

The Construction of City Walls in the Chapters on the Defence of Cities in the *Mozi*

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Preamble

The *Mozi* 墨子 contains a series of chapters, starting with Chapter 52 “Preparation of City Walls and Gates” (“Bei chengmen” 備城門) and ending with the final chapter “Miscellaneous Defences” (“Zashou” 雜守), that describe military defensive tactics for cities (*cheng* 城), fortified villages (*wu* 塢), blockhouses (*tingzhang* 亭障), etc., military personnel and the placement of offensive and defensive equipment, the construction of military structures, and the art of prognostication. As is well-known, these chapters related to the defence of cities are of the most recent origin among the chapters of the *Mozi*, and they are thought to have been added by later Mohists. The *Mozi* contains many abstruse passages, and these particular chapters could be said to be the most difficult in the entire work. Hu Shi 胡適 once wrote that because they are unrelated to Mozi’s philosophy, these chapters do not require elucidation,¹⁾ while Zhu Xizu 朱希祖 has argued that they are forgeries composed during the Han 漢 dynasty.²⁾ Considerable portions of the chapters on the defence of cities have been lost; and among the twenty chapters from Chapter 52 to Chapter 71 only eleven have survived. According to the “*Mozi mulu*” 墨子目錄 reedited by Bi Yuan 畢沅 of the Qing 清, the organization of these chapters is as follows:

Fascicle 14

- Chapter 52: “Preparation of City Walls and Gates” (“Bei chengmen” 備城門)
- Chapter 53: “Defence against Overlook Carts” (“Bei gaolin” 備高臨)
- (Chapter 54: “Defence against Hooks” [“Bei gou” 備鉤]—missing)
- (Chapter 55: “Defence against Battering Rams” [“Bei chong” 備衝]—missing)
- Chapter 56: “Defence against Ladders” (“Bei ti” 備梯)
- (Chapter 57: “Defence against Ramps” [“Bei yin” 備堙]—missing)
- Chapter 58: “Defence against Inundation” (“Bei shui” 備水)
- (Chapter 59: “Defence against Empty Caves” [“Bei kongdong” 備空洞]—missing)
- (Chapter 60—missing)
- Chapter 61: “Defence against Sallies” (“Bei tu” 備突)
- Chapter 62: “Defence against Tunnelling” (“Bei xue” 備穴)

Chapter 63: "Defence against the Ant-Rush" ("Bei yi-fu" 備蛾傅)

Fascicle 15

(Chapter 64—missing)

(Chapter 65—missing)

(Chapter 66—missing)

(Chapter 67—missing)

Chapter 68: "Sacrifice against the Coming of the Enemy" ("Yingdi ci" 迎敵祠)

Chapter 69: "Flags and Banners" ("Qizhi" 旗幟)

Chapter 70: "Commands and Orders" ("Haoling" 號令)

Chapter 71: "Miscellaneous Defences" ("Zashou" 雜守)

Among commentaries on the *Mozi*, the achievements of the textual criticism of the Qing dynasty are well-known, and these include the *Mozi* (15 fascs.) by Bi Yuan, the *Mozi zazhi* 墨子雜誌 (6 fascs.) by Wang Niansun 王念孫 and Wang Yinzhi 王引之, the *Mozi kanwu* 墨子刊誤 (2 fascs.) by Su Shixue 蘇時學, and the *Mozi pingyi* 墨子平議 (3 fascs.) by Yu Yue 俞樾, but representative of them all is the *Mozi jiangou* 墨子閒詁 (15 fascs.) by Sun Yirang 孫詒讓, which brings together the work of previous scholars. As was noted above, however, the chapters on the defence of cities contain many difficult passages which have puzzled generations of commentators, and consequently there has hitherto been virtually no comprehensive research on these chapters, while the majority of modern commentaries and translations both in Japan and overseas have given them a wide berth. Almost the sole exception is a painstaking study by Cen Zhongmian 岑仲勉,³⁾ written in 1948, which deals in detail with this section of the *Mozi*.

The chapters on the defence of cities in the *Mozi* include considerable information on the actual construction of city walls, some of which may be considered important for the history of architectural technology. However, there has been almost no research, including Cen's above-mentioned opus, that deals with this subject from the perspective of practical technology, and it may therefore be said that these chapters have never been actively utilized as source material for the study of the history of Chinese architecture or civil-engineering technology.

In Japan, Watanabe Takashi 渡邊卓 has published two outstanding articles in which he discusses the background to the composition of the chapters in question with reference to the history of Chinese thought,⁴⁾ and although these are exceptional studies that have won high praise, he does not deal in detail with technical details except for the size of the city walls. As for modern translations, an early Japanese translation was that by Makino Kenjirō 牧野謙次郎,⁵⁾ which relied basically on Sun Yirang's *Mozi jiangou*, and though it is useful for its succinct presentation of the general gist of the text, there are still many sections concerning military techniques and civil-engineering technology that have been left unresolved. Some time later, Yabuuchi Kiyoshi 藪内清 attempted to make up for these shortcomings in his translation of the *Mozi* by referring to later works on the art of war, but regrettably he includes only brief excerpts from Chapter 52 and other

chapters containing the most references to the construction of city walls.⁶⁾ The translations of the *Mozi* by Takata Atsushi 高田淳⁷⁾ and Honda Wataru 本田濟⁸⁾ contain even briefer excerpts from these chapters. The more recent translation by Watanabe Takashi and Nitta Daisaku 新田大作 was an epochal work in that it represented the first complete Japanese translation of the *Mozi*,⁹⁾ but in his annotations to the chapters on the defence of cities Nitta generally follows the interpretations found in Sun Yirang's *Mozi jiangou*, and many points that have been unclear in the past remain so. The same may also be said of the still more recently published translation by Yamada Taku 山田琢.¹⁰⁾ In addition to the above, articles of some relevance to the subject have also been published by Ôtsuka Banroku 大塚伴鹿¹¹⁾ and Chihara Katsumi 千原勝美.¹²⁾ However, all things considered, it has to be said that, when viewed from the perspective of the history of technology, there remains considerable scope for further inquiry in the work of these precursors, including that of Cen Zhongmian.

Zhu Xizu's thesis that the chapters on the defence of cities were forgeries of Han times received strong support for some time, but in more recent years it would seem that the view that these chapters were composed by Mohists in the late Warring States period is beginning to prevail. Already in his aforementioned annotative study Cen Zhongmian had suggested that they were probably the work of people of the Qin 秦. Since then there have appeared studies that make use of new materials such as the Han bamboo slips from Juyan 居延 in Gansu 甘肅 and elsewhere, and Chen Zhi 陳直, basing himself on a detailed comparison of Chapter 52 *infra* of the *Mozi* with the Juyan Han slips, has argued that these chapters postdate the late Warring States period and were composed during the Qin dynasty.¹³⁾ In addition, Li Xueqin 李學勤, having compared the legal terminology and institutions appearing in the Qin bamboo slips from Yunmeng 雲夢 in Hubei 湖北 with Chapter 52 *infra* of the *Mozi*, suggests with still greater explicitness that these chapters were composed in the later Warring States period in the state of Qin by people affiliated with the Mohists.¹⁴⁾ It could thus be said that there has finally begun to appear multifaceted research into various related questions, including the date of the composition of these chapters and their background. In addition to these research results, it is also worth noting that one of the many bamboo books recently discovered in a Han tomb at Yinqueshan 銀雀山 in Linyi 臨沂, Shandong 山東, and entitled *Shoufa* 守法 ("Methods of Defence")¹⁵⁾ exhibits a number of parallels with the chapters on the defence of cities in the *Mozi*.

The chapters on the defence of cities in the *Mozi* are difficult to comprehend not only because parts of the text have been lost, as was noted above, but also because of textual confusion and the frequent use of loan characters,¹⁶⁾ which present further obstacles to our understanding. The discovery of some fragmentary new source materials is not in itself sufficient to resolve the problems posed by the many unintelligible passages. Nor is it likely that someone such as myself, unversed in palaeography, can have anything meaningful to say about problems that have baffled generations of textual scholars. Nonetheless, in the following, ill-advised

though it may be, I wish to present my views on a number of points relating primarily to city walls purely from the standpoint of the history of technology. (When quoting from the *Mozi*, I have for convenience of reference added to the chapter number the section number[s] given in Cen Zhongmian's *Mozi chengshou gepian jianzhu*, but there are some places where I have not followed Cen's divisions or punctuation.)

I. The Size of Cities and the City Walls

A distinctive feature of Chapter 52 "Preparation of City Walls and Gates" in the *Mozi* is that it lists the defensive structures, military personnel, defensive and offensive equipment, and everyday articles to be placed at regular intervals around the city walls. In this article I shall be dealing chiefly with the sections pertaining to the construction of the city walls, but in order to provide an overall perspective on what follows, I shall first show in tabular form the placement of defensive structures, installations and equipment around the city walls as elucidated by Cen Zhongmian.

The structures, installations and equipment listed in Table 1 are presumably given in the *Mozi* on the assumption that they would be installed at certain points along the walls surrounding a city of a particular size. It is thus strange to find that there are, with one exception, no clear references to the size of the city itself in Chapter 52 and other related chapters of the extant *Mozi*. The sole exception is the final sentence of the concluding chapter (Chapter 71.30):

率萬家而城方三里。

For every ten thousand households, the city is three *li* square.

The immediately preceding passage reads as follows:

子墨子曰。凡不守者有五。城大人小。一不守也。城小人衆。二不守也。人衆食寡。三不守也。市去城遠。四不守也。畜積在外。富人在虛。五不守也。

The Master Mozi said: "In general, there are five situations in which a city cannot be defended. The first is when the city is large and the men are few; the second is when the city is small and the men are numerous; the third is when the people are numerous and food is scarce; the fourth is when the markets are distant from the city; and the fifth is when stores are located outside the city and the wealthy are also elsewhere.

Thus the above-quoted reference to a city's size is no doubt meant to give an indication of the size and population of a city that would not result in these five adverse situations. Cen Zhongmian appears to have had misgivings about the authenticity of this single reference to a city's size, and, rather than attributing it to the Mohists themselves, he considers it to be a gloss added in later times. It has indeed been pointed out by others that the content of Chapter 71 overlaps in many

Table 1 Placement of Defensive Structures, Installations and Equipment Attached to City Walls in Chapters on Defence of Cities in *Mozi* (Water Containers, Timber, Firewood, etc., Omitted)

4 sides	1 lookout post
4 corners	1 corner watch tower
2 <i>bu</i>	1 drain, 1 bamboo shelter, 1 linked flail, 1 long hammer, 1 wooden crossbow, 1 spear, 20 bundles of rushes
5 <i>bu</i>	1 furnace, 1 well, 1 torch hole, basket of mud
6 <i>bu</i>	1 suspended box
10 <i>bu</i>	1 long axe, 1 long sickle, 1 shovel
20 <i>bu</i>	1 suspended box, 1 mobile tower, 1 strewing pebble
25 <i>bu</i>	1 furnace
30 <i>bu</i>	1 mobile tower, 1 mobile furnace, 1 crossbow hut, 1 lookout post, 1 privy at base of wall
50 <i>bu</i>	1 mobile tower, 1 furnace, 1 <i>ji</i> , 1 room, 1 latrine, 1 staircase, 1 multistoreyed tower
100 <i>bu</i>	1 watch tower, 1 wooden tower, 1 lookout post, 1 sally post, 1 blockhouse, 1 well, 1 open-topped tower, 10 hidden drains
200 <i>bu</i>	1 high tower

respects with that of Chapter 52, and along with Chapters 68, 69 and 70 it is considered to represent the most recent section of the *Mozi*. Watanabe Takashi, on the other hand, considers this sentence to be attributable to late Mohists of the Qin, and he distinguishes the type of city to which it alludes from the cities of the early Mohists referred to in Chapter 52, but this point will be taken up again below.

However, Chapter 52 also contains a passage that provides some information on the size of the city walls (Chapter 52.73).

疎束樹木。令足以爲柴搏（搏）。毋前面。樹長丈七尺一。以爲外面。以柴搏（搏）從（縱）橫施之。外面以強塗。毋令土漏。令其廣厚能任三丈五尺之城以上。以柴木土稍杜之。以急爲故。前面之長短。豫蚤接之。令能任塗。足以爲堞。善塗其外。令毋可燒拔也。

Loosely tie together trees and timber, making them into 'brushwood bundles', and stack them with their tips facing the walls; use logs 1 *zhang* 丈 7 *chi* 尺 in length to form the outer face, place brushwood bundles lengthwise and crosswise, and plaster the outer face with durable mud, ensuring that the mud does not fall off. Make the depth and height to which the brushwood bundles are stacked such that they are sufficient for protecting a city wall of more than 3 *zhang* 5 *chi*. This is for defending a section of the outer face of a wall by means of brushwood bundles, wood and earth, and it should be done expeditiously. The varying lengths of the tips of the brushwood bundles should be aligned well in advance, and after having applied the mud, ensure that parapets can be built along the top. Apply a good coating of mud to the

outside so that it cannot be burnt down or the brushwood pulled out by the enemy.

