



# Investigation and Design for One Part of the Great Wall Named *JINSHANLING*

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# Investigation and Design

Investigation

Design for Conservation

History

Present  
status

The rule  
for design

Principle  
for conservation

Construction  
forms

Evaluation

Character  
of the project

Action plan



*Part 1*

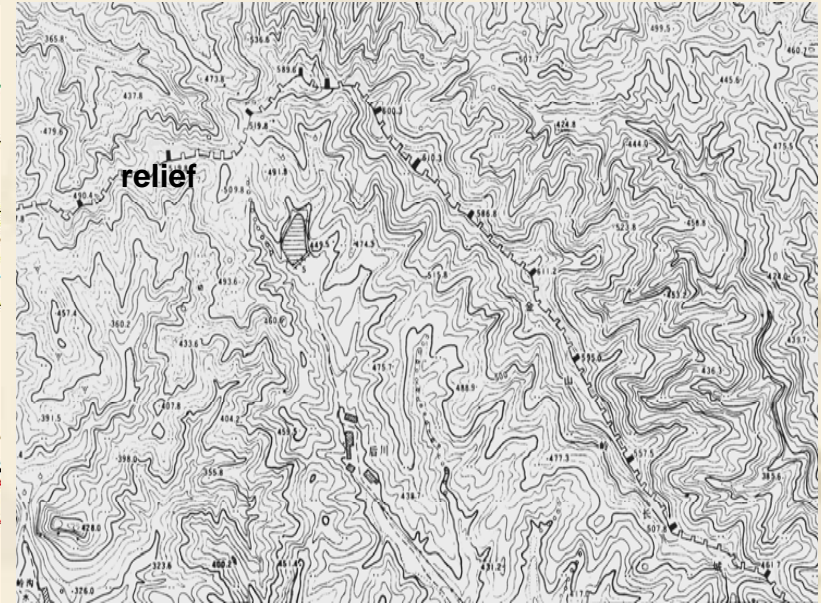
**Report for Investigation**



## situation

# 1 Brief introduction

JINSHANLING Great Wall lies between Miyun county of Beijing and Luanping county of Hebei Province, 140 km from Beijing city. It is a World Heritage Site and a National Priority Protected Site (of 1271 sites in China). It is an important remain of the Ming Dynasty (1368 –1644 AD).





**Panorama of  
JINSHANLING**



## 2. Investigation of the age of the wall

**Ming Dynasty** records show that in the 1370s, the government sent soldiers to defend GUBEIKOU.

We discover steles from the 1540s that record that Tan Lun, Liu Yingjie and Qi Jiguang, famous government officials, built this section of the wall.

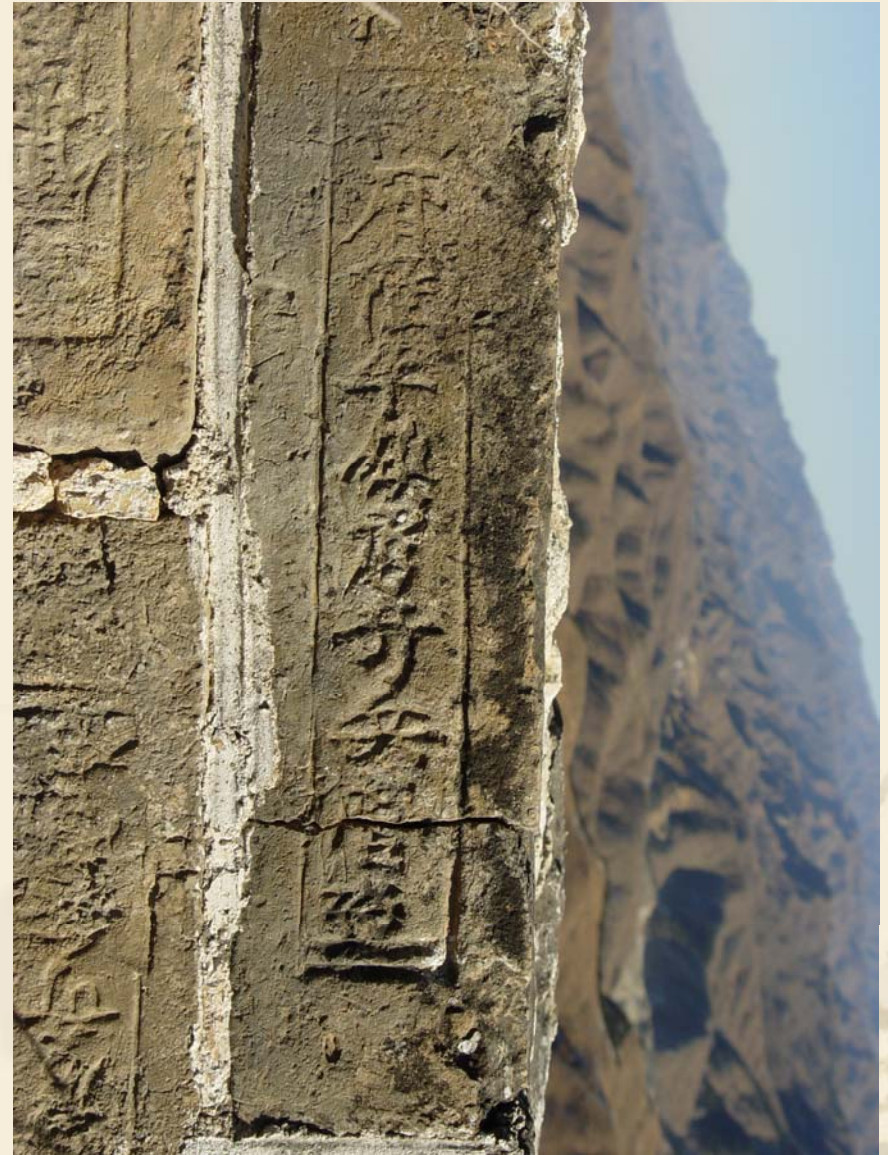
隆慶三年孟夏之吉總督劉廷保定  
兵部左侍郎兼都察院右叅都御史  
等處邊備兼巡撫順天等府地方都  
縣劉應節巡按直隸監察御史上饒  
處兵備山東右政司右叅政兼按察司副使太倉凌雲翼  
副使曲周一鶚總理練兵兼鎮守薊州等處地方總兵  
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鄱陽李超分守古北口等處地方叅將署都指揮僉事定  
遠朱紹文軍門標下遊擊將軍霍立李如槽河南領班都  
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軍官福山王維藩把總吳汝

