

2. A commercial building should use no more than four lanterns while the basic brightness of lighting is ensured.

3. Street light locations should be carefully selected, and the color and level of lighting illumination should be suitable and not visually dominate the streetscape ambience.

- Lanterns should be placed under the eaves and above the lintel.

- Wall lamps for commercial streets should be installed above the lintel of the entrance gate that leads to alleyways, one on each side, and in simple traditional style. Wall lamps for residential streets should be placed on the exterior wall of the courtyard houses with fixed spacing.

4. Lanterns and wall lamps should use soft warm light and avoid neon light, fluorescent light or incandescent light.

Recommended position for lanterns and wall lamps on both commercial and residential streets are illustrated in following Figures 6.23-6.26.

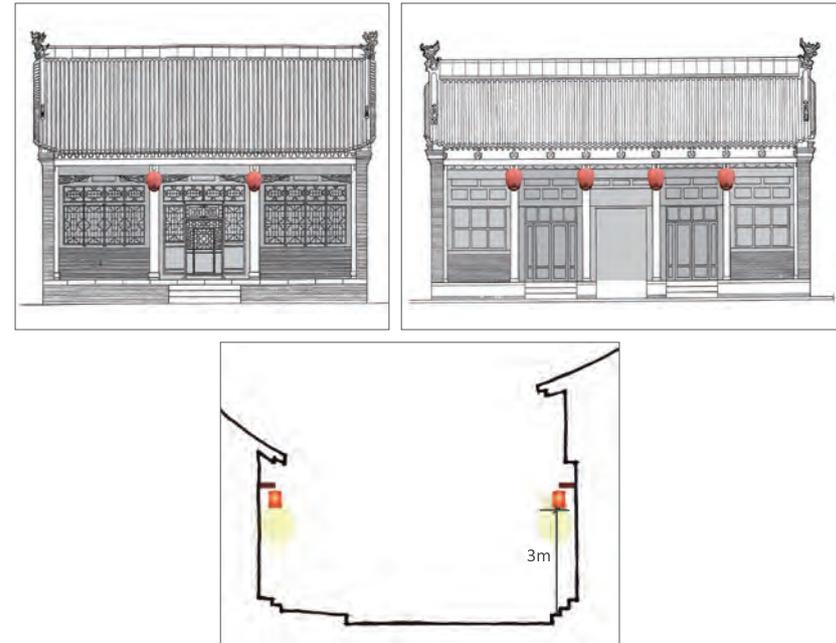


Figure 6.23: Recommended lantern position in commercial streets

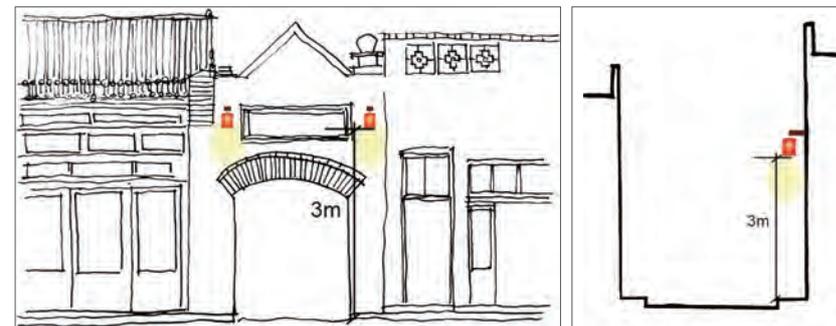


Figure 6.24: Recommended lantern position of wall lamps in commercial streets

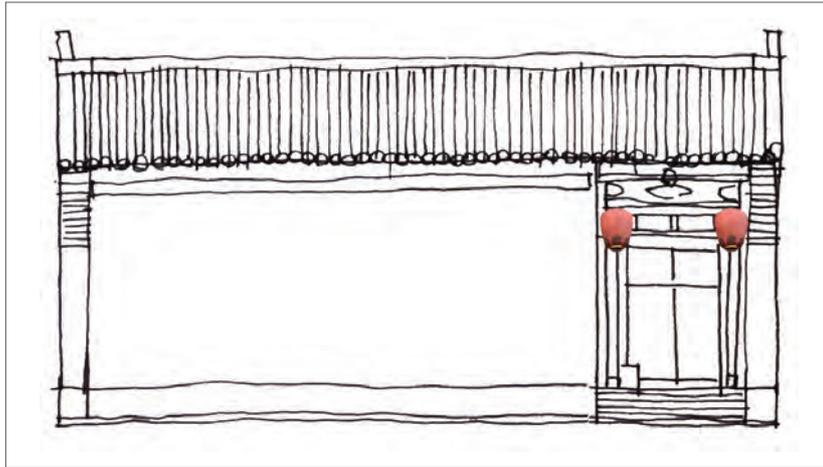