This describes defence procedures for guarding against an enemy attack by stacking 'brushwood bundles' (*chaibo* 柴搏) along the outside of the city walls and coating them with mud for protection against fire. The construction work itself "should be done expeditiously," while the "city wall of more than 3 *zhang* 5 *chi*" is of course the existing city wall, and therefore the height given here may be considered to represent the standard height of such walls. (It should be noted that this passage was originally included in Chapter 62 ["Defence against Tunnelling"] and was moved to its present position by Sun Yirang.)

In addition, Chapter 52.33 contains the following statement:

城上廣三步到四步。乃可以爲使鬪。

The width at the top of the walls is 3 *bu* 步 to 4 *bu*, so that it is possible to engage in combat.

The figures 3 *bu* (18 *chi*) to 4 *bu* (24 *chi*) refer to the distance between the parapets along both sides of the top of the walls.

The wall height of 3 *zhang* 5 *chi* (approx. 8 metres) is the same as the height of the city walls of Chang'an 長安 during the Former Han 前漢 given in the *Sanfu huangtu* 三輔黃圖, and it may be regarded as having been the average height of such walls. It is, however, somewhat less than the standard height of 5 *zhang* and 4 *zhang* given respectively in the *Shenji zhidi taibo yinjing* 神機制敵太白陰經, a military treatise by Li Quan 李筌 of the Tang 唐, and the *Yingzao fashi* 營造法式, a work on architectural technology by Li Jie 李誠 of the Northern Song 北宋, and it is nothing like the height of the ramparts of capital cities during the Warring States period. For instance, the height of the extant city walls of old Han 韓 and Zheng 鄭 (Xinzheng 新鄭, Henan 河南) is 18 metres, that of Handan 邯鄲 of Zhao 趙 is 12 metres, and that of Jinan 紀南 of Chu 楚 (Jianglingbei 江陵北, Hubei) is 7 metres.¹⁷⁾ As for the upper width of 18-24 *chi* (4-5 metres), nothing definitive can be said on the basis of extant remains, and although this figure differs markedly from the 12.5 *chi* mentioned in the *Taibo yinjing* and the 40 *chi* and less given in the *Yingzao fashi*, it too may be considered to fall within the average range. (*The Yingzao fashi* distinguishes between *luqiang* 露牆 [earthen walls] and *chourenqiang* 抽絨牆 [walls of tamped earth containing wooden crosspieces], and although no standard figure is given for the latter, it assumes a slightly lower figure.)¹⁸⁾ However, in the same Chapter 52 of the *Mozi* it also says, at least with reference to the defensive deployment of soldiers and civilians discussed below, that "one calculates on the basis of this ratio in accordance with the size of the city" (城小大以此率之), thus implying the existence of cities of different sizes, and one must also consider the possibility that the passage quoted above refers to a smaller category of cities.

Meanwhile, a more general statement on city walls can be found in Chapter

52.5:

凡守圍（圉）城之法。〔城〕厚以高。壕池深以廣。樓櫓（櫓）插（脩）。守備繕利。薪食足以支三月以上。……

In general, the procedure for defending a city is: the city walls are to be thick and high, the moat is to be deep and wide, the towers are to be in good repair, the preparations for defence (i.e., weapons) are to be mended and sharp, the fuel and food are to be sufficient to hold out for more than three months,...

However, there is no reference to the size or batter of the walls, invariably mentioned in military manuals of later times. For example, Li Quan of the Tang writes as follows in his *Taibo yinjing* 5, “Zhucheng pian” 築城篇 43:

In the *Classic* it says: “Under the system of the previous king, a large city did not exceed one third of the capital city, a medium city one fifth, and a small city one ninth.’ Therefore, it says, ‘If a metropolitan city exceeds 100 *zhi* 雉, it is detrimental to the kingdom.’ If the cities of today’s marquis are compared with the Eastern and Western Capitals (Luoyang and Chang’an), the length of one side corresponds to one fifth, while the height of the walls is equivalent to that of the Great Wall for defending the frontier regions, and there are no controls.

The formula for determining the size of city walls in both the past and the present is that the height should be twice the base width and the base width should be twice the upper width. If the base width is 2 *zhang* 5 *chi*, then the upper width is 1 *zhang* 2 *chi* 5 *cun* 寸. These are the criteria for the height and width.”¹⁹⁾

In the opening sentences Li Quan quotes the words of Ji Zhong 祭仲 appearing in the entry for the first year of Duke Yin 隱公 in the *Chunqiu Zuoshi zhuan* 春秋左氏傳 (*Zuozhuan* 左傳), and similar statements are frequently found in the discussions of Confucianists from Han times onwards, but we will return to this later. The formula for determining the batter, or receding upward slope, of the walls described in the second half of the above passage is not mentioned in the *Mozi*, but judging from the extant remains of towns and cities of the Warring States period, paintings from the Han dynasty, and literary sources, it may be assumed that such formulae did exist. According to the *Kaogongji* 考工記, “Jiangren wei gouxu” 匠人爲溝洫,

in the case of granaries, underground pits, warehouses and cities, the walls recede by one sixth,

and in Zheng Xuan 鄭玄’s commentary this is interpreted as follows: “‘Recede’ (*ni* 逆) means ‘gradually batter’. When building these four kinds of structures, the height is divided by six and the top of the walls has batter by just one part.”²⁰⁾ In

the same section of the *Kaogongji* we also read:

The thickness of the walls is 3 *chi*, and their height is three times this.

According to Zheng Xuan's commentary, "If the height and thickness are based on this, the walls will hold."²¹ These are probably the earliest references to the batter of city walls. Dispensing with any further tedious explanations, I shall now illustrate the former case on the basis of the example given in the commentary by Jia Gongyan 賈公彥 of the Tang (height: 1 *zhang* 2 *chi*, base width: 4 *chi*) along with the dimensions given in the *Taibo yinjing* by Li Quan of the Tang and in the *Yingzao fashi* by Li Jie of the Song (Fig. 1).

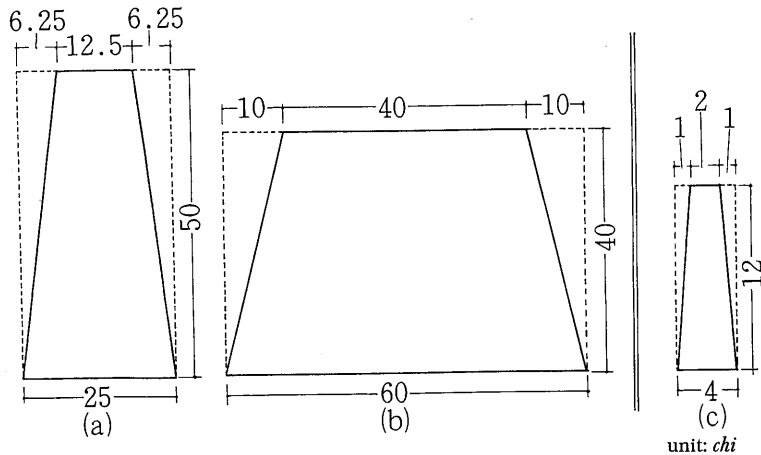


Fig. 1 Cross section of city walls

- (a) Li Quan (Tang), *Taibo yinjing*.
 (b) Li Jie (Song), *Yingzao fashi*, "Haozhai zhidu" 壕寨制度.
 (c) Jia Gongyan's commentary on *Kaogongji*, "Jiangren yingguo" 匠人營國.

When discussing the size of the cities alluded to in Chapter 52 of the *Mozi*, which possibly preserves the records of early Mohists, Watanabe Takashi indirectly infers from references to the deployment of soldiers and civilians that there were cities of three sizes (large, medium and small), and availing himself also of archaeological data from the remains of towns and cities of the Warring States period, he presents a table in which he compares the size and population of the large, medium and small cities of Chapter 52, the cities of Chapter 71, and cities alluded to in pre-Qin literature. The passage on which he bases himself is Chapter 52.67-69:

守法。五十步丈夫十人，丁女二十人，老小十人。計之。五十步四十人。城下(上)樓本(卒)率一步一人。二十步二十人。城小大以此率之。乃足以守圍(圍)。宕

(客) 馮面而蛾傅之。主人則先之知 (知之)。主人利。客適 (病)。客攻以遂。十萬 <物> (衍) 之衆。攻無過四遂者。上術廣五百步。中術三百步。下術 [百] 五十步。諸不盡百五 [十] 步者。主人利而客病。廣五百步之隊。大 (丈) 夫千人，丁女二千人，老小千人。凡 [四] 千人而足以應之。此守術之數也。

Method of defence: For every 50 *bu* have 10 able-bodied men, 20 able-bodied women, and 10 old people and children. This comes to a total of 40 people for every 50 *bu*. As for the towers on top of the city walls, have 1 soldier for 1 *bu* and 20 men for 20 *bu*. If one calculates on the basis of this ratio in accordance with the size of the city, it will be sufficient for the purposes of defence. Should the enemy make an antlike approach from four sides, then if the chief of the defenders notices this first, he will be at an advantage and the enemy will be at a disadvantage. Should the enemy attack by means of trenches, then even if it is a large army of 100,000 men, it will be no more than one of its four divisions that makes the attack. A superior trench is 500 *bu* wide, a medium trench is 300 *bu* wide, and an inferior trench is 150 *bu* wide. In other cases when the trench is less than 150 *bu* wide, the chief is at an advantage and the enemy at a disadvantage. In the case of a division that is 500 *bu* wide, 1,000 able-bodied men, 2,000 able-bodied women, and 1,000 old people and children, making a total of 4,000 people, will be sufficient to counter it. This is the number of people for defending against an attack by means of trenches.

Watanabe equates the width of each of the four divisions deployed by the enemy when attacking by means of trenches (*sui* 遂, *shu* 術) with the length of one side of the city walls. Although archaeological excavations of city remains would suggest that there were actually very few cities in pre-Qin times that were square in shape, it should go without saying that the above account presents no more than a hypothetical model of the Mohists and, just like the assumption that enemy hosts would attack the city from all four sides in an “antlike approach” or mass infantry assault, it is linked to the character of military treatises. Therefore, Watanabe’s attempt to estimate on the basis of this passage the size of contemporary cities defended by the Mohists is most original and deserves high praise. But even if one allows that the above passage suggests the existence of three grades of cities (large, medium and small), there are still insufficient grounds for equating the figures mentioned (500 *bu*, 300 *bu* and 150 *bu*) with the lengths of the walls of each of these three grades of cities.

However, the *Shoufa*, a bamboo slip text recently unearthed at Yinqueshan, contains the following passage (slips 777-780):

守城之法。客四面蛾傅之。主人先知之。主人利。客…… [上] 遂廣五百步。中遂三百步。下 [遂] ……遂丈夫千人。……者萬人。老不事者五千人。嬰兒五千人。女子負嬰 [兒若干人] ……

Apart from the fact that superior, medium and inferior *sui* 遂 have been substituted

for superior, medium and inferior *shu* 術, this passage bears a very close resemblance to the above passage from Chapter 52. According to Sun Yirang, *shu* and *sui* both have the same tone and both signify a route for attacking a city. Although the bamboo-slip *Shoufa* has numerous lacunae, it should be evident that both passages describe an identical “method of defence.” Moreover, the *Shoufa* is more explicit than the *Mozi* in that it clearly refers to an “enemy approaching like ants from four sides” (客四面蛾傅之). But assuming that *sui* denotes the paths or trenches used by the attackers, and even though the length of the city walls would naturally be greater than the width of this *sui*, it is nonetheless difficult to see how its width would have been directly linked to the length of one side of the city walls, and one is still left without any basis for determining the actual length of the city walls.

By way of comparison with the passage from the *Mozi* quoted above, Watanabe goes on to cite first the words of Ji Zhong appearing in the entry for the first year of Duke Yin (722 B.C.) in the *Chunqiu Zuoshi zhuan*, already alluded to above:

If a metropolitan city exceeds 100 *zhi* 雉, it is detrimental to the kingdom.²²⁾

Next, he also quotes the words of Confucius cited in an entry for the twelfth year of Duke Ding 定公 (498 B.C.) in the *Chunqiu Gongyang zhuan* 春秋公羊傳 (passages in brackets are from the commentary by He Xiu 何休 of the Later Han 後漢):

家不藏甲。邑無百雉之城。……雉者何。五板而堵 [八尺曰板。堵凡四十尺]。五堵而雉 [二百尺]。百雉而城 [二萬尺。凡周十一里三十三步二尺。公侯之制也。禮。天子千雉。蓋受百雉之城十。伯七十雉。子男五十雉。……]。²³⁾

Armour is not stored in the homes, and there is no city of one hundred *zhi* 雉 in the district... What is a *zhi*? Five *ban* 板 make 1 *du* 堵 [8 *chi* are called a *ban*, and a *du* is about 40 *chi*], 5 *du* make a *zhi* [200 *chi*], and 100 *zhi* make a city [20,000 *chi*; its circumference is 11 *li* 33 *bu* 2 *chi*, and this is the standard for dukes and marquis. According to the *Rites*, the city of the Son of Heaven is 1,000 *zhi*, and so 100 *zhi* probably represents one tenth of that. The city of an earl is 70 *zhi*, and the city of a viscount or baron is 50 *zhi*....].