鼎建

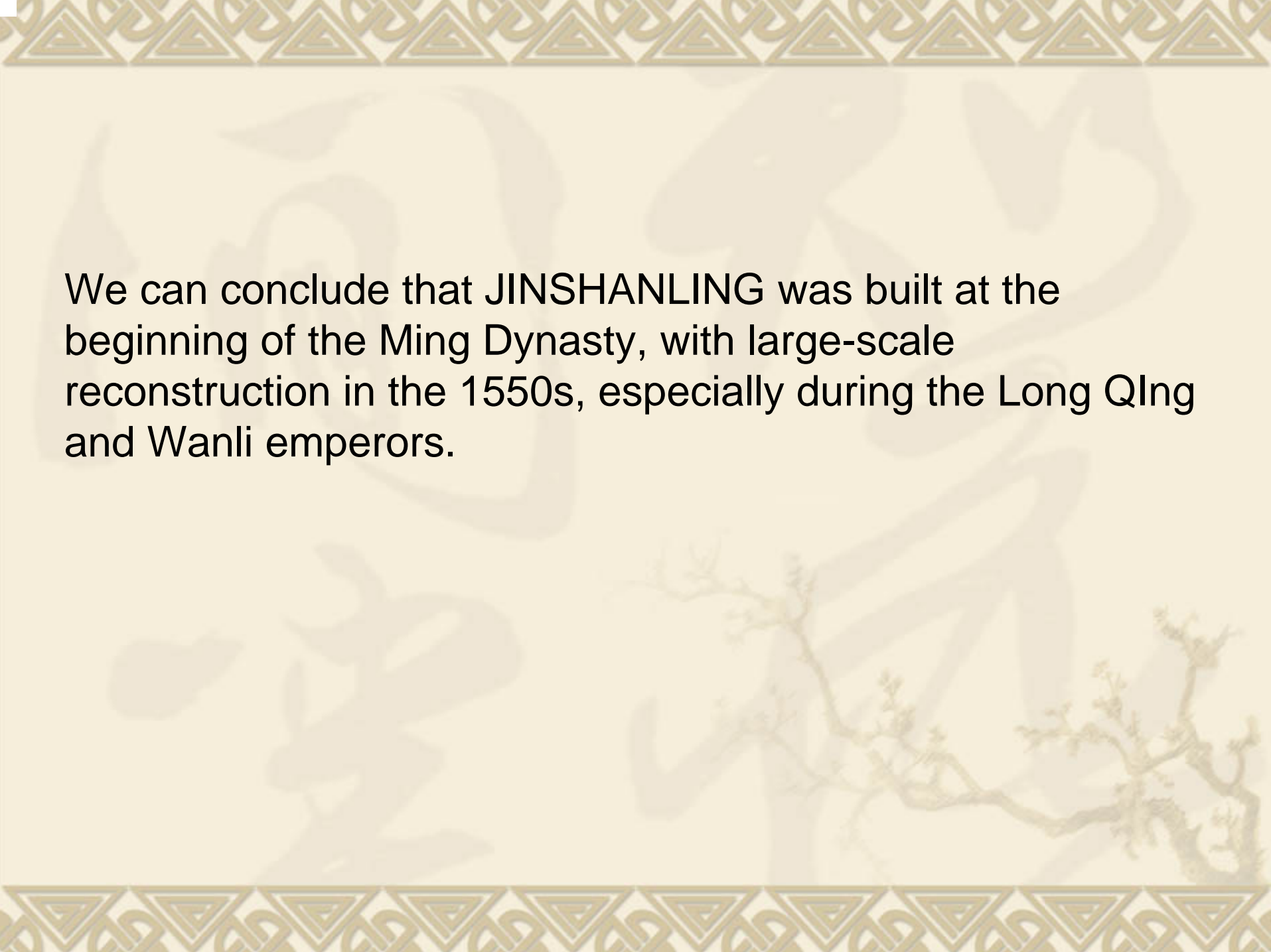

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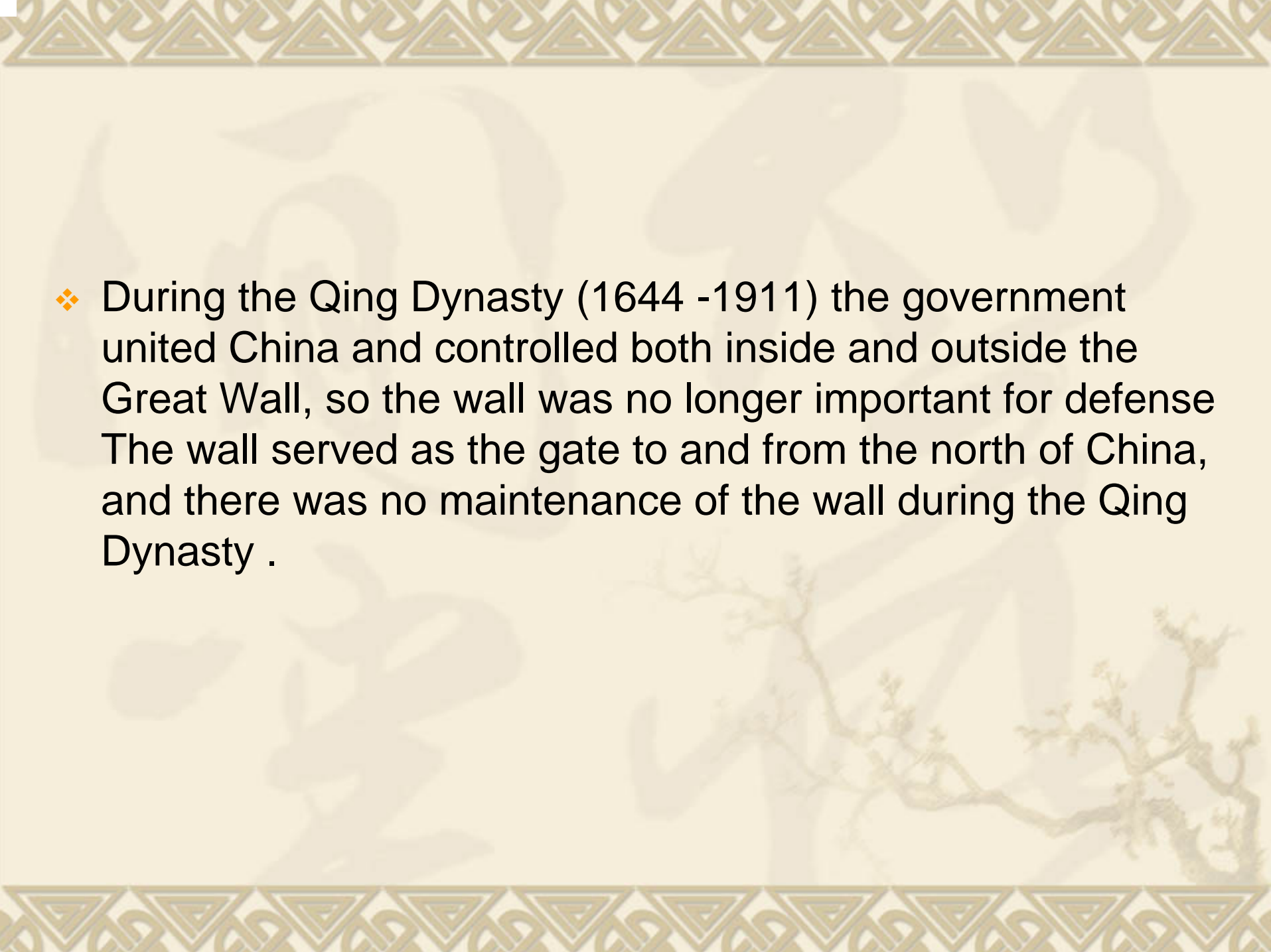
On several bricks of the wall are the characters “Fifth year of Wanli Emperor” (1549 AD) which allows us to date the wall accurately.







We can conclude that JINSHANLING was built at the beginning of the Ming Dynasty, with large-scale reconstruction in the 1550s, especially during the Long Qing and Wanli emperors.

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- ❖ During the Qing Dynasty (1644 -1911) the government united China and controlled both inside and outside the Great Wall, so the wall was no longer important for defense. The wall served as the gate to and from the north of China, and there was no maintenance of the wall during the Qing Dynasty .

### 3. Form of Construction

- ❖ The length of the JINSHANLING Wall is 10.5kms. It has six cols (gates), 68 dilous (towers) of varied form and two Feng Huo Tai (high watch towers).

The col was used for army patrols to pass through the wall or attack the enemy.



The wall has many dilou, about every 100 m along the ridge of the mountain, many more than on other sections of the wall. Where necessary, they are 50--60 m apart. The form of the dilou is square, oblong, or rhomboid. All dilou are hollow, sit in the middle and on top of the wall. They are about 10 m high.

**Dense  
Dilou**



The foundation of the dilou is of bar shaped stones and the body of bricks and stones. Its wall was built with bricks with stone fill. All dilou have two floors: the ground floor is is brick and wood, or brick with arches. The soldiers lived, stored food and weapons on the ground floor, and used the second floor to fight or stand guard.