Figure 6.25: Recommended lantern position of lanterns in residential streets

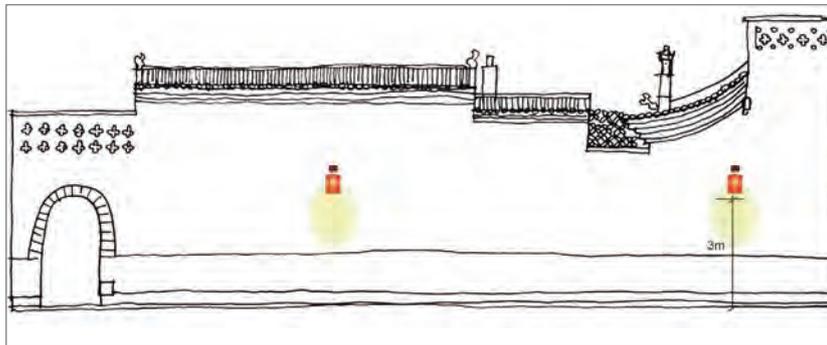


Figure 6.26: Recommended position of wall lamps in residential streets

## 6.6. Outdoor Business Areas and Infrastructure

### 6.6.1. Outdoor Business Areas

Outdoor business areas are an extension of shops into the main street as an overflow space associated with additional retailing, for items such as snacks and local products. Due to lack of management, this space has a negative impact on the streetscape and public safety and must be controlled and guided.

#### Guidance Notes

1. The number, location, type of operation and facilities of outdoor business areas must be strictly limited to maintain the orderly character of the city, while still maintaining a dynamic street atmosphere as well as authenticity and integrity of the Ancient City of Pingyao.
2. Outdoor business areas must be in their proper position: either within the platform boundary or within one meter of the exterior wall and must not obstruct traffic (Figure 6.27).
3. The design of outdoor business areas are recommended to use traditional style, material and colors (Figure 6.28).

# Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

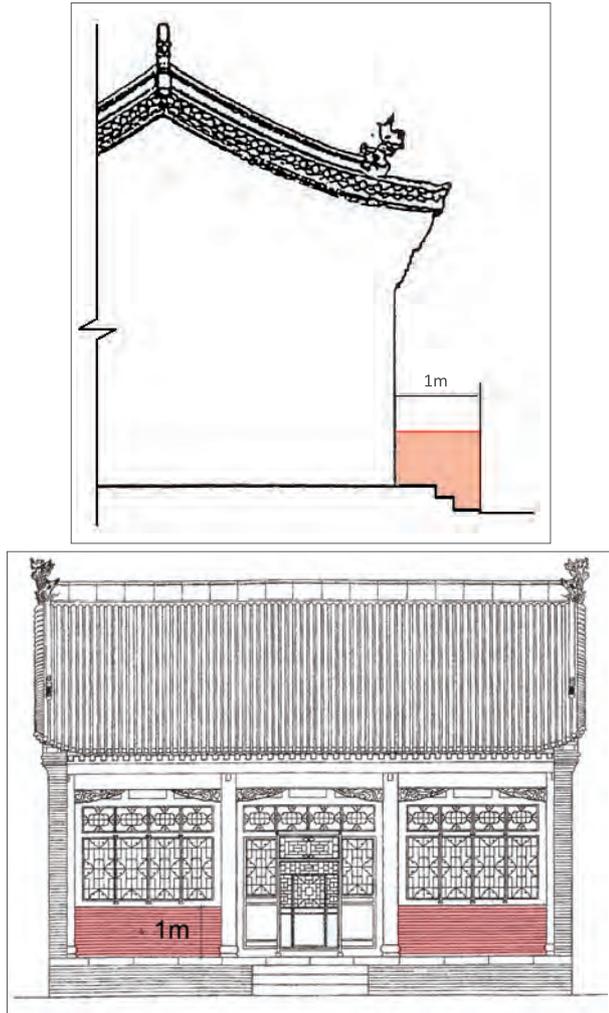


Figure 6.27: Recommended positions for outdoor business area

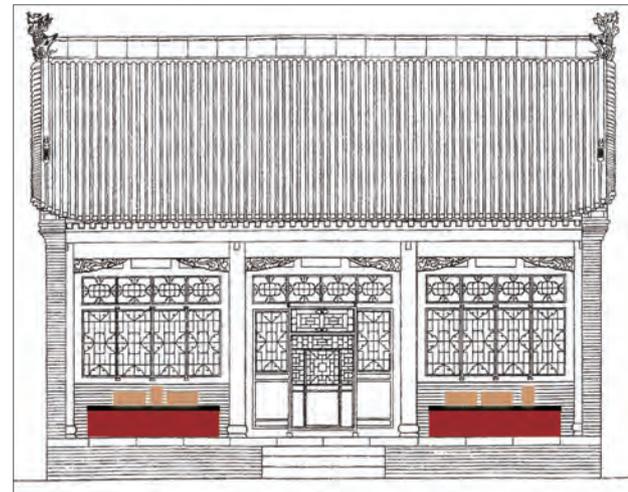


Figure 6.28: Recommended style for outdoor business area

### 6.6.2. Infrastructure

Placement of infrastructure such as pipelines, substation boxes, garbage cans and the air conditioning condensing units must be in harmony with the environment in terms of their positions, styles, materials and colors.

#### Guidance Notes

1. Exposed pipelines should be hidden under the eaves of the building. The color and material of the packaging/wrapping of the pipelines shall be in harmony with courtyard façade (Figure 6.29).
2. The air conditioning condensing units are preferably placed inside of the courtyard. If it is within visible sights from the street, then it should be covered up with design that is in harmony with the surrounding environment (Figure 6.30). Multiple air conditioning units on the same building should be installed at the same height level.



**Figure 6.29:** Recommended treatment of exposed pipelines



**Figure 6.30:** Recommended style for covering air conditioning split unit





# Appendices

Appendix 1: English-Chinese Glossary

Appendix 2: Classification Standards of Protected Courtyards

Appendix 3: “Incentives for the Conservation of Traditional Courtyard Houses at the Ancient City of Pingyao”, issued by Pingyao Urban Planning Bureau in 2012

Appendix 4: Bibliography

Appendix 5: Figures

# Appendices

## Appendix 1: English-Chinese Glossary

English	Pinyin	Chinese	Literal meaning
ancient	gu	古	ancient
adaptive reuse	shiyixing gongneng	适应型功能	adapt + type + function
architecture	jianzhu	建筑	building/architecture
assessment	pinggu	评估	assessment/evaluation
authenticity	zhenshi(xing)	真实性	true + fact/real
axial-connection type of courtyard layout	chuanlianxing yuanluo	串联型院落	string + connection + type + courtyard
buffer zone	jianshe kongzhi didai	建设控制地带	construction/development + control + zone