On the assumption that 100 *zhi* was one of the standard lengths of city walls at this time, and taking the *Gongyang zhuan* and He Xiu's commentary as the most reliable indicators of the length of a *zhi*, Watanabe suggests on the basis of the statement that “its circumference is 11 *li* 33 *bu* 2 *chi*” that a city of 100 *zhi* would have been a square city of which the length of the walls along one side would have been 25 *zhi* = 5,000 *chi* = 833 *bu* 2 *chi* = 2 *li* 233 *bu* 2 *chi* = 1,125 metres. The *zhi* and *du* are both units based on the *ban*, corresponding to the boards of the shuttering used when constructing walls by means of the tamped-earth method. Watanabe comments that “in particular it is worth noting that He Xiu alludes to the length of the boards that formed the basis of construction work and sets their length at 8 *chi*,” but although

he shows considerable ingenuity in converting this figure on the basis of the “great *chi*” of the Warring States period, exemplified by the ruins of tamped-earth walls at Xiadu 下都 of Yan 燕, this can apply only to the length of the *ban*, and there are discrepancies in the various interpretations of the actual length of the *zhi*, with the above gloss by He Xiu holding a rather special position, a fact that requires caution. This is discussed in detail by Sun Yirang in his *Zhouli zhengyi* 周禮正義 with reference to Kong Yingda 孔穎達’s commentary on the above-cited passage from the entry for the first year of Duke Yin in the *Zuozhuan* and also with reference to a passage from the *Zhouli kaogongji* 周禮考工記, “Jiangren yingguo” 匠人營國 (王宮門阿之制五雉. 宮隅之制七雉. 城隅之制九雉).²⁴ Firstly, in the *Wujing yiyi* 五經異義 by Xu Shen 許慎, quoted by Kong Yingda in his commentary on the *Zuozhuan*, Duke Yin, year 1, it is stated as follows:

According to the *Dadai liji* 大戴禮記 and *Hanshi waizhuan* 韓詩外傳, 8 *chi* are 1 *ban* 版, 5 *ban* are 1 *du*, the width of 1 *ban* is 2 *chi*, the height of five of these placed on top of each other is 1 *zhang*, 5 *du* are 1 *zhi*, and the length of 1 *zhi* is 4 *zhang*. Formerly, according to the *Zhouli* and *Zuozhuan*, 1 *zhang* was 1 *ban*, the width of 1 *ban* was 2 *chi*, 5 *ban* were 1 *du*, and a wall of 1 *du* was 1 *zhang* long and 1 *zhang* high. Three *du* are 1 *zhi*, a wall of 1 *zhi* is 3 *zhang* long and 1 *zhang* high, and when measuring lengths one uses this length (3 *zhang*) and when measuring heights one uses this height (1 *zhang*).

Furthermore, in Mao Heng 毛亨’s commentary on the line “100 *du* [of walls] all arose” (百堵皆作) in the *Shijing* 詩經, “Xiaoya: Hongyan” 小雅·鴻雁, it says “1 *zhang* is called a *ban*, and 5 *ban* are called a *du*,” while Zheng Xuan’s commentary on this reads:

In the *Chunqiu [Gongyang] zhuan* it says, “5 *ban* are called a *du*, and 5 *du* are called a *zhi*.” Since the length of a *zhi* is 3 *zhang*, [the length of] a *ban* is 6 *chi*.

As is explained by Jiao Xun 焦循 and Sun Yirang, Mao Heng equates 1 *ban* with 1 *zhang*, resulting in 1 *zhi* = 3 *du*, while Zheng Xuan equates 1 *ban* with 6 *chi*, resulting in 1 *zhi* = 5 *du*, but they are in agreement insofar that they both define a wall of 1 *zhi* as being 3 *zhang* long and 1 *zhang* high. Furthermore, the equivalents 1 *ban* = 8 *chi* and 1 *zhi* = 5 *du* = 4 *zhang* given by Xu Shen on the basis of the *Dadai liji* and *Hanshi waizhuan* differ only with respect to the length of the *ban* and reflect the same basic way of thinking, a fact that is made quite clear when he goes on to state that, according to the *Zhouli* and *Zuozhuan*, a wall of 1 *zhi* is 3 *zhang* long and 1 *zhang* high and that the length and height of city walls are to be measured on the basis of this basic unit.

He Xiu’s gloss, on the other hand, presents a marked contrast to the above interpretations. That is to say, even if we accept his definition of 1 *ban* as 8 *chi*, his equivalents 1 *du* = 5 *ban* = 4 *zhang* and 1 *zhi* = 5 *du* = 20 *zhang* indicate that he has

increased only the horizontal length fivefold, twenty-fivefold, and so on, thereby resulting in a considerable difference in size to the order of one when compared with other commentators. To wit, assuming that the width of a *ban* is uniformly 2 *chi* while its length varies from 6 *chi* to 8 *chi* or 1 *zhang*, proper consideration of the actual procedures followed in the tamped-earth method of construction, whereby successive layers of tamped earth are built on top of each other in units 1 *ban* in length, would suggest that the *du* represents a block unit incorporating a certain fixed height. Therefore, He Xiu's interpretation, which ignores the process of raising layer upon layer of tamped earth in a vertical direction and defines the *du* by simply quintupling the length of the *ban* in a horizontal direction, is fundamentally untenable. For the sake of brevity and to facilitate the reader's understanding, the representative interpretations of these units of measurement are shown in Fig. 2. According to Xu Yan 徐彥 of the Tang, He Xiu's gloss is based on the *Chunqiu shuo* 春秋說, while the *Gongyang zhuan zhu* 公羊傳注 quoted in the *Chuxueji* 初學記 24, "Juchubu: chengguo" 居處部·城郭 reads as follows (with an almost identical passage, this time attributed to the *Gongyang zhuan*, appearing in the *Taiping yulan* 太平御覽 192, "Juchubu" 20: "Cheng" 城 1):

天子之城千雉。高七雉。公侯百雉。高五雉。子男五〔十〕雉。高三雉。(The *Chuxueji* and *Taiping yulan* omit the characters 十 and 子 respectively.)²⁵⁾

The walls of the Son of Heaven's city are 1,000 *zhi* [long] and 7 *zhi* high; those of a duke or marquis are 100 *zhi* [long] and 5 *zhi* high; and those of a viscount or baron are 50 *zhi* [long] and 3 *zhi* high.

It is thus probably no coincidence that He Xiu's gloss makes no reference to the elevation of the city walls.

However, although it is to Watanabe's credit that he took special note of the correspondence between 1 *ban* and 8 *chi*, his rejection of the views of Zheng Xuan and others as being merely academic and his identification of 1 *zhi* with 200 *chi* on the basis of He Xiu's gloss are probably unwarranted. There is, namely, still scope for further examination of whether or not "a city of 100 *zhi*" actually refers to a city that was 25 *zhi* square (= 2 *li* 233 *bu* 2 *chi*) and also whether or not statements such as "[a city with] inner walls of 3 *li* and outer walls of 7 *li*" (三里之城。七里之郭) in *Mengzi* 孟子 II.B describe the entire circumference of the city walls. This is because although the interpretation of the length of city walls and other structures when there is no indication as to whether the measurements refer to only one side or the entire circumference is a perennial problem in the fields of architectural and urban history that is not restricted to the pre-Qin period, and although further investigations are necessary, there are passages that would seem to preserve early forms of explicit references in this regard—e.g., "The capital cities constructed by artisans and engineers are 9 *li* square and have three gates on each side" (*Kaogongji*: 匠人營國。方九里。旁三門); "... [a state of] 60 or 70 [*li*] square, or even of 50 or 60" (*Lunyu* 論語 XI: 方六七十。如五六十); "[Is it true that] the park of King Wen was 70

li square” (*Mengzi* I.B: 文王之囿. 方七十里); “The city walls are 1,720 *zhang* square and the outskirts are 70 *li* square” (*Yi Zhoushu* 逸周書, “Zuoluo” 作雒: 城方千七百二十丈. 郭方七十里); “The audience hall is 112 *chi* square” (*ibid.*, “Mingtang” 明堂: 明堂方百十二尺)—and from the Later Han onwards the mode of expression “... *li* in circumference” (周○○里 or 周員/周圍/周圍/周回/圓周/方圓○○里) would seem to have come into general usage.²⁶⁾

Meanwhile, the bamboo-slip *Shoufa* (slips 768-769) contains the following passage:

萬乘之國. 郭方〔廿〕七里. 城方九〔里. 城高〕九仞 (仞). 池□ (廣) 百步. 國城郭……〔郭〕方十五里. 城方五里. 城高七仞 (仞). 池廣八十步. 大縣……

In the case of a capital city of ten thousand carriages, the outer walls are 27 *li* square, the inner walls are 9 *li* square, the city walls are 9 *ren* 仞 (6 *zhang* 3 *chi*) high, and the moat is 100 *bu* wide—such are the inner and outer walls of a capital city.... [The outer walls] are 15 *li* square, the inner walls are 5 *li* square, the city walls are 7 *ren* (4 *zhang* 9 *chi*) high, and the moat is 80 *bu* wide—such is a large town.²⁷⁾

This appears to tally with the following gradational dimensions given in Xu Shen’s *Wujing yiyi* quoted in the *Chuxueji* 24:

天子之城高九仞. 公侯七仞. 伯五仞. 子男三仞.

The walls of the Son of Heaven’s city are 9 *ren* high, those of a duke or marquis are 7 *ren*, those of an earl are 5 *ren*, and those of a viscount or baron are 3 *ren*.

As we have already seen, however, the *Shoufa* includes passages that closely resemble the chapters on the defence of cities in the *Mozi*, and I am of the view that, when we take into account the fact that much of the extant sections of Chapter 52 is muddled and contains many lacunae, it would be natural to assume that Chapter 52 too originally contained a passage of similar import to the above passage from the *Shoufa* which was subsequently lost.

In the above passage from the *Shoufa*, the section on the different grades of cities below the capital city is incomplete, but it can be readily surmised from what follows that it refers to “large towns” (*daxian* 大縣), “medium towns” (*zhongxian* 中縣), and “small towns” (*xiaoxian* 小縣), and it could be further conjectured that the height of the walls of these four grades of cities was 9 *ren* (63 *chi*), 7 *ren* (49 *chi*), 5 *ren* (35 *chi*), and 3 *ren* (21 *chi*) respectively.²⁸⁾ Assuming that this was indeed so, then the reference to “city walls of 3 *zhang* 5 *chi*” in Chapter 52 coincides with the height of the city walls of a “medium town,” the third of the four grades of cities mentioned in the *Shoufa*. It could likewise be surmised that the inner walls of such a city were 3 *li* square and the outer walls 9 *li* square, and the surface area within the inner walls would then tally with the statement at the very end of Chapter 71 that “for every

ten thousand households, the city is three *li* square.” The height of the walls is somewhat less than the 5 *zhi* given as the standard measure for the height of the gate to a royal palace in the *Kaogongji*, “Jiangren yingguo” (王宮門阿之制五雉) or the walls of the royal capitals of the Warring States period, but it still does not represent a difference of a full order in area and height. Moreover, the relevant passage in Chapter 52 describes procedures for reinforcing the outer face of the city walls in order to protect the main body of the walls, and it is stated that this should be done so as to be able to protect at the very least city walls of 3 *zhang* 5 *chi*.

Since the second half of the *Shoufa* is missing, we must refrain from indulging in any further speculation. To sum up, the cities on which Chapter 52 and subsequent chapters of the *Mozi* are predicated belong, I believe, to a relatively smaller class among the cities of the Warring States period, although they were not as small as was assumed by Watanabe. To enable readers to judge for themselves, details of the sizes of cities described in the sources quoted so far, including information not only on their surface area but also on the height and width of their walls and the size of their moats, are provided in Table 2.

Considerable mention has already been made of the structure and size of the city walls themselves in connection with the size of cities, and a comparison with technological treatises of later times has also been made in Table 2 with regard to wall height, batter, base width and upper width. Next, as for building materials, the walls themselves were constructed of tamped earth (*hangtu* 夯土), while the structures erected on top of the walls are thought to have been wooden, and bricks too were presumably used for dressing the inner and outer faces and for the coping. There are no explicit references to such matters in the *Mozi*, but Chapter 52.66 contains the following passage:

民室杵 (材) 木, 瓦石, 可以蓋 (益) 城之備者. 蓋 (盡) 上之. 不從令者斬.

Timber, tiles and stones from people's homes and everything serviceable for the defence of the city are to be handed in, and those who do not obey orders are to be executed.

We similarly read in Chapter 70.26:

悉舉民室材木, 瓦, 若藺石數. 署長短, 小大. 當舉不舉. 吏有罪.

Inspect all the timber, tiles and stones for hurling down on besiegers in people's homes, and record their length and size. If an inspection is not made when it should have been, then the official responsible is to be punished.