The wall is the main body for the whole system. It has a stone base. The wall itself is a brick shell filled with stone and earth. Where the landform is even, the wall is about 4.5--5 m high. The width at the bottom is about 5 m. The height of the wall is about 4.5 m. On the outside (right in the picture) the Duokouqiang (steps on the side of the wall) are 1.8 m. The inside of the wall has Yuqiang, which are about 1.5 m.



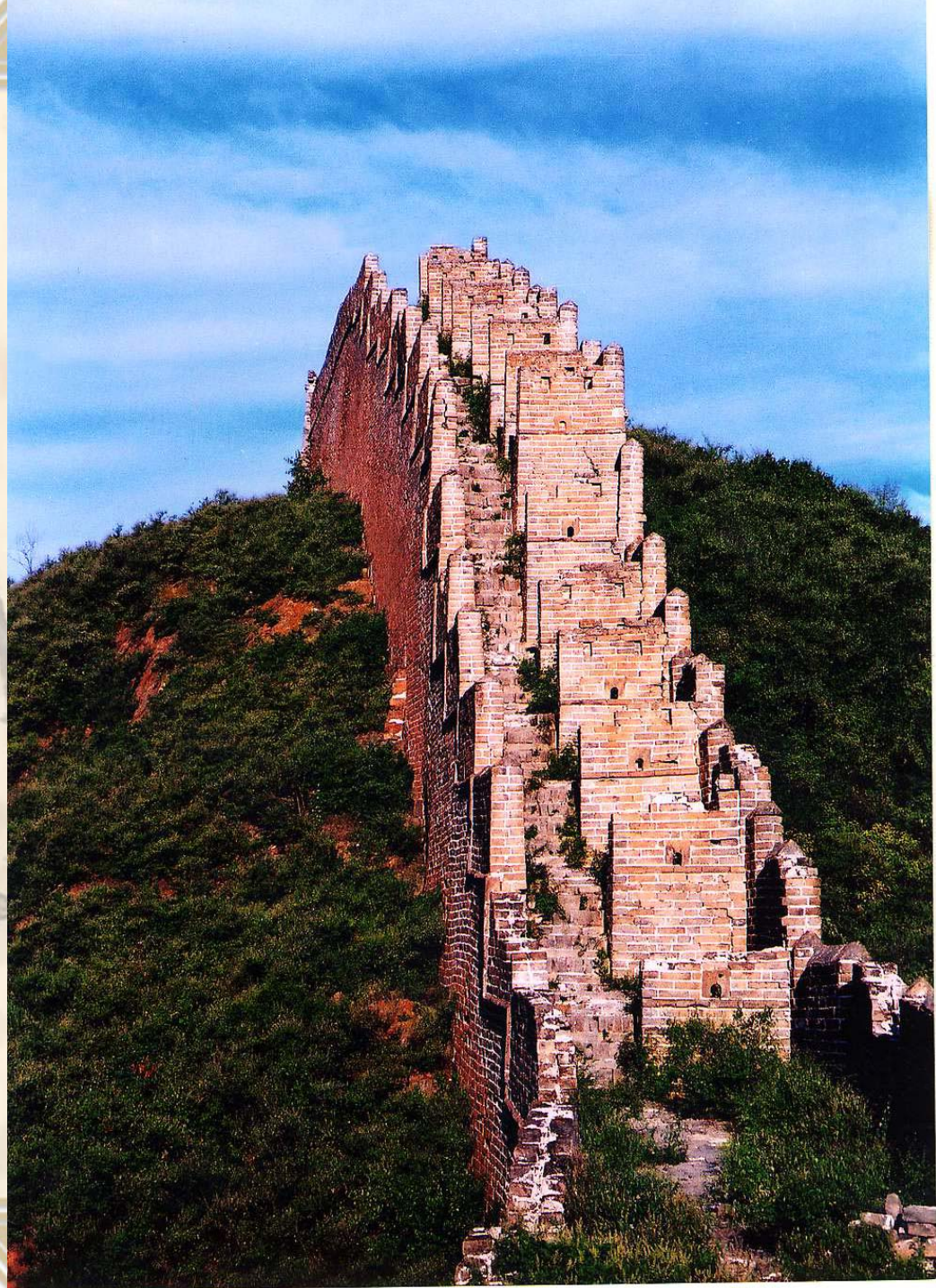




Feng Huo Tai (watch towers) were built on steep peaks inside or outside the wall. When the enemy came, soldiers would light fires to warn the others.



A barrier wall  
was built inside  
the wall to delay  
the enemy if they  
climbed the wall.





The overall characteristics of the JINSHANLING Wall: a wide view, frequent dilou, unique sight, beautiful architectural art, integrity of the defense system.



## 4. Present status and assessment

There are 68 dilous together, one typical instance Siyanlou is chosen for this project. It includes one section of collapsed wall and one section of the wall where the shell has fallen off.

4.1

The Siyanlou Dilou has two floors. The ground floor has arrow windows. The second floor has a chamber and a low wall around it used when shooting the enemy with arrows or crossbows.





The east gate is damaged: the brick (or stone) around the gate is gone. The west gate has a crack and a lot of weeds and shrubbery on the roof. The arrow window is damaged. 2/5 of the floor bricks were broken.





## The bricks on the ground floor



4.2 Some of the wall has fallen down. Many of the wall bricks are gone. Most of the earth filling has collapsed, and only the inner wall remains.



4.3

The col (two layers of the arch) has collapsed.