English	Pinyin	Chinese	Literal meaning
building	jianzhu	建筑	building/architecture
building-like gate	wuyushi damen	屋宇式大门	house + type + main door
commercial courtyard house	shangpulei minju	商铺类民居	store/shop + type + residence
commercial street	shangyexing jiexiang	商业型街巷	commercial + type + street/lane
component	i. goujian ii. bufen	i. 构件 ii. 部分	i. structure + piece ii. part/section
conservation/ conserve (protection/protect)	i. baohu ii. baohu gongzuo	i. 保护 ii. 保护工作	i. conserve + protect ii. conserve + work
conservation process	baohu chengxu	保护程序	conserve + process/procedure
consolidation	jiagu	加固	add + solid/firm
construction design	shigongtu sheji	施工图设计	construction + drawing + design
contemporary	dangdai	当代	now + generation
courtyard boundary wall	yuanqiang	院墙	courtyard + wall
damage or deterioration	i. pohuai ii. sunhuai	i. 破坏 ii. 损坏	i. destruction/damage ii. damage
disassembly	jietai	解体	take apart
disaster	zaihain	灾害	disaster + harm

English	Pinyin	Chinese	Literal meaning
disaster prevention	yufang zaihai	预防灾害	prevent + disaster
dao zuo	dao zuo	倒座	reverse/backwards + seat/base
detached style signage	dulishi dianzhao	独立式店招	independent + type + store + sign
eave gallery	langyan	廊檐	gallery/veranda + eave
eave wall	yanqiang	檐墙	eave + wall
entrance gate	damen	大门	main + door
evidence	yiju	依据	basis + evidence
existing condition	xianzhuang	现状	present + condition
feature element	tezheng yaosu	特征要素	characteristic + important element
floral-pendant gate	chuihuamen	垂花门	hanging + flower + door
gable wall	shanqiang	山墙	mountain + wall
gallery type	changlangshi	敞廊式	open + gallery/veranda + type
hallway type	mentingshi	门厅式	door + hall + type
historic condition	yuanzhuang	原状	original/previous + condition
in situ	yuanzhi	原址	original + place
intervention	i. ganyu ii. cuoshi	i. 干预 ii. 措施	i. intervene ii. suitable action

English	Pinyin	Chinese	Literal meaning
kang	kang	炕	heated brick bed
maintenance	baoyang	保养	conservation + support
management	guanli	管理	administer + manage/put in order
masonry-wood structure	zhuanmuxing	砖木型	brick + wood + type
measure	cuoshi	措施	suitable action
middle gate	zhongmen	中门	middle + door
minor restoration	xianzhuang xiuzheng	现状修整	present + condition + repair + put in order/fix
mixed typed of courtyard layout	hunhexing yuanluo	混合型院落	mixed + type + courtyard
modern	jindai	近代	recent + period
monitoring	jiance	监测	supervise + measure
normal procedure	zhengchang chengxu	正常程序	normal + procedure/process
one-entrance gate courtyard	yijin yuanluo	一进院落	one + entry/unit + courtyard
original fabric	yuanwu	原物	original + substance/property
painted decoration	youshi	油饰	oil + decoration
parallel-connection type of courtyard layout	binglianxing yu-anluo	并联型院落	adjoining + connection + type + courtyard

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

English	Pinyin	Chinese	Literal meaning
paving	pudi	铺地	lay + floor/ground
plan	fang'an	i. 方案 ii. 规划	i. plan ii. plan
platform	baotai	包台	wrap (around) + platform
polychrome painting	caihua	彩画	colorful + painting
preliminary design	chubu sheji	初步设计	preliminary + design
preserve	i. baocun ii. baohu	i. 保存 ii. 保护	i. conserve + keep ii. conserve + protect
principal house	zhengfang	正房	main/central + room
principle	zhunze	准则	follow + norms
process (procedure)	chengxu	程序	procedure + sequence
ramp	podao	坡道	slope + way
reconstruction	chongjian	重建	again + build
repair	weixiu	维修	maintain + repair
replacement	tihuan	替换	replace + change
residential courtyard house	juzhulei minju	居住类民居	residential + type + residence
residential street	juzhuxing jiexiang	居住型街巷	residential + type + street/lane
restoration	xiufu	修复	repair + recover (turn back)