This is similar in purport to the following instructions found in the *Shangjun shu* 商君書, “Bingshou pian” 兵守篇:

Pull down the beams, tear down the houses, transport whatever can be transported to the city, and burn what cannot be transported.²⁹⁾

Table 2 Comparative Table of City Walls According to Various Sources

	Size of City		Moat	Height	City of Wall		
	Outer Walls	Inner Walls	Width/Depth		Upper Width	Lower Width	Batter
<i>Shoufa</i> Capital city of 10,000 carriages Large town	[27] <i>li</i> square (48,600 <i>chi</i> /10.94km) 15 <i>li</i> square (27,000 <i>chi</i> /6.08km)	9 <i>li</i> square (16,200 <i>chi</i> /3.62km) 5 <i>li</i> square (9,000 <i>chi</i> /2.03km)	100 <i>bu</i> wide (600 <i>chi</i> /135m) 80 <i>bu</i> wide (480 <i>chi</i> /108m)	9 <i>ren</i> (63 <i>chi</i> /14.2m) 7 <i>ren</i> (49 <i>chi</i> /11.09m)			
Medium town	[9 <i>li</i> square] (16,200 <i>chi</i> /3.65km)	[3 <i>li</i> square] (5,400 <i>chi</i> /1.22km)	[60 <i>bu</i> wide] (360 <i>chi</i> /81m)	[5 <i>ren</i>] (35 <i>chi</i> /7.88km)			
Small town	[3 <i>li</i> square]	[1 <i>li</i> square]	[40 <i>bu</i> wide]	[3 <i>ren</i>]			
<i>Mozi</i> Chap. 52				3 <i>zhang</i> 5 <i>chi</i> (7.88m)	3 <i>bu</i> –4 <i>bu</i> (18–24 <i>chi</i> /4.1–5.4m)	[ex. 27 <i>chi</i> –37.5 <i>chi</i>]	1/10 1/4
Chap. 71	3 <i>li</i> square (5,400 <i>chi</i> /1.22km)						
<i>Kaogongji</i> , “Jiangren yingguo”	9 <i>li</i> square (16,200 <i>chi</i> /3.65km)		3 <i>chi</i> deep (0.68m)	City wall corner: 9 <i>zhi</i> (90 <i>chi</i> /20.3m) Palace corner: 7 <i>zhi</i> (70 <i>chi</i> /15.8m) Palace gate: 5 <i>zhi</i> (50 <i>chi</i> /11.3m)			1 sixth
<i>Chunqiu Gongyang Zhuan</i> (He Xiu's commentary) Son of Heaven	1,000 <i>zhi</i> (30,000 <i>chi</i> /6.75km) [200,000 <i>chi</i> /45.0km] [27.8 <i>li</i> square/11.25km]			7 <i>zhi</i> (70 <i>chi</i> /15.8m) [unknown]			
Duke or marquis	100 <i>zhi</i> (3,000 <i>chi</i> /0.68km) (2,000 <i>chi</i> /4.5km) [2.78 <i>li</i> square/1.13km]			5 <i>zhi</i> (50 <i>chi</i> /11.3m) [unknown]			
Baron	50 <i>zhi</i> (1,500 <i>chi</i> /0.34km) [10,000 <i>chi</i> /2.25km] [1.38 <i>li</i> square/0.56km]			3 <i>zhi</i> (30 <i>chi</i> /6.8m) [unknown]			
<i>Mengzi</i> II.B	7 <i>li</i> (12,600 <i>chi</i> /2.84km)	3 <i>li</i> (5,400 <i>chi</i> /1.22km)					
<i>Taiboyin jing</i>			2 <i>chi</i> wide(6.2m) 1 <i>chi</i> deep(3.1m)	5 <i>zhang</i> (15.6m)	12.5 <i>chi</i> (3.9m)	25 <i>chi</i> (7.8m)	6.25 <i>chi</i> (1/8) (1.9m)
<i>Yingzao fashi</i>				<i>Chourenqiang</i> : 40 <i>chi</i>	40 <i>chi</i>	60 <i>chi</i>	1/4 1/8
<i>Mozi</i> , Chap. 52 Large (superior trench) Medium (medium trench) Small (inferior trench)	1 side = 500 <i>bu</i> (3,000 <i>chi</i> /0.68km) 1 side = 300 <i>bu</i> (1,800 <i>chi</i> /0.41km) 1 side = 150 <i>bu</i> (900 <i>chi</i> /0.20km)						

It will have been noticed that tiles are mentioned, although only as matériel for preparing to defend a city against seige. Meanwhile, when describing the fortification of the residences of leaders of squads of ten and one hundred soldiers, Chapter 52.56 states:

復使卒急爲壘壁。以蓋瓦復之。

Again, have the soldiers quickly erect rampart walls, and cover the roof with tiles.

Along with the following passage in Chapter 70.59, this would suggest that roofs were as a rule tiled:

葆宮之牆必三重。牆之垣。守者皆累瓦釜（塗）牆上。

The walls of the guardhouse for hostages must be threefold, and in order to fortify each ring of walls, place tiles on top of all the walls and plaster them with mud.

A passage similar in content to Chapter 52.66 quoted above is also found in the *Shoufa* (slips 810-811):

諸官府室屋壯（牆）垣及家人室屋器戒（械）。可以給城守者盡用之。不可聽者斬。

The buildings and walls of government offices and the fixtures of householders' buildings that are of use for defending the city are to be all requisitioned, and those who disobey are to be executed.

Similarly, slip 812 has:

積石及毀瓦，靈（甗）辟（甃），疾（蒺）莉（藜）於城下。百步而一積。城守之造也。

Pile stones, broken tiles, bricks, and caltrops at the base of the city walls, placing one pile every 100 *bu*. This serves as material for fortifying the walls.

Again, in slips 807-808 we read:

積大瓦及石於城上。靈（甗）辟（甃）之重皆五斗以上。毋下人五十。

Pile large tiles and stones on top of the city walls. The weight of the bricks should be all more than 5 *dou* 斗, and each person must have no less than fifty.

These passages clearly show that the requisitioned tiles and stones were not only set aside for defensive purposes, but were also used as material for the construction of fortifications.³⁰⁾ As is indicated by the editors of the *Shoufa*, the characters *lingpi*

靈辟 have presumably been used for *lingpi* 瓴壁, with regard to which reference can be made to the *Erya* 爾雅, “Shi gong” 釋宮 (with Guo Pu 郭璞’s commentary):

Lingdi 瓴甃 (‘tiles’) are called *pi* 壁. (These are *luzhuan* 甃甃 [‘paving tiles’]. Nowadays [in the Jin 晉 dynasty] in the Jiangdong 江東 region they are called *lingpi* 瓴壁.)³¹⁾

As I have pointed out elsewhere, these correspond to the baked bricks (*zhuan* 磚) or sun-dried bricks (*ji* 墼) of later times.³²⁾ The Han slips from Juyan contain numerous expressions such as *zhiji* 治墼 (‘brick-making’) and *anji* 案墼 (‘bricklaying’), as well as references to their measurements (墼廣八寸, 厚六寸, 長尺八寸: “bricks are 8 *cun* wide, 6 *cun* thick, and 1 *chi* 8 *cun* long”),³³⁾ and these are all thought to refer to sun-dried bricks. Chapters 52 and 70 in the *Mozi* contain no explicit references to bricks, but a number of terms that have baffled previous commentators may be related to them. In Chapter 52.94 we read:

靈丁。三丈一。犬牙施之。

Lingding are placed every 3 *zhang* in such a way that they interlock.

Cen Zhongmian speculates that *lingding* 靈丁 may be a phonetic variant of *lingpi* 瓴壁,³⁴⁾ and since this follows the instruction to “make fires with brushwood on the outside and inside of the walls” (馮垣外內。以柴爲燔), the above passage may be tentatively considered to refer to a type of parapet constructed of bricks. Next, Chapter 52.74 contains the following passage:

令耳。屬城爲再重樓。下墼城外堞內。深丈五，廣丈二。樓若令耳。皆令有力者主敵。善射者主發。

With *linger* make a two-storeyed tower attached to the city walls. Below it and inside the outer parapet of the wall dig a hole 1 *zhang* 5 *chi* deep and 1 *zhang* 2 *chi* wide. In the case of a tower made of *linger*, have all the strong men deal with the enemy and have those skilled in archery shoot arrows.

In view of the fact that in clerical script (*lishu* 隸書) the character *er* 耳 bears a close resemblance to the character *wa* 瓦 (‘tile’),³⁵⁾ the *linger* 令耳 alluded to here may also be linked to the aforementioned *lingpi*, and since this passage describes emergency defence procedures, it could be interpreted as describing rushed construction work using baked bricks.

Next, let us consider defence works along the top of the city walls. The term *die* 堞 that has appeared already in Chapter 52.73 quoted earlier (令能任塗。足以爲堞) denotes the parapet along the top of a wall, and it was also called the ‘woman’s wall’ (*nüqiang* 女牆). The entry for the sixth year of Duke Xiang 襄公 in the *Zuozhuan* contains the statement “They built an earthen mound around the city walls and reached the parapets,” and in his commentary Du Yu 杜預 equates ‘parapet’ (*die*)

with ‘woman’s wall’ (*nüqiang*).³⁶⁾ Similarly, the ‘peepers’ (*pini* 俾倪) described in Chapter 52.34 also refer to the parapets:

俾倪廣三尺。高二尺五寸。

The peepers are 3 *chi* wide and 2 *chi* 5 *cun* high.

The clearest explanation of these terms is probably provided by Liu Xi 劉熙 in his *Shiming* 釋名, “*Shi gongshi*” 釋宮室 (edited by Bi Yuan):

The wall along the top of the city walls is called *pini* 俾倪. This refers to the fact that one can peep through its holes at untoward happenings. It is also called *pi* 陴, i.e., *pi* 裨 (‘helper’). This refers to the fact that it helps or supplements the height of the walls. It is also called *nüqiang* 女牆 (‘woman’s wall’). This refers to the fact that it is low and small in comparison with the main wall, just like a woman in comparison with a man. It is also called *die* 堞, and this draws on the meaning of ‘piling up’.³⁷⁾

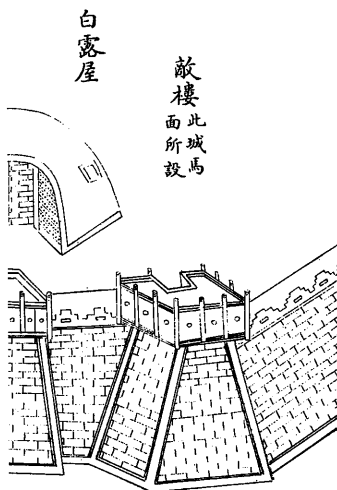


Fig. 3 City wall, from *Wujing zongyao* I.12

Although belonging to a later period, reference should be made to the accompanying illustration of an ‘enemy tower’ (*dilou* 敵樓) or balcony given in the *Wujing zongyao* 武經總要 of the Northern Song (Fig. 3). In passing, it might also be noted that the passage in Chapter 52.50 read by Cen Zhongmian as 五<十> (衍) 步一堞。下爲爵穴。三尺而一。 (“Place a parapet every 5 *bu*, and at its base make a torch hole every 3 *chi*.”) must be emended as follows in accordance with Sun Yirang’s punctuation, since it is highly unlikely that parapets would have been placed only at intervals of 5 *bu* (30 *chi*): 城上之備。……，飛衝，縣口 (梁)，批屈。樓五十步一。堞下爲爵穴。三尺而一爲薪臯。³⁸⁾

The *Mozi* makes mention of both *die* and *pini*, and in the *Shoufa* (slips 796-797) we find the following reference:

外堞 (堞) 高七尺。內堞 (堞) 高四尺。外堞 (堞) 埤堦……

The outer parapets are 7 *chi* high and the inner parapets are 4 *chi* high. The outer parapets....

Because the rest of the sentence is missing, it is unclear whether the final *pini* 埤堦 describes the appearance of the outer parapets, is another designation for the outer parapets, or forms part of a longer compound, as for instance in the case of the

watchtowers, which also functioned as belfries, that were placed at intervals of 50 *bu* along the top of the city walls of Luoyang 洛陽 during the Northern Wei 北魏 and were called *piniwu* 睥睨屋.³⁹ It is at any rate evident from this fragment that in ancient times the outer parapets were higher than the inner parapets, and this coincides with the structure of extant portions of the Great Wall and walls of district towns. The statement in Chapter 52.34 cited earlier that they were “3 *chi* wide and 2 *chi* 5 *cun* high” suggests far smaller parapets, but the word ‘wide’ (*guang* 廣) used here could refer not to the width of one of the raised merlons as seen in later illustrations, but to the thickness of the parapet.