## 4.4 The brick shell has separated



## 4.5 Other damages



4.5.1

2200 m<sup>2</sup> of brick on the wall are severely damaged.



### 4.5.2

One section of 130 m of the wall's Duokouqiang and 140 m of Yuqiang are gone.



### 4.5.3

The outer skin of wall brick is separating from the inner brick layer (see right edge).





4.5.4

There are many weeds and shrubs on the wall.



### 4.5.5

The collapsed brick deposits around the wall makes it is hard for water to drain.



## 5. Analysis of the reasons for the damage.

### 5.1 Natural damage

- ❖ The wall is more than 460 years old. The local climate has great temperature variation. The coldest temp is below  $-20^{\circ}\text{C}$  in the winter, while the hottest temperature in sunshine is above  $50^{\circ}\text{C}$ . The greatest difference in temperature can be  $40^{\circ}\text{C}$  over 24 hours.
- ❖ After the wall was finished, there was not any maintenance.
- ❖ According historical records, on July 28, 1679, there was a violent earthquake only 75 km from JINSHANLING. The intensity in the middle was 11 degrees.

### 5.2 man-made damage

- ❖ The wall is far from the city. For a long time no person or organization managed the wall. The local farmers took the bricks and stones to construct their own buildings.

# 6. Evaluation (Assessment)

## 6.1 Value of The Great Wall

### 6.1.1 scientific value

- ❖ The layout and project is reasonable and necessary.
- ❖ The form, materials and technology of the Great Wall represent the science and technology of that time.
- ❖ In peace time the Great Wall provides a service for travellers and messengers.
- ❖ We can study many subjects through the study of the great wall, such as history, nationality, politics, economy, techniques, etc.

### 6.1.2 history value

- ❖ JINSHANLING is the most important section of the Ming Dynasty wall. In terms of history, the barrier wall is very representative. It is the most important example for research on historic military defenses.
- ❖ This section of the wall is the witness of many important historic events .
- ❖ Around the wall many cultural relics have been found, such as arrowheads and spears. It is very important in archaeology.

### 6.1.3 Artistic value

The wall has a nice and artistic framework and components, such as the QiLin wall (QiLin was an imaginary animal in ancient China). It was formed with beautiful carved bricks.



#### 6.1.4 Scenic value

- ❖ The wall on the ridge of the mountain is like a megalosaurus and shows the Great Wall's majesty, desolation, richness and power. Everyone feels in specialness. Maybe it is just the fascination of the cultural heritage.

金山嶺長城



## 6.2 Evaluation of the management

- ❖ More and more tourists visit the wall, but it is not open for visitors and there are no services established, so it is dangerous when tourist climb the damaged wall, not only for tourists but also for the wall.
- ❖ Local government established a unit to protect and manage the wall in 2000. But it is short of professionals; the clerks should receive specialized training and qualify to practice after proficiency testing.

## 6.3 Evaluation of the *status quo*


6.3.1 The whole collectivity is integrity. The Siyanlou is distortion but its framework is safe now. But the shell off brick will cause more bricks shell off, so should be reinforce as early as possible.

6.3.2 The small wall on the wall is damaged very seriously and for the safety of tourists, it should be repaired.

6.3.3 The weeds and shrubs cause to the wall crack. Snow and rainwater inside the cracks expand when it freezes, and the brick shell falls off, so it should be cleared and water drainage system fixed.

6.3.4 The qilin wall is sensitive to the weather. A special protection plan should be designed. (It should be done very carefully because we do not have good experience).






## *Part 2*

# The Design for Conservation

### 1. The rule for design

The design should be according to the following:

- 1.1 *Laws of the People's Republic of China on the Protection of Cultural Relics* prescribe “when remedy the heritage sites must retain the historic condition ”
  - 1.2 *Principles for the Conservation of Heritage Sites in China*
  - 1.3 *International Charter for the Conservation of Heritage of Monuments and Sites (The Venice Charter)*
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## 2. Character of the project

- ❖ Address the problems of the wall, including physical protection and strengthening, to solve the existing and hidden problems.