English	Pinyin	Chinese	Literal meaning
screen wall	yingbi	影壁	Shadow + wall
setting	huanjing	环境	environment
significance	jiazhi	价值	value
sill wall	jianqiang	槛墙	sill + wall
simple procedure	jianyi chengxu	简易程序	simple + procedure/process
step	taijie	台阶	platform + step
storefront type	linjieshi	临街式	facing + street + type
structure	jiegou	结构	join + fabricate
threat	zaihain	灾害	disaster + harm
timber component	mugoujian	木构件	wood + structure + piece
treatment	i. xiushan ii. chuli iii. zhengzhi	i. 修缮 ii. 处理 iii. 整治	i. repair ii. attend to/fix up iii. put in order + treat
two-entrance gate courtyard	liang(er)jin yuanluo	两(二)进院落	two + entry/unit + courtyard
under-the-eave style signage	yanxia dianzhao	檐下店招	eave + below + store + sign
values	jiazhi	价值	value
wall-like gate	qiangyuanshi	墙垣式大门	enclosure wall + type
wing house	xiangfang	厢房	Chamber + room

English	Pinyin	Chinese	Literal meaning
workshop courtyard house	zuofanglei min-ju	作坊类民居	workshop + type + residence
Yaodong structure	guyaoshi	窑窑式	restrained/closed + cave/kiln + type

[Partially excerpt from *Principles for the Conservation of Heritage Sites in China (2002)*]

## Appendix 2: Classification Standards of Protected Courtyards

In Pingyao, in terms of protection, courtyard houses are currently graded as Rank I, Rank II, and Rank III by the Pingyao authorities.

**Rank I Courtyard (with very high historic value):** The courtyard complex or single courtyard with intact overall appearance and a certain amount of feature elements such as screen walls etc., is formed in the shape of the Chinese character “日 (ri)” or “目 (mu)” with relatively intact layout condition as well as rich historic features. For the conservation of rank I courtyards, original courtyard space ratio, dimension, structure, layout and style should be maintained. Any addition or alteration that has taken place must be removed.

**Rank II Courtyard (with high historic value):** The courtyard is with relatively large scale, intact layout and well preserved historic buildings; or the courtyard is in relatively poor integrity condition as a whole but maintain some valuable feature elements. For the conservation of rank II courtyards, original courtyard space ratio, dimension, structure, layout and style should be maintained. Restoration of missing or damaged buildings should be undertaken in order to rebuild the traditional architecture spatial relationship. Any addition or alteration in the courtyard must be removed.

**Rank III Courtyard (with relatively high historic value):** The courtyard is formed in the shape of the Chinese character “日 (ri)” or “口 (kou)” with a relatively large amount of missing components and historic information. For the conservation of rank III courtyards, original courtyard space ratio should be maintained. Building layout, dimension and spatial relationship shall be restored. Any addition or alteration in the courtyard must be removed.

### Appendix 3: “Incentives for the Conservation of Traditional Courtyard Houses at the Ancient City of Pingyao”, issued by Pingyao Urban Planning Bureau in 2012

#### Target Group

This document is applicable to traditional residences in the Ancient City of Pingyao that has clear property ownership and use for residential purpose. The scope of the conservation intervention will include the building and its subsidiary elements (doors and windows, wall, roof, etc.) and the traditional courtyard components (entrance gate, screen wall, paving, etc.); and also for historic trees, wells, mills, etc.

#### Requirements for Conservation Work

When undertaking preservation work on historic residences:

- Conservation intervention should be based on regulatory documents including “Planning for Protection and Control of the Ancient City of Pingyao” and “Practical Conservation Guidelines for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao”.
- Consolidated restoration standards and requirements should be adhered to. Consolidated unit construction price standards should

be applied to the same construction work.

- Professional monitoring team should be involved during the implementation of the construction work.

#### Procedure for support application

- Residents submit application materials to the Urban Planning Bureau with the following documents:
  - Property ownership certificate
  - Current and historic information about traditional courtyard houses
  - Conservation purpose, scale and methodology with certified experts signed sample design of courtyard components such as doors, windows, walls, etc.
  - Two sets of photos of pre-conservation courtyard houses
  - Construction budget with confirmation of relevant department
  - Approval from relevant administrative departments
- On-site investigation by staff of the Urban Planning Bureau.
- After approval of the application, applicants sign the “Preservation Work Agreement” with construction companies and the “Preservation Work Financial Support Agreement” with the Urban Planning

Bureau. The Urban Planning Bureau will organize staff to monitor all the preservation work to ensure that it follows the preservation requirements.