The ‘woman’s wall’ is invariably referred to in military and technical manuals of later times, and a general description is found, for instance, in the *Jingkang chaoye qianyan houxu* 靖康朝野僉言後序 (*Shoucheng lu* 守城錄 1), in which Chen Gui 陳規 describes how he defended the city of De’an 德安 from Jin 金 forces in Jingkang 靖康 2 (1127), the final year of the Northern Song dynasty:

The system of constructing walls: On top of the walls be sure to build battlements (*nütouqiang* 女頭牆). Between the merlons (*nütou* 女頭) erect well-sweeps (*goujiaomu* 狗脚木: ‘dogleg pole’) and hang bamboo screens between each pair of merlons. By this means one can, however, intercept only arrows fired by bows, and it is difficult to intercept missiles and stones. Alternatively, make flat parapets (*pingtouqiang* 平頭牆) without any screens and leave sets of three square eyelets (*kongyan* 空眼) arranged in the shape of the character *pin* 品 near the base. These resemble battlements and are extremely useful.⁴⁰

A similar but more detailed description appears in Chen Gui’s *Shoucheng jiyao* 守城機要, according to which the battlements were formerly built in the shape of the character *shan* 山 (‘mountain’), and he also gives the dimensions of the eyelets or apertures made in the flat parapets.⁴¹ It is thus clear that by this time the term ‘woman’s wall’ generally referred to a parapet with raised merlons as depicted in Fig. 3, and it is possible that there was a similar distinction in ancient times in the usage of the terms *die* and *pini*.

A further example of the usage of the term *die* may be seen in this passage from Chapter 52.74:

城內有傅壤 (堞). 因以內壤 (堞) 爲外. 鑿其間. 深丈五尺. 塞以樵. 可燒之以待敵.

On the inside of the city walls erect another parapet, thus making the [original] inner parapet the outer parapet. In between them dig a hole 1 *zhang* 5 *chi* deep, fill it with firewood and cover it, and then set it alight in response to an attack by the enemy.

This passage follows on from the description of the city gates quoted at the start of

Section II below, and since it describes an emergency defensive measure carried out while retreating behind the city walls in the face of an enemy assault, it should not be necessary to discuss it here in the context of full-scale construction procedures. If, however, as is suggested by Makino Kenjirō, it describes the hasty construction of additional ramparts and parapets inside the city walls (cf. Fig. 11), then it may provide a hint for understanding the peculiar construction technique employed in the recently excavated city walls of Handan, the royal capital of Zhao in Hebei, where tiles have been laid directly on the surface of a tiered earthen wall inside the main walls (the original number of tiers being unknown).⁴²⁾

We also know that there were stairways (*bi* 陞) on top of the city walls, for in Chapter 52.35 we read:

陞高二尺五 [寸]. 廣長各三尺. 遠 (道?) 廣各六尺.

The stairs are 2 *chi* 5 [cun] high, 3 *chi* wide and long, and (the paths?) are each 6 *chi* wide.

One text reads 遠唐 for 遠廣, but since this does not make sense, I tentatively follow Sun Yirang in regarding the character 遠 as an error for 道.⁴³⁾ In the *Shuowen* 說文, *bi* 陞 is defined as a staircase for climbing to a higher level, and here I wish to clarify some points that previous scholars have failed to note. Firstly, this passage follows on from descriptions of the wall's upper width (Sect. 33) and the 'peepers' (Sect. 34), and it may therefore be assumed to describe small stairways that led to various installations along the top of the walls. Hence, the height of 2.5 *chi* (approx. 56 cm) and the width of 3 *chi* (approx. 68 cm) probably refer to the height of the riser and the width of the tread of each step, resulting in a gradient of 39.8°. Both the height of the riser and the gradient are considerably steeper than in the case of ordinary buildings, presumably because the stairs served a defensive purpose, and they call to mind the Great Wall at the highest section of the Badaling 八達嶺 ridge.

Meanwhile, in Chapter 52.41 we read:

城上五十步一道陞. 高二尺五寸. 長十步.

On top of the city walls there is a staircase from the road every fifty *bu*; it is 2 *chi* 5 *cun* high and 10 *bu* long.

The *dao* 道 ('road') of *daobi* 道陞 is understood to refer to the road encircling the city walls, alluded to in the following passages: "On the perimeter road below the city walls there is a pile of firewood every 100 *bu*" (Chap. 52.45: 城下州 (周) 道內百步一積薪); "The perimeter road outside the moat below the city walls is 8 *bu* wide" (Chap. 58.1: 城內塹外周道廣八步—this passage will be reconsidered at the end of the next section); and "Below the defenders' hall build a large tower that is high and overlooks the city walls, and below the hall there is a perimeter pathway" (Chap. 70.35: 守堂下爲大樓. 高臨城. 堂下周散道). Therefore, the above quotation would appear to be referring to stairways that gave access to the top of the walls

from the road below. Stairways or ramps such as these can be seen even today at various points along the Great Wall and in the extant walls of district towns (e.g., Pingyao 平遙 in Shanxi 山西). Recently there was discovered at the site of an ancient city at Shixianggou 尸鄉溝 near Yanshi 偃師, dating from the Yin 殷 dynasty, a sloping path for horses built of tamped earth, 3-4 metres wide and 30 metres long, that was attached to the inside of the second gate on the west side and joined the road around the inside of the city walls, and so one cannot completely discount the possibility that something along these lines is meant by the above quotation.⁴⁴⁾ But in either case the statement that it was “10 *bu* long” (60 *chi* or approx. 13.5 m) would be a reference to its entire length, and assuming that the figure of 2 *chi* 5 *cun* for the height is correct, then this can only be interpreted as indicating the height of the risers, for if it referred to the overall height of the stairway or ramp, it would result in an overly gentle gradient of only 0.04 (1/25).⁴⁵⁾

II. The City Gates and ‘Temporary Walls’

Some comparatively detailed descriptions of city gates have been preserved in the *Mozi*, probably because they were of the greatest importance when defending the city walls. In Chapter 52.74 two types of gates (*guimen* 闕門 and *guomen* 郭門) are described:

大城丈五爲闕門。廣四尺。爲郭門。郭門在外。爲衡。以兩木當門。鑿其木。維敷上堞。爲斬(塹)縣梁。酌(令)穿斷城以板橋。邪穿外。以板次之。倚殺如城報(勢)。

For the main wall make a *guimen* 1 *zhang* 5 *chi* high with the leaves of the gate 4 *chi* wide. Also make a *guomen*. The *guomen* is on the outside. Make a gate bolt and attach two pieces of timber to the gate; holes are bored into the timber, and they are connected by ropes to the parapet on top of the wall. Make a ditch and place a drawbridge across it, cutting off the city by means of a planked bridge or else keeping it open to the outside. Slope the bridge and cover it with planks; its slope depends on the terrain surrounding the city.

Since the height of the city walls given earlier was 3 *zhang* 5 *chi*, the *guimen* described here cannot have been a large gate representing the main city gate. According to the *Erya*, “Shi gong,”

palace gates are called *wei* 闕, and small ones are called *gui* 闕,⁴⁶⁾

and in the *Shuowen* we read:

Gui is a gate that stands alone. It is round at the top and square at the bottom, and there are some that resemble the *gui* 圭 in shape.⁴⁷⁾

Originally the *guimen* would thus appear to have been a small gate “round at the top and square at the bottom” similar to the keyhole-shaped entrance cut out of the lower section on the east side of the north wall of a decorated stone tomb of the Later Han at Chang’an in Haining 海寧 district, Zhejiang 浙江,⁴⁸⁾ and, as has been demonstrated by Zhang Lianggao 張良皋, it probably corresponds to the *guiyu* 圭窰 or small door referred to in the *Liji* 禮記, “Ruxing pian” 儒行篇 (儒有一畝之宮，環堵之室，鞏門圭窰).⁴⁹⁾ According to the *Shuowen*, there was also a variant form of the *guimen* that had a triangular extension at the top resembling in shape the jade vessel known as the *gui* 圭. The city gate depicted in the cave murals of the Northern Zhou 北周 on Maijishan 麥積山 in Tianshui 天水 district, Gansu, has a gateway with a triangular top, and this is thought to preserve the original form of the *guimen*. The city gates in the Tang murals of the Mogao Caves 莫高窟 in Dunhuang 敦煌, the city gate of Bianliang 汴梁 during the Northern Song as depicted in the “Zhongxing zhenying tu” 中興禎應圖 by Xiao Zhao 蕭照 of the Southern Song 南宋, and the city gate to be seen in the “Pingjiangtu” 平江圖 stele of the Southern Song all have a piece shaped like a pedestal above the entranceway, and these could all be vestiges of the earlier *gui*-like shape. In addition, Chapter 52.92 has the following reference to the *guimen*:

爲閩門。閩門兩扇。令可以各自閉也。

Make a *guimen*. The *guimen* has two doors, and make them so that they can be both closed automatically.

A similar passage is also found in Chapter 52.47 with reference to the *guimen* serving as the gateway in the walls surrounding a blockhouse or post (*ting* 亭).

Next, the *guomen* 郭門 also mentioned in the above passage from Chapter 52.74 appears to correspond, to state my conclusion first, to what in later times was called the ‘jar wall’ (*wengcheng* 甕城) or ‘sheep-horse wall’ (*yangmacheng* 羊馬城). The *Shoujufu* 守拒法 quoted in the *Tongdian* 通典 contains the following instructions:

Outside the city walls on all four sides construct another small dividing wall inside the moat and 10 *bu* (60 *chi*) from the city walls. It should be 6 *chi* thick with a parapet on top. This is called the ‘sheep-horse wall’.⁵⁰⁾

Similarly, in Li Quan’s *Taibo yinjing* 3, “Zhucheng pian” 43 we read:

The ‘sheep-horse wall’ is built inside the city’s moat, and it is 8 *chi* high up to the parapet on top of the wall.⁵¹⁾

Elsewhere, in “Fengsuitai pian” 烽燧臺篇 46, Li Quan recommends that such ‘sheep-horse walls’ be constructed around beacon towers (*fengsuitai* 烽燧臺).⁵²⁾ In addition, the *Wujing zongyao* gives a more detailed explanation:

Outside the city gates build a 'jar wall'. Outside the 'jar wall' and about 30 *bu* (180 *chi*) from the main walls dig a moat and lay a drawbridge across it. On the inner bank of the moat erect a 'sheep-horse wall' approximately 10 *bu* (60 *chi*) from the main walls. On top of all the walls there should be parapets, and construct 'horse faces' (i.e., bastions) every 10 *bu*....

The 'sheep-horse wall' should be less than 1 *zhang* and more than 8 *chi* high. On one side open a gate such that it is on the opposite side to that of the 'jar wall'. If the gate of the 'jar wall' is on the left, the gate of the 'sheep-horse wall' is on the right. The parapet should be about 5 *chi* high. The width of the moat is determined according to the local terrain, but the main thing is to make it wide on the surface and narrow at the bottom, and in depth it should reach the underground water level. If it makes it difficult for arrows and missiles to reach the city, then it is fine....

On top of the 'jar wall' install lookout hoards (*zhanpeng* 戰棚), making them in the same form as 'enemy towers', while their size is determined by the width of the wall. If the city is in hill country, take due account of the surrounding terrain and erect another wall (viz. 'jar wall') in the vicinity of the main walls and in conformity with the contours of the hills, connecting it to the main walls. Be sure to erect it on high ground, and again dig a moat on the outside. Alternatively, erect beacon towers between the two walls and use them for keeping watch on distant movements....⁵³⁾

According to this description, the wall constructed inside the city walls is the 'sheep-horse wall' and that on the outside the 'jar wall', but in the *Shoujufa* and *Taibo yinjing* quoted earlier the latter is referred to as 'sheep-horse wall', and this may be assumed to have been its original designation. At any rate, both were small gates attached to the city gate in the main walls. The illustration given in the *Wujing zongyao* with the caption "Structure of Walls" ("Chengzhi" 城制) depicts what the same work refers to as the 'jar wall' or barbican (Fig. 4), and it is similar to the

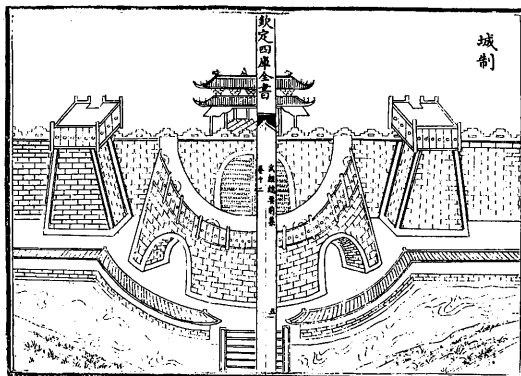


Fig. 4 'Jar wall', from *Wujing zongyao* I.12

barbican gateway called *masugata* 柵形 in Japan. There are in fact several extant examples of this type of structure, although they date from later times. One of the more famous is the Pan Gate 盤門 in Suzhou 蘇州, Jiangsu 江蘇, which consisted of two land gates and two water gates, with the land gates taking the form of ‘jar walls’, and the lower part of the gates and the city walls have survived (Fig. 5).⁵⁴⁾ A ‘jar wall’