### 3.The principles for the work

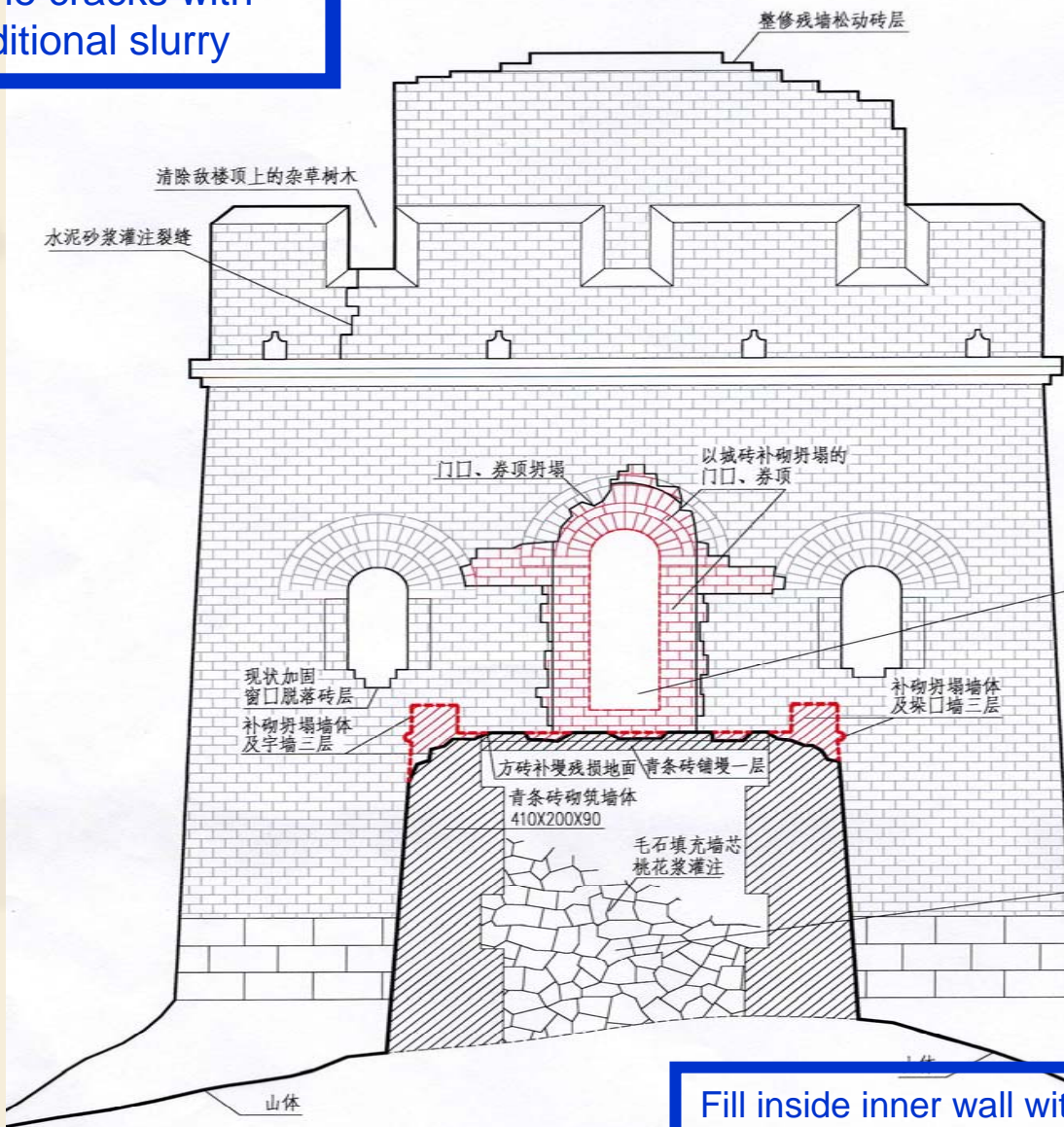
#### 3.1 On retaining the Historic Condition of Heritage Sites.

- ❖ 3.1.1. Protective materials and structures should not harm what they are protecting or change the original fabric.
- ❖ 3.1.2. Permanent solutions should not be decided in haste, and allowance should always be made for later implementation of more effective protection and strengthening interventions.
- ❖ 3.1.3. When it is necessary to add a protective structure to a site, it should be used only on those parts most in danger. The structure should be unobtrusive and, as far as possible, allow the site's original physical characteristics to be retained.

## 4 Action plan

### 4.1 Reinforce the Siyanlou

Fill the cracks with traditional slurry



Patch the flexible brick

Clear up the weed and shrubbery

Patch the east gate and arch with old brick around the wall



Fill inside inner wall with stone and earth and mend the wall's surface with brick.

East surface 1:50

东立面图 1:50

Why not use stone to patch the east gate, just as the west gate

- No sure evidence to prove the gate is made up of stone;
- Other dilou near the Siyanlou are made of brick;
- There are many old bricks around the gate and the wall. Although it can no be proven the gate is made of brick, we can use it;
- We can keep detailed records for this conservation, and the project is reversible. If we have definite evidence to show the gate was made of stone (such as old photos), we can correct it later.





整修残墙松动砖层

Patch the flexible brick

Clear up the weed and shrubbery

裂缝一道宽25-30  
白灰砂浆灌注

Fill cracks with traditional slurry



裂缝一道宽15-25  
白灰砂浆灌注

清除敌楼顶上的杂草树木

补砌坍塌墙体及垛口墙三层

补砌坍塌墙体及垛口墙三层

方砖补砌残损地面 青条砖铺墁一层

青条砖砌筑墙体  
410X200X90  
毛石填充墙芯  
桃花浆灌注

Fill inside inner wall with stone and earth, and mend the wall's surface with brick.