- Following the completion of the preservation work, applicants arrange for the Urban Planning Bureau to evaluate the work.
- The Urban Planning Bureau will organize experts in cultural relics and historic building protection, auditors, monitoring staff, experts in design and construction to evaluate the preservation work.
- Construction projects receiving a disqualification for standards two times within two years during the construction implementation, will be disqualified from conservation programme with financial penalty of 10% of the project total cost.

### Monitoring

The monitoring staff must include:

- Selected representatives of National People's Congress (NPC) and Chinese People's Political Consultative Conference (CPPCC) of Shanxi Province will be involved during the entire construction work period as observers.
- An expert from the study field of historic architecture and assigned by the government, will exam and monitor construction work irregularly.

- People from the relevant professional field and affinity with conservation of historic cities.

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## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

### Appendix 5: Figures

Figure	Name	Source
Figure 1.1	Ancient City of Pingyao in Pingyao County	Tongji University
Figure 1.2	General layout of the Ancient City of Pingyao, showing the defense system with the six fortified gates and major streets	Tongji University
Figure 1.3	Buildings in the Ancient City of Pingyao	Tongji University
Figure 1.4	Location of landmark architectures in the Ancient City of Pingyao	From Annuals of Pingyao County (1999)
Figure 1.5	Street layout of Pingyao	Tongji University
Figure 1.6	Commercial streets layout - the Chinese character “土 (tu)” upside down	Tongji University
Figure 1.7	Architecture in Ancient City of Pingyao	Tongji University and UNESCO Beijing Office
Figure 1.8	The three components that form the Ancient City of Pingyao World Heritage site	Tongji University
Figure 1.9	Topographic map of the Ancient City of Pingyao area	Pingyao County Administration of Cultural Heritage
Figure 1.10	Overview of the actions of safeguarding the OUV of a World Heritage site”	Tongji University

Figure	Name	Source
Figure 2.1	Working Procedure Flow Chart and Responsible Parties	Tongji University
Figure 2.2	Detailed working procedure flow chart	Tongji University
Figure 3.1	Typical Pingyao historic courtyard	Tongji University
Figure 3.2	Commercial courtyard houses	Tongji University
Figure 3.3	Residential courtyard houses	UNESCO Beijing Office
Figure 3.4	Yaodong houses distribution areas	Tongji University
Figure 3.5	Yaodong types	Tongji University
Figure 3.6	Fengshui theory in architecture	Tongji University
Figure 3.7	The eight trigrams theory of Fengshui in courtyard layout	Tongji University
Figure 3.8	Axial-connection type of courtyard layout	Tongji University
Figure 3.9	Parallel-connection type of courtyard layout	Tongji University
Figure 3.10	Mixed type of courtyard layout	Tongji University
Figure 3.11	Basic elements of a one-entrance gate courtyard in Pingyao	Tongji University

Figure	Name	Source
Figure 3.12	Typical layout of a two-entrance gate courtyard in Pingyao	Tongji University
Figure 3.13	Interior circulation flow line of a courtyard	Tongji University
Figure 3.14	Gradually rising ground level and building height in Pingyao traditional courtyard houses	Tongji University
Figure 3.15	Courtyard boundary walls	UNESCO Beijing Office
Figure 3.16	Components of courtyard boundary walls with a wall-like main gate	Tongji University
Figure 3.17	Building-like gate	Tongji University
Figure 3.18	The main gate	UNESCO Beijing Office
Figure 3.19	Archway and ramp	UNESCO Beijing Office
Figure 3.20	Screen walls and shrines	Tongji University and UNESCO Beijing Office
Figure 3.21	Daozuo and decorations of the main gate	Tongji University and UNESCO Beijing Office
Figure 3.22	Square bricks laid in straight and diagonal stretcher course	UNESCO Beijing Office
Figure 3.23	Paving and flower rail	UNESCO Beijing Office
Figure 3.24	Middle gate	UNESCO Beijing Office
Figure 3.25	Wing house	UNESCO Beijing Office
Figure 3.26	Three rooms into two rooms	Tongji University