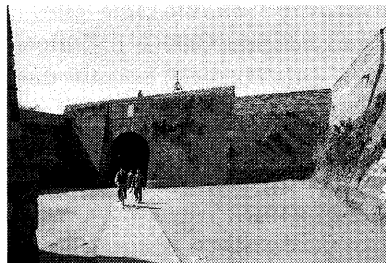


Fig. 5 ‘Jar wall’ of Pan Gate, Suzhou, Jiangsu

can also be seen in the city walls of Pingyao, Shanxi, which have been restored in recent years, and further examples may be found in district towns such as Qufu 曲阜 in Shandong. These have all lost their gate-towers, but the Xizhi Gate 西直門 of Beijing 北京’s Inner City, built during the Qing dynasty, survived in its original state with wall-tower, barbican gate-tower (*jianlou* 箭樓), and walls until after the

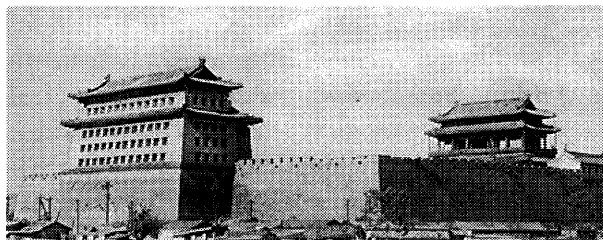


Fig. 6 ‘Jar wall’ of Xizhi Gate, Inner City, Beijing

Communist liberation (Fig. 6). The Zhengyang Gate 正陽門, popularly known as the Fore Gate (Qianmen 前門), was constructed in 1906, and although its barbican, two side gates, and walls have since been dismantled, the wall-tower and gate-tower remain, while the gate-tower and part of the barbican walls of the Desheng Gate 德勝門 have also been preserved.⁵⁵⁾

In an early study of the ‘jar wall’ or barbican, Katō Shigeru 加藤繁 took up for consideration the ‘jar wall’ of Bianliang (Kaifeng 開封), capital of the Northern Song, and on the subject of its origins he wrote: “It seems to have been first built during the Sui 隋 and Tang in the northern frontier regions as a defence against the Northern Barbarians, and it was during the Song dynasty that it came to be erected in the cities of the interior.”⁵⁶⁾ In Chinese archaeological circles there are many who consider the ‘jar wall’ and ‘sheep-horse wall’ to have proliferated during the Tang and Song dynasties, and there have even been instances in which the discovery of a ‘jar wall’ has been used as a yardstick for determining the date of the remains of which it forms a part. But both literary evidence and the results of recent archaeological excavations suggest that this view is in need of considerable modification.

Firstly, a well-known example of the actual construction of a 'jar wall' is that at Kaifeng during the Northern Song. The *Dongjing menghua lu* 東京夢華錄 1 describes it as follows:

The city gates were all 'jar walls' with three-storeyed gate-towers, and the roads leading to the gates were winding. However, the Nanxun Gate 南薰門, Xinzheng Gate 新鄭門, Xinsong Gate 新宋門 and Fengqiu Gate 封丘門 alone were all approached directly and were two-storeyed. This was because they were the main gates and the imperial route passed through them.⁵⁷⁾

Among the city gates of Kaifeng, archaeological excavations in recent years have revealed the remains of the Nanxun Gate, Xinzheng Gate, Wansheng Gate 萬勝門, Xincao Gate 新曹門 and Bianho Dongshui Gate 汴河東水門, and in each case a rectangular or semicircular 'jar wall' has been discovered.⁵⁸⁾ But literary sources provide earlier examples than these. As has been pointed out by Wang Wencai 王文才,⁵⁹⁾ the *Chuangzhu luocheng ji* 創築羅城記 by Wang Hui 王徽 contains the following reference to the outer walls (*luocheng* 羅城) of Chengdu 成都 in Sichuan 四川 during the Tang dynasty:

It is a total of 25 *li* around the south, north, east and west sides, and there are 8 *li* in the form of protective gates for repelling the enemy. The height of their walls is about 2 *zhang* 6 *chi*, and on top of them were built towers and corridors totalling 5,680 *jian* 間.⁶⁰⁾

This tallies with Du Guangting 杜光庭's *Shenxian ganyu zhuan* 神仙感遇傳, according to which in the eighth month of Qianfu 乾符 3 (876),

they constructed outer walls for the first time, and together with the barbicans (*yongmen* 壘門) for repelling the enemy they were 32 *li*.⁶¹⁾

This is considered to be the first recorded reference to a 'jar wall'. According to the *Chuangzhu yangmacheng ji* 創築羊馬城記 by Li Hao 李昊, the walls of Chengdu were later repaired in Tiancheng 天成 2 (926) of the Later Tang 後唐 during the Five Dynasties 五代 period, and a 'sheep-horse wall' was added to the new walls with a circumference of 42 *li*.⁶²⁾

Additionally, in Chen Gui's *Jingkang chaoye qianyan houxu* the city defences of De'an are described as follows:

Behind the city walls dig the ground at their base and make a deep, wide moat. Several *zhang* back from the moat construct another rear wall and make it face the old city gate, but build no more gates. Two or 3 *li* along the moat at the base of the newly built wall open a gate in the new wall, thereby preventing people from going straight to the main walls. Also ensure that people cannot

climb onto the new walls from the banks of the moat behind the city walls. One must walk 2 or 3 *li* along the bottom of the wall before one can enter the city gate. By doing this, even if the enemy should try to fill in the moat, they will be able to do no more than fill in the rear moat. If they wish to enter the gate, they must walk along the banks of the rear moat below the new wall, and because those on top of the wall will be able to look right down on the enemy to see who they are, they will be unable to carry out their assault. This is a fatal situation for the enemy, and on no account will they be able to pass through the main gate into the city.⁶³⁾

In the classification of the *Wujing zongyao* quoted earlier, this corresponds to a 'sheep-horse wall' built inside the city walls.

As examples of ancient sites with 'jar walls' uncovered by archaeological excavations, mention must be made first of the defensive walls (*chengzhang* 城障) at Wulijigaole 烏力吉高勒 and Qingkulun 青庫倫 in the Chaoge 潮格 banner, Inner Mongolia (Fig. 7).⁶⁴⁾ Both of these have a projection outside the city wall's east gate that is shaped like an inverted L and is thought to have served as a barbican. The only relic useful for dating purposes that has been discovered at these sites is an earthenware bowl that was found in the topsoil at Wulijigaole, and since the style of this cord-marked piece of pottery is considered by the authors of the excavation report to belong to the Han dynasty, the remains of the defensive wall itself can also, I believe, be considered to date from Han times. In the past the existence of a 'jar wall' or 'sheep-horse wall' has often been cited as evidence for dating sites to the Tang dynasty and later, but there would not appear to be very clear-cut grounds for doing so. Of a different type are the remains of a beacon tower at Majuanwan 馬圈灣 in Dunhuang, Gansu,⁶⁵⁾ the company headquarters of Jiaqu 甲渠 in Juyan, Gansu, beacon tower 4 at Jiaqu, and Jinguan 金關 F1, also in Juyan,⁶⁶⁾ where in each case a single thick barrier wall has been erected outside the gate, thereby deliberately creating a narrow, circuitous passageway, and Chu Shibin 初師賓 has suggested that the term *huimen* 回門 ('turning gate') appearing in the Han bamboo text "Houshi guangde zuozui xi" 候史廣德坐罪檄 (ETP, 57.108) may refer to a

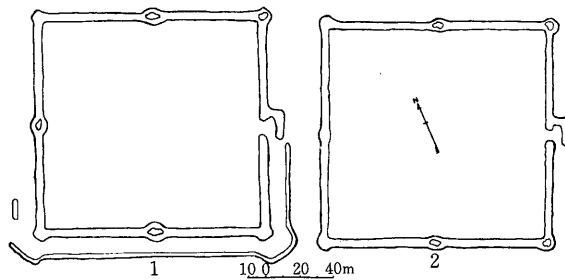


Fig. 7 Ground plans of remains of defensive walls at Wulijigaole (left) and Qingkulun (right), Chaoge banner, Inner Mongolia

similar structure.⁶⁷⁾ In spite of the differences between the entrance to a group of buildings and a city gate, the principle behind the construction of their access passageways is identical, and it is possible to recognize a link between the two types of structures, while if one disregards the differences in size, it is not inconceivable that the *huimen* may also have been a type of barbicanlike structure.

Furthermore, at the site of the ancient city of Bishbalik (Beiting 北庭) near Jimsa (Jimusar 吉木薩爾) in Xinjiang 新疆, where large numbers of 'horse faces' (*mamian* 馬面; see below) were installed, a projecting barbican shaped like an inverted L has been discovered along the north wall of the outer walls, and it is thought to date from the early Tang (Fig. 8).⁶⁸⁾ A curved barbican also survives at the north gate of the west wall of the outer walls of the ancient city of Gaochang 高昌 in Turfan, Xinjiang.⁶⁹⁾ In addition, at Yangzhou 揚州 in Jiangsu the remains of a platform foundation of tamped earth have been discovered outside a gap in the east wall where the east gate is initially thought to have been, and according to the excavation report, which dates it to the Tang dynasty, "it may have been a structure similar in type to the 'jar wall' or 'sheep-horse wall' used for defensive purposes."⁷⁰⁾ City remains at Chengshanzi 城山子, Tonggouling 通溝嶺 and Majuanzi 馬圈子 near Dunhua 敦化 in Jilin 吉林 all date from the early years of the kingdom of Bohai 渤海, and each has one or two gates in the form of a barbican,⁷¹⁾ and barbicans have also been discovered at the sites of former cities of Bohai located in Russia.⁷²⁾ Of a slightly later date are the cities of Raozhou 饒州 in Linxi 林西 district, Zhaowuda 昭烏達 league, Liaoning 遼寧 province,⁷³⁾ Tazi 塔子 in Tailai 泰來 district, Heilongjiang 黑龍江 province,⁷⁴⁾ and Heicheng 黑城 in Ningcheng 寧城 district,

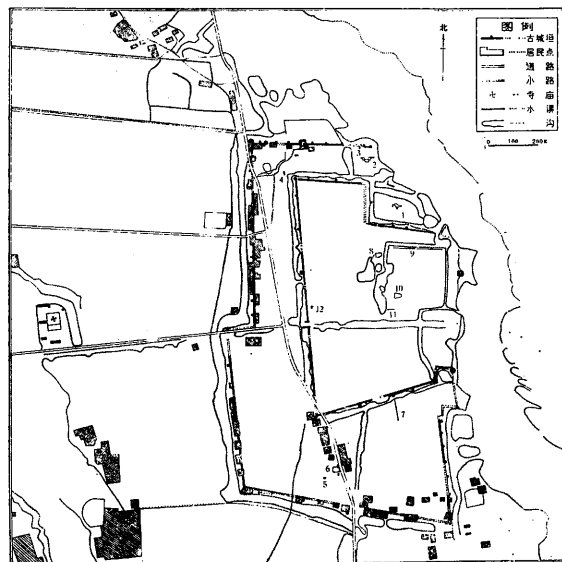


Fig. 8 Ground plan of ancient city of Bishbalik near Jimsa, Xinjiang

Heilongjiang province,⁷⁵⁾ all dating from the Liao 遼 dynasty, and in each case the remains of barbicans have been discovered on all four sides of the city walls. (At Raozhou the north and south walls have both a barbican and an ordinary gate.) The remains of a barbican have also been discovered at the site of a Liao city at Gumuna 固木納 in Tangyuan 湯原 district, Heilongjiang.⁷⁶⁾ In cities dating from the Jin dynasty, barbicans have been discovered at its first capital Shangjing Huiningfu 上京會寧府 in Acheng 阿城 district, Heilongjiang,⁷⁷⁾ as well as at Haojiachengzi 郝家城子 in Lanxi 蘭西 district, Heilongjiang,⁷⁸⁾ and at sites at Damiao 大廟, Silahada 思弼哈達⁷⁹⁾ and Chengpo 城坡⁸⁰⁾ in Inner Mongolia. Moving further down in time, we find that among remains from the Yuan 元 dynasty there have been discovered in Inner Mongolia alone city gates with square or U-shaped barbicans at places such as the former capital Shangdu 上都, Yingchanglu 應昌路, Daninglu 大寧路, Jininglu 集寧路, Shajing Zongguanfu 砂井總管府, Deninglu 德寧路, Fengzhou 豐州, Yunneizhou 雲內州, Xuanningxian 宣寧縣 and Chijinailu 赤集乃路.⁸¹⁾

To sum up, although there is indeed a strong possibility that the 'jar wall' and 'sheep-horse wall' first appeared in the frontier regions of the north or west, and although they seem to have become increasingly popular during the Tang and Song dynasties, geographically speaking, they had already reached Jiangnan 江南 and Sichuan by the Tang dynasty, and it is probably necessary to go back further in time than has hitherto been the case when considering the date of their initial emergence. Further corroborative evidence of this is provided by the 'horse face' (*mamian*), similar in shape to the 'jar wall' and 'sheep-horse wall', which often forms a set with these in some of the sites noted above and is also considered to have spread extensively during the Tang and Song dynasties. It is described as follows in Chen Gui's *Shoucheng jiyao*:

'Horse face': In the old system one was erected every 60 *bu*. It was built so that it projected more than 2 *zhang* out from the city walls. The width is determined by the terrain and is not fixed. It is possible to look directly down from both sides at the bottom of the walls.⁸²⁾