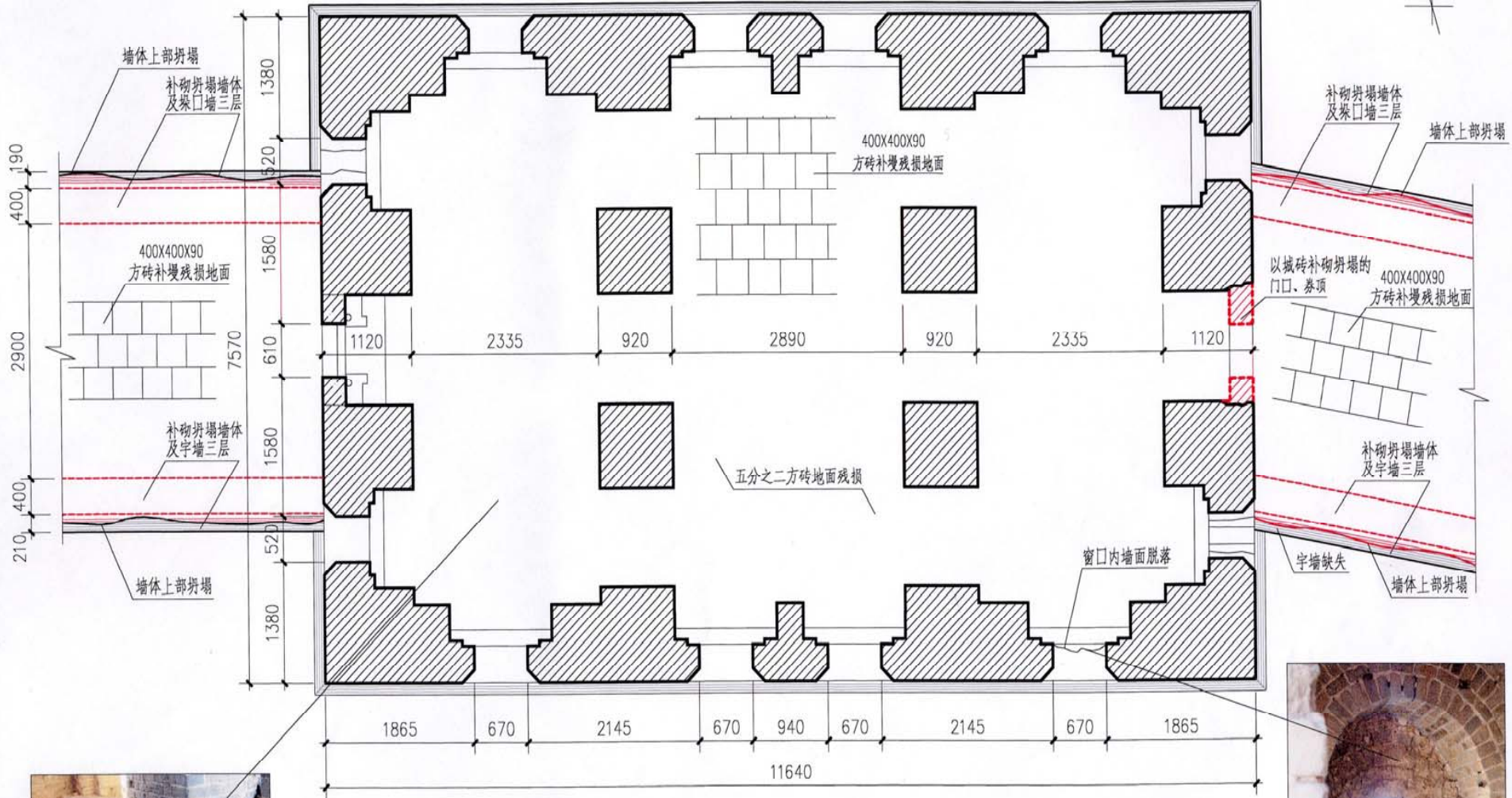
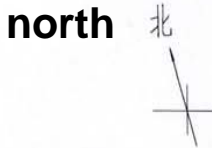
West surface  
1:50

山体

山体

西立面图 1:50

# Mend the ground with old bricks



**Plan 1:50**

平面图 1:50



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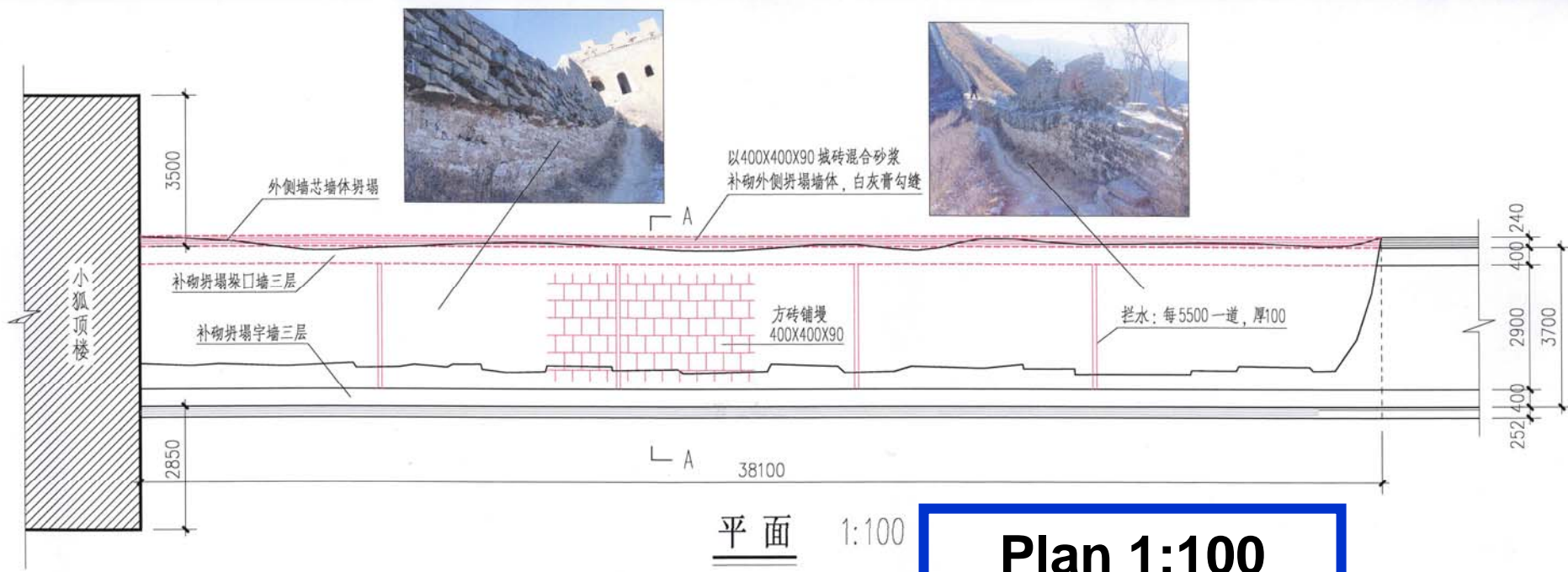
## 4.2 Mend the collapsed wall