Figure	Name	Source
Figure 3.27	Layout of room (a) of Figure 3.23	Tongji University
Figure 3.28	Elevation and layout of front and back wing houses	Tongji University
Figure 3.29	Eave walls of a wing house	UNESCO Beijing Office
Figure 3.30	One 'open' room with two 'hidden' rooms	Tongji University
Figure 3.31	Three 'open' rooms with two 'hidden' rooms	Tongji University
Figure 3.32	Section of a cave structure type principal house	Tongji University
Figure 3.33	The eave gallery of a principal house	Tongji University and UNESCO Beijing Office
Figure 3.34	Stone base carved drum-like surfaces	UNESCO Beijing Office
Figure 3.35	Brick carving	Tongji University
Figure 3.36	View over the roofs of traditional Pingyao courtyard house	UNESCO Beijing Office
Figure 3.37	Fengshui screen walls with a shrine in the middle on the roof of a principal house	Tongji University
Figure 3.38	Interior layout of a principal house	Tongji University and UNESCO Beijing Office
Figure 3.39	Traditional bedroom interior layout	Tongji University
Figure 3.40	Murals on the surrounding walls of a kang	UNESCO Beijing Office and online source

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

Figure	Name	Source
Figure 3.41	Typical doors and windows of a Yaodong principal house with five rooms	Tongji University
Figure 3.42	Doors and windows of a Yaodong principal house	UNESCO Beijing Office
Figure 3.43	Doors and windows of a wing house	Tongji University
Figure 3.44	Typical windows of a wing house	Tongji University
Figure 3.45	Typical doors of a wing house	Tongji University
Figure 3.46	Doors and windows of traditional residences in Pingyao	Tongji University
Figure 3.47	Wood carving on dougong	Tongji University
Figure 3.48	Wood carving on bean head	Tongji University
Figure 3.49	Wood carving on windows	Tongji University
Figure 3.50	Wood carving on gualuo	UNESCO Beijing Office
Figure 3.51	Wood carving on floral-pendant gate	UNESCO Beijing Office
Figure 3.52	Brick carving on staircase railing	Tongji University
Figure 3.53	Brick carving on screen wall	UNESCO Beijing Office
Figure 3.54	Brick carving on middle gate	Tongji University
Figure 3.55	Stone carving on staircase sheathing	UNESCO Beijing Office
Figure 3.56	Stone carving on column base	Tongji University
Figure 3.57	Brick carving on screen wall	UNESCO Beijing Office

Figure	Name	Source
Figure 3.58	Stone carving on shangmashi	UNESCO Beijing Office
Figure 3.59	Brick carving on eave gallery of a principal house	Tongji University
Figure 4.1	Examples of courtyard complex and single courtyard house layout	Tongji University
Figure 4.2	Roof types	Tongji University
Figure 4.3	Two suggested repair methods (with modern materials)	Tongji University
Figure 4.4	Types of walls	Tongji University and UNESCO Beijing Office
Figure 4.5	Post and lintel construction	Tongji University
Figure 4.6	Model 1	Tongji University
Figure 4.7	Model 2	Tongji University
Figure 4.8	Model 3	Tongji University
Figure 4.9	Types of paving	Tongji University
Figure 4.10	Types of paving for finishing the edges	Tongji University
Figure 4.11	Decorations in traditional Pingyao residences	Tongji University
Figure 4.12	Weathered bricks	UNESCO Beijing Office
Figure 4.13	Brick efflorescence	UNESCO Beijing Office
Figure 4.14	Moisture damage to bricks	UNESCO Beijing Office
Figure 4.15	Wood cracking	Tongji University

Figure	Name	Source
Figure 4.16	Detachment of plaster layers of column (left) and stairs (right)	Tongji University
Figure 4.17	Improper use of replacement materials	UNESCO Beijing Office
Figure 4.18	A wall having stains and covered with improper material which needs to be cleaned urgently	Tongji University
Figure 4.19	Two rows of holes shall be punched, so that a waterproofing agent can be non-pressure injected	Tongji University
Figure 4.20	The section of the double-row-hole punch (eg. 370mm thick walls)	Tongji University
Figure 4.21	Brick wall face with moisture and efflorescence	UNESCO Beijing Office
Figure 5.1	Ad hoc additions into the courtyard spaces disrupt the traditional layout	UNESCO Beijing Office
Figure 5.2	Kitchen and bathroom in traditional courtyard	UNESCO Beijing Office
Figure 5.3	Examples of residences integrating modern living condition	Tongji University
Figure 5.4	Recommended model for public/shared bathroom and kitchen within a courtyard building	Tongji University

Figure	Name	Source
Figure 5.5	Recommended models for the installation of private bathroom and kitchen in wing house and principal house	Tongji University
Figure 5.6	Recommended model for the installation of private bathroom and kitchen in Daozuo	Tongji University
Figure 5.7	Location of air conditioning condensing unit	Tongji University
Figure 6.1	Layout of the Ancient City of Pingyao, the commercial streets are shown in red, the residential streets are shown in blue	Tongji University
Figure 6.2	Typical section of commercial streets	Tongji University
Figure 6.3	Typical section of residential streets	Tongji University
Figure 6.4	Hallway type	Tongji University
Figure 6.5	Gallery type	Tongji University
Figure 6.6	Storefront type	Tongji University
Figure 6.7	Recommended color schemes for Pingyao traditional architecture	Tongji University
Figure 6.8	Sections of residential building with wood structure main entrance type facade	Tongji University

## Conservation Management Guidelines

for Traditional Courtyard Houses and Environment in the Ancient City of Pingyao

Figure	Name	Source
Figure 6.9	Section of residential building with Yaodong structure main entrance type façade	Tongji University
Figure 6.10	Steps that span the entire length of the building façade on commercial streets	Tongji University
Figure 6.11	Steps that span the length of one room module of the building on commercial streets	Tongji University
Figure 6.12	Paving layouts and materials of steps in commercial streets	Tongji University
Figure 6.13	Recommended paving styles in commercial streets	Tongji University
Figure 6.14	Paving methods and materials of steps and ramps in residential streets	Tongji University and UNESCO Beijing Office
Figure 6.15	Construction methods and materials of platform in residential streets	Tongji University and UNESCO Beijing Office
Figure 6.16	Recommended paving styles for residential streets	Tongji University
Figure 6.17	Traditional under-the-eave style signage	Tongji University and UNESCO Beijing Office
Figure 6.18	Recommended position for commercial signage on commercial streets	Tongji University
Figure 6.19	Recommended position for commercial signage on residential streets	Tongji University

Figure	Name	Source
Figure 6.20	Recommended plaque and writing colors	Tongji University
Figure 6.21	Wall lamp and lamp post	UNESCO Beijing Office
Figure 6.22	Recommended lantern styles	UNESCO Beijing Office
Figure 6.23	Recommended lantern position in commercial streets	Tongji University
Figure 6.24	Recommended lantern position of wall lamps in commercial streets	Tongji University
Figure 6.25	Recommended lantern position of lanterns in residential streets	Tongji University
Figure 6.26	Recommended position of wall lamps in residential streets	Tongji University
Figure 6.27	Recommended positions for outdoor business area	Tongji University
Figure 6.28	Recommended style for outdoor business area	Tongji University and UNESCO Beijing Office
Figure 6.29	Recommended treatment of exposed pipelines	UNESCO Beijing Office
Figure 6.30	Recommended style for covering air conditioning split unit	Tongji University
Cover photo	N/A	UNESCO Beijing Office
Chapter cover photo	N/A	Tongji University and UNESCO Beijing Office