In a passage quoted earlier from the *Wujing zongyao* it was stated that 'horse faces' were erected every 10 *bu*, while the illustration of the 'enemy tower' in the same work (Fig. 3) has a note reading "This wall is provided with a 'horse face'," thus enabling one to gain a good idea of its structure. Extant examples include those at Pingyao in Shanxi (Fig. 9). When describing the materials used for constructing city walls, Shakeshi 沙克什 of the Yuan writes in his *Hefang tongyi* 河防通議 1:

For constructing city walls, use a traverse beam (*renmu* 絳木) every 5 *chi* up. This also applies to the like of 'jar walls' and 'horse faces'.⁸³⁾

This indicates that the 'jar wall' and 'horse face' were regarded as similar structures. Still later, Mao Yuanyi 茅元儀 of the Ming 明 provides a detailed



Fig. 9 'Horse faces' on wall of district headquarters, Pingyao, Shanxi

description in his *Wubeizhi* 武備志, where he refers to it as *zhi* 雉.⁸⁴⁾

The 'horse face' corresponds in effect to a bastion, and many examples have been found at numerous sites, including some of those already mentioned above: the early Tang outer walls at Bishbalik near Jimsa, Xinjiang; Gaochang in Turfan, Xinjiang; the Bohai ruins at Chengshanzi in Dunhua, Jilin; the Liao remains at Heicheng in Ningcheng district, Heilongjiang; the Liao remains at Tazi in Tailai district, Heilongjiang; the Liao remains at Gumuna in Tangyuan district, Heilongjiang; the Liao remains at Raozhou in Linxi district, Liaoning; the Jin remains at Damiao and Silahada in the Siziwang 四子王 banner, Inner Mongolia; and the Jin remains at Chengpo in the Zhungar 準噶爾 (Jungar) banner, also in Inner Mongolia. An example from earlier times may be seen at Wuchang 武昌 (Echeng 鄂城, Hubei), built as the royal capital of Wu 吳 during the Three Kingdoms 三國 period, where the remains of a bastion 17 metres long and 7 metres deep have been discovered projecting from the south wall.⁸⁵⁾ In addition, more recently bastions have been discovered at the northern end of the west wall and at the eastern end of the north wall of the Han-Wei remains at Luoyang and outside the city of Jinyong 金墉 (Fig. 10).⁸⁶⁾ As a result of these discoveries it is now conceivable that the bastion ('horse face') too may be traced back at least as far as the Han dynasty. Among still earlier remains, we find, for instance, the following: a crescent-shaped projection at the southeast corner of the remains of a city of the kingdom of Wei dating from the Eastern Zhou 東周 period in Ruicheng 芮城 district, Shanxi province,⁸⁷⁾

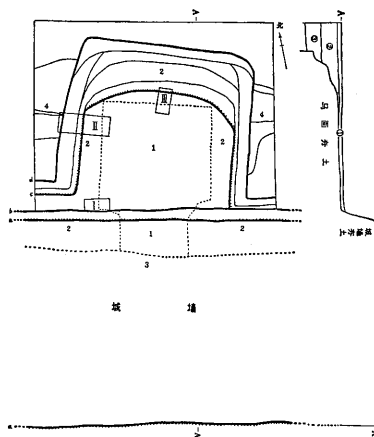


Fig. 10 Ground plan and cross section of 'horse face' no. 1, Han-Wei city of Luoyang

four projecting sections at the site of Lingshou 靈壽 of the kingdom of Zhongshan 中山 of the Warring States period at Sanji 三汲 in Pingshan 平山 district, Hebei province;⁸⁸⁾ and a projecting section at the Former Han site of Guanglu 光祿 at Zenglongchang 增隆昌 in Guyang 固陽 district, Inner Mongolia.⁸⁹⁾ Up until now these have all been regarded as some sort of defensive installation or wall-tower, but these too could perhaps be the remains of bastions, and hence there is a possibility that the 'horse face' first appeared even earlier than previously thought.

Meanwhile, in Chapter 53.2 of the *Mozi* we read:

子墨子曰。子問羊黔〔之守邪。羊黔〕者將之拙者也。足以勞卒。不足以害城。守爲臺城。以臨羊黔。左右出巨（距）各二十尺。行城三十尺。強弩〔射〕之。技（校）機藉之。奇器□□之。然則羊黔之攻敗矣。

The Master Mozi said: "Are you asking about the defence against ramps (*yangqian* 羊黔)? For a commander the ramp is a clumsy method of attack, for it is enough to exhaust the troops but inadequate to damage the city walls. To defend against it, make a 'platform wall' (*taicheng* 臺城) to overlook the ramp. The platform wall extends to the left and right 20 *chi* out from the main wall. This 'temporary wall' (*xingcheng* 行城) is 30 *chi* high. Shoot at the enemy with strong crossbows, fire at them with trebuchets, and [??] with strange devices: if you do so, then any attack by means of a ramp will be defeated."

Again, Chapter 56.5 reads as follows:

子墨子曰。問雲梯之〔守〕邪。雲梯者重器也。其動移甚難。守爲行城。雜樓相見。以環其中。以適廣陝（狹）爲度。環中藉幕（幕）。毋廣其處。行城之法。高城二十尺。上加堞。廣十尺。左右巨（距）各二十尺。〔雜樓〕高廣如行城之法。

The Master Mozi said: "Are you asking about the defence against counterweighted ladders (*yunti* 雲梯: 'cloud-ladder')? A counterweighted ladder is a heavy piece of equipment, and manoeuvring it is very difficult. To defend against it, build a 'temporary wall' with various towers. Make it round in the middle and as wide or narrow as is deemed appropriate. Hang a curtain in the circular centre, but do not make it too wide. The method for constructing a temporary wall: it should be 20 *chi* higher than the main wall, with a parapet added on top; it should be 10 *chi* wide and extend to the left and right 20 *chi* out from the main wall. The height and width [of the various towers] are the same as in the case of the temporary wall."

As has been pointed out by Cen Zhongmian, the character *xing* 行 in *xingcheng* has the meaning of 'temporary', as in *xinggong* 行宮 or *xingzai* 行在, both referring to the emperor's temporary abode away from the capital, and the term *xingcheng* may therefore be considered to refer to a temporary wall that was added to the main city walls in order to counter attacks by heavy equipment. The designation 'platform wall' (*taicheng*), on the other hand, is thought to derive from its shape, and as is

supporting pillars (*paichazhu* 排叉柱) mentioned in the *Yingzao fashi*, that is, the wooden pillars erected to reinforce the walls on both sides of the passageway through the city gate. According to the *Yingzao fashi*, these pillars went only up as far as the beams, and although this was the regular method of construction, it differed from the defensive measures employed in emergencies. In Chen Gui's *Shoucheng jiyao* it is stated:

In addition, on top of the 'magpie platform' (*qiaotai* 鵲臺) erect against the parapet one stake (*paichazhu*) every 4 *cun*, making it stick 5 *chi* up above the parapet. Insert two or three thin pieces of wood horizontally and fasten them. Even if those attacking the city should get beyond the eyelets arranged in the shape of the character *pin*, they will be unable to climb onto the parapet, and the top of the wall will also be blocked by the stakes.

As is noted in Chen Gui's *Jingkang chaoye qianyan houxu*, these stakes were sometimes also "buried" into the walls, and in cases of emergency construction work they also served as what in later times was called the *yongdingzhu* 永定柱, suggesting that they sometimes formed an integral part of the superstructure of city walls.⁹³⁾

Next, let us consider the doors of the *guimen* gate. Chapter 52.9 reads as follows:

救車(熏)火。爲烟矢。射火城門上。鑿扉上爲棧(杙)。塗之。持水，麻斗，革盆救之。門扇薄(稊)植皆鑿半尺(寸)一寸一涿弋。弋長二(七)寸。見一寸。相去七寸。厚塗之以備火。城門上處鑿以救門火者。各一垂水。容三石以上。小大相雜。

To guard against an attack by fire and to counter fire-arrows shot over the city gate, drill holes into the leaves of the gate, drive nails into the holes, plaster the surface with mud, fetch water in 1-*dou* hemp vessels and leather basins, and put the fire out. Drill holes half a *cun* or 1 *cun* deep in the leaves of the gate, the posts and the doorbars and drive nails into them. The nails are 7 *cun* long and the nail heads 1 *cun* across, and they are hammered into rows 7 *cun* apart. The surface is plastered with a thick layer of mud to guard against fire. At each of the places where holes have been drilled into the city gates to guard against the gate's being set on fire, place pots, both large and small, with a capacity of more than 3 *shi* 石.⁹⁴⁾

Furthermore, in Chapter 52.104 we read:

涿弋。弋長七寸。弋間六寸。刻其末。

Nails: nails are 7 *cun* long, the distance between the nail heads is 6 *cun*, and the tips are pointed.

Bi Yuan, Sun Yirang and other commentators differ in their interpretation of these two passages, but the above reading takes into account the actual circum-

stances to which they may be assumed to refer.⁹⁵⁾ The plastering of the woodwork as a precaution against fire is also mentioned in Chapter 52.7 quoted below, and a similar reference is found in the *Shoujufa* quoted in the *Tongdian* 252:

The leaves of the city gates and the towers are covered with a thick layer of mud to guard against fire.⁹⁶⁾

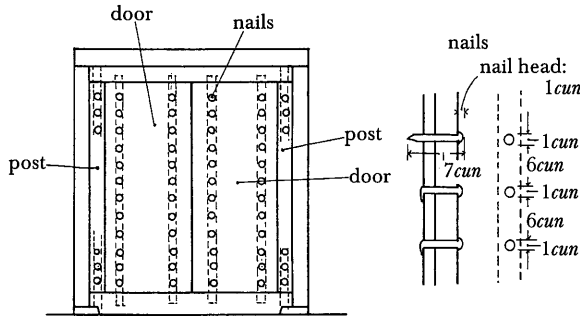


Fig. 12 Reconstruction of doors of *guimen* and iron nails as described in *Mozi*, Chapter 52

The “nails” (*zhuoyi* 涿弋) described above probably correspond, as is suggested by Cen Zhongmian, to what were called *mending* 門釘 (‘gate-nail’) in later times, and although the passage in question is dealing with fire-prevention measures, the actual result would presumably have been similar to the *banmen* 版門 described in the *Ying*

zao fashi, which had several vertical panels with rows of nails hammered into them. Some details remain unclear, but reference should be made to Fig. 12.

Following on from Chapter 52.9 quoted above, Chapter 52.10 continues:

門植關必環鋼。以鋼金若鐵鑠之。門關再重。鑠之以鐵必堅。蔬關。蔬關二尺。蔬關一莞。封以守印。

The areas around the gate’s doorbars and crossbars must be strengthened with metal, covering them with copper or iron plating. The gate’s crossbar is made double, and if wrapped in sheet iron, it will certainly be durable. Also use a wooden lock, which is 2 *chi* long and forms a set with a metal key. These are sealed with the Defender’s seal.

Zhi 植 and *guan* 關 refer to the vertical doorbar and horizontal crossbar, while *su* 蔬 (*suo* 鎖) and *guan* 莞 (*guan* 管) probably refer to the small keys used to lock these in place.

Next, we come to a more substantial piece of defensive equipment, namely, the portcullis (*xuanmen* 縣門: ‘suspended gate’). In Chapter 52.7 it is described as follows:

故凡守城之法。備城門以縣〔門〕沈機。長二丈。廣八尺。爲之兩相如。門扁(扇)數令相接三寸。施土扇上。無過二寸。塹中深丈五。廣比扇。塹長以力爲度。塹之末爲之縣。可容一人所。

Generally speaking, the method of defending the city walls is to furnish the city

gate with a portcullis together with a release mechanism. It is to be 2 *zhang* tall and 8 *chi* wide, and the two leaves should fit tightly together, with an overlap of 3 *cun*. The leaves are to be plastered with mud no more than 2 *cun* thick. Dig a moat 1 *zhang* 5 *chi* deep and as wide as the two leaves of the portcullis, while its length depends upon the terrain. The portcullis is placed at the edge of the moat, and there is room for one person.

A simpler description of the portcullis is found in the *Weigong bingfa* 衛公兵法 quoted in the *Taiping yulan*:

Portcullis gate: planks of wood are suspended to form a double gate.⁹⁷⁾

In the *Wujing zongyao* it is described in greater detail under the name of *zhaban* 牌版, and there is also an illustration of it (Fig. 13).

Portcullis: It forms a double gate with the city gate. Use elm or sophora wood to construct it, with its width corresponding to that of the city gate. Cover it with fresh oxhide and wrap it with iron plating. Attach iron rings on both sides through which iron ropes are passed. Generally, in the case of a large city gate, erect two posts 5 *chi* from the leaves of the gate, cut vertical grooves into them, and cover them with iron plating. If an enemy should come, then, from the wall-tower and using a windlass, pull the iron ropes passing through the iron rings and lower the portcullis into the vertical grooves. Carefully plaster the outside with mud to guard against attack by fire and prop timber against the inside to prevent it from toppling over.⁹⁸⁾

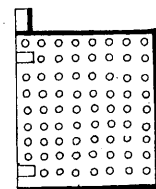
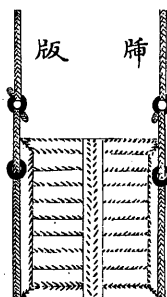


Fig. 13 Portcullis, from *Wujing zongyao* I.12

The Pan Gate at Suzhou in Jiangsu, referred to earlier, preserves an example of the “release mechanism” (*chenji* 沈機) alluded to above, although it probably dates from the Qing dynasty, and it is identical in structure to a lock gate (Fig. 14).

A defensive mechanism resembling the portcullis is the drawridge (*xuanliang* 縣梁: ‘suspended bridge’), already mentioned in Chapter 52.74 and further described in Chapter 52.99:

穿外塹。去格七尺。爲縣梁。城遼陝（狹）不可塹者勿塹。

Dig a moat outside the city walls, and 7 *chi* from the wooden stakes construct a



Fig. 14 ‘Suspended gate’ of Pan Gate, Suzhou, Jiangsu

drawbridge. In cases where the city is narrow and it is not possible to dig a moat, do not dig a moat.

In addition, Chapter 52.107 reads:

去城門五步大塹之。高地丈五尺。下地至泉。三尺而止。施棧其中。上爲發梁而機巧之。比傳薪土。使可道行。旁有溝壘。毋可踰越。而出佻且北。適人遂入。引機發梁。

Dig a large moat 5 *bu* (30 *chi*) from the city gate. In the case of high ground make it 1 *zhang* 5 *chi* deep, and in the case of low-lying ground, upon reaching the underground water level, stop at 3 *chi*. Install devices in it, construct a 'releasable bridge' (*faliang* 發梁) over it, and operate it by means of a trigger mechanism. Spread brushwood and mud over the bridge to make it look like a path. Alongside it are ditches or mounds so that people cannot jump over it. Rush out to engage the enemy and then run back, pretending to be defeated. When the enemy come in pursuit, pull the mechanism and release the bridge.

This is similar to the 'revolving bridge' (*zhuanguanqiao* 轉關橋) described in the *Taibo yinjing* 4, "Shouchengju pian" 守城具篇 36:

Revolving bridge: Construct the bridge with a single girder, and at one end attach a traverse bolt. When the bolt is removed, the bridge springs up, and men and horses, unable to cross, all fall into the water. The Qin used this bridge to kill Yan Dan 燕丹.⁹⁹⁾

Another type of drawbridge was the 'hanging bridge' (*diaoqiao* 釣橋), described as follows in the *Wujing zongyao*:

Hanging bridge: Construct it with elm or sophora wood. In structure it is like a bridge. Attach three iron rings on top, pass two iron ropes through them, add hemp ropes to these, and fasten them to a wall-tower. Behind the bridge, about 3 *bu* (18 *chi*) from the city walls, erect two posts, each 2 *zhang* 5 *chi* tall. Make an opening towards one end of the wall-tower, make wrought-iron rail grooves, and lay the iron ropes and hemp ropes over these to facilitate the raising of the bridge. Should a signal be given from outside the city, then have men on the wall-tower pull the ropes and raise the bridge so as to cut off the enemy's path and also to protect the city gate.¹⁰⁰⁾

The illustration given in the *Wujing zongyao* (Fig. 15) appears to be almost identical in structure to the aforementioned portcullis. The descriptions of the 'hanging bridge' and portcullis (*zhaban* 牌版) in the *Wujing zongyao* are followed by a passage similar in wording to that just quoted from the *Taibo yinjing* but with the heading 'mechanical bridge' (*jijiao* 機橋), and it is accompanied by an illustration that seems

to resemble the 'suspended bridge' of the *Mozi*.

The passage quoted above from Chapter 52.99 advised against the digging of moats when the city was narrow, but elsewhere moats or ditches (*qian* 塹) are almost invariably mentioned, and they may be considered to have been a standard feature of city fortifications. Chapter 52.31 states:

百步爲幽隴 (隴). 廣三尺. 高四尺者千 (十).

Every 100 *bu* (600 *chi*) construct ten hidden drains 3 *chi* wide and 4 *chi* deep.

Du (隴: 'drain') is similar in meaning to the *dou* 竇 ('drain') described as being 3 *chi* deep in the *Kaogongji*, "Jiangren yingguo," and *youdu* 幽隴 are thus covered drains. Ten of these drains were to be constructed every 600 *chi*, that is, one every 60 *chi*, to drain waste water

from inside the city, and a prerequisite for them would have been the existence of a moat. These drains would have passed under the city walls and also probably under the perimeter road encircling the outside of the walls. This road has already been referred to in Chapters 52.45 and 58.1 quoted at the end of the previous section, and according to Chapter 58 it was 8 *bu* (48 *chi*) wide. The instruction in Chapter 52.99, quoted above, to construct a drawbridge 7 *chi* from the wooden stakes probably refers to this road as well.¹⁰¹⁾ As has already been shown by Sun Yirang, Lao Gan 勞榦 and others,¹⁰²⁾ the term *ge* 格, translated here as 'wooden stakes', corresponds to the *chungzhou huluo* 中周虎落 mentioned in the biography of Chao Cuo 鼂錯 in the *Hanshu* 漢書, the *muchai jiangluo* 木柴僵落 mentioned in the section on the Xiongnu 匈奴 in the *Hanshu*, and the *jiangluo* 疆落 appearing in Han slips from Juyan, all of which refer to sharpened wooden stakes that were set in the ground to prevent the enemy from approaching the city walls. Remains of these have been discovered at the site of the commander's headquarters and beacon tower 4 at Jiaju, Juyan, and at Jinguan, Jianshui 肩水.¹⁰³⁾ In the *Shoucheng jiyao* the same kind of device is called *lujiao* 鹿角 ('deer's antler'),¹⁰⁴⁾ and in Japan they are called *saka-moji* 逆茂木 ('inverted branches').

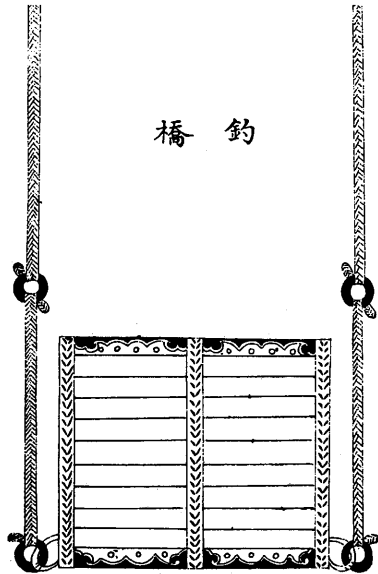


Fig. 15 'Hanging bridge', from *Wujing zongyao* I.12

Concluding Remarks

In the above we have considered, within somewhat narrowly circumscribed limits, the actual construction of city fortifications as described in the relevant chapters of the *Mozi* and with reference to newly discovered materials. Many

questions remain, but although our discussion has included speculation from a purely technical perspective, I hope that it has been possible to make at least some advances on previous research with regard to concrete details.

As was pointed out at the start, in this article I have dealt primarily with the city walls, city gates and city moats, which represented the basic components of city fortifications. The chapters on the defence of cities in the *Mozi* also include much interesting information on various defensive and ancillary structures such as the towers erected on top of the city walls, beacon towers, blockhouses, and fortified villages used in frontier defences, guardhouses for hostages (*baogong* 葆宮), and the 'defenders' hall' (*shoutang* 守堂). There are aspects of these too that need to be elucidated from the perspective of the history of technology, and I have dealt with them elsewhere.¹⁰⁵⁾

Addendum

Lastly, I wish to add some supplementary comments on archaeological discoveries relating to the 'jar wall' or barbican in ancient times on which I was unable to touch in the above. The ancient remains at Sandaoying 三道營 in Zhuozi 卓資 district, Inner Mongolia, consist of an east city and a west city, and a barbican was attached to the south wall of the west city, while all four sides were provided with corner towers and bastions; these remains are thought to be those of the district headquarters of Wuyao 武要 district, Dingxiang 定襄 commandery, dating from the Former Han.¹⁰⁶⁾ In the region bordering the Great Wall and in addition to the defensive walls at Wulijigaole and Qingkulun in the Chaoge banner in Inner Mongolia, mentioned in Section I above, the ancient sites at Zengchanglong and Sanyuancheng 三元成, Guyang district, in the Wulateqian 烏拉特前 banner dating from the Warring States to Former Han period¹⁰⁷⁾ and at Taiyangmiao 太陽廟 in the Hangmianhou 杭綿後 banner¹⁰⁸⁾ all have the remains of barbicans, while bastions and corner towers were attached to the walls of the ancient city at Guaizishang 拐子上 in Chingshuihe 清水河 district.¹⁰⁹⁾ It could thus be said that the emergence of the barbican and bastion has been archaeologically demonstrated to go back as far as the Warring States period. The most recently discovered important remains are those from the Yin period at Yuanqu 垣曲 in Shanxi province, where double walls have been found extending from outside the west gate towards the southern corner and also along the south wall of a city that formed an irregularly shaped square.¹¹⁰⁾ On the basis of this discovery, and also with reference to the interpretation of Sun Ji 孫機,¹¹¹⁾ who equates the term *yin* 闌 in the poem "Qu qi dongmen" 出其東門 in the *Shijing* ("Zhengfeng" 鄭風) with the barbican on the basis of Mao Heng's comment that "*yin* is a curved city wall" (闌, 曲城也), Xun Qi 薰琦 has argued that the barbican first appeared 3,500 years ago during the Yin period.¹¹²⁾ The remains in question are, needless to say, extremely important, but the Shang 商 walls at Yuanqu are double walls, and although they are certainly closely associated with the barbican, they differ considerably both in

form and function. Consequently, I would be inclined to wait until further evidence comes to light before endorsing Xun's views. It should also be pointed out that investigations making use of aerial photography have been conducted at the ancient sites of Gaochang and Bishbalik in Xinjiang, alluded to in Section I.¹¹³

Notes

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- 2) Zhu Xizu, “Mozi Bei chengmen yixia ershi pian xi Hanren weishu shuo” 墨子備城門以下二十篇係漢人偽書說 (The theory that the twenty chapters of the *Mozi* from “Preparation of City Walls and Gates” on down were forgeries by Han authors), *Qinghua zhoukan* 清華週刊 30, No. 9 (1929); reprinted in *Gushibian* 古史辯 4.
- 3) Cen Zhongmian, *Mozi chengshou gepian jianzhu* 墨子城守各篇簡注 (Brief notes on the chapters of the *Mozi* dealing with the defence of cities; Guji Chubanshe 古籍出版社, 1958); reprinted in *Xinbian zhuzi jicheng* 新編諸子集成 1 (Zhonghua Shuju 中華書局, 1987).
- 4) Watanabe Takashi, “Bokka no hei gikōsho ni tsuite” 墨家の兵技巧書について (On the technical military treatises of the Mohists), *Tōkyō Shina Gakuhō* 東京支那學報 3 (1957); reprinted in *id.*, *Kodai Chūgoku shisō no kenkyū* <*Kōshi den no keisei*> to *Ju-Boku shūdan no shisō to kōdō*—古代中國思想の研究—<孔子傳の形成>と儒墨集團の思想と行動— [Studies in Chinese thought: The “formation of Confucius’ biography” and the thought and behaviour of Confucianist and Mohist groups; Sōbunsha 創文社, 1973]; *id.*, “Bokka no shugyo shita jōyū ni tsuite” 墨家の守禦した城邑について (On the cities defended by the Mohists), *Tōhōgaku* 東方學 27 (1964; reprinted in *Kodai Chūgoku shisō no kenkyū*).
- 5) Makino Kenjiro, *Bokushi kokuji ge* 墨子國字解 (Japanese exegesis of the *Mozi*), 2 vols. (Waseda Daigaku Shuppanbu 早稻田大學出版部, 1911 [*Kanseki kokuji ge zensho* 漢籍國字解全書]).
- 6) Kakimura Shun 柿村峻 and Yabuuchi Kiyoshi, *Kanpishi, Bokushi* 韓非子・墨子 (*Han Feizi and Mozi*; Heibonsha 平凡社, 1968 [*Chūgoku koten bungaku taikai* 中國古典文學大系 5]).
- 7) Takata Atsushi, *Bokushi* 墨子 (*Mozi*; Meitoku Shuppansha 明德出版社, 1967 [*Chūgoku koten shinsho* 中國古典新書]).
- 8) Honda Wataru, *Bokushi* 墨子 (*Mozi*; Kōdansha 講談社, 1978 [*Jinrui no chiteki isan* 人類の知的遺産 6]).
- 9) Nitta Daisaku, *Bokushi* 墨子 (*Mozi*), Vol. 2 (Shūeisha 集英社, 1977 [*Zenshaku kanbun taikai* 全釋漢文大系 19]).
- 10) Yamada Taku, *Bokushi* 墨子 (*Mozi*), Vol. 2 (Meiji Shoin 明治書院, 1987 [*Shinshaku kanbun taikai* 新釋漢文大系 51]).
- 11) Ōtsuka Banroku, “*Bokushi