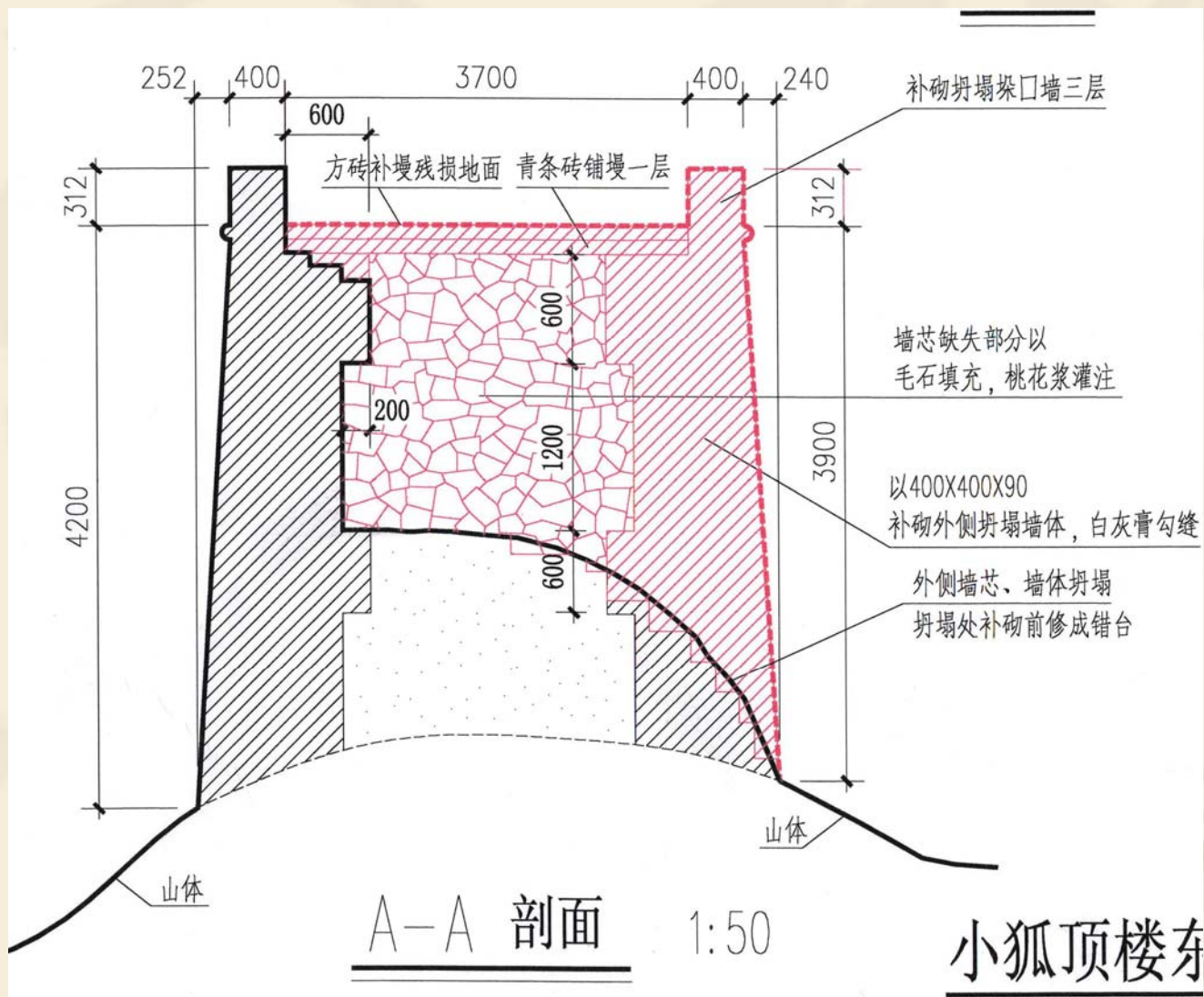
4.2.1 Do archaeological excavations around the collapsed wall.

4.2.2 Remove the loose stone and earth, patch stone and earth, fill with the traditional slurry.

4.2.3 Replace the bricks which are old, fill with the traditional slurry.

4.2.4 Do not repair the Duokouqiang and Yuqiang entirely. Patch three layers of old bricks along the width. It should retain the origin shape.





**Section 1:50**



Thank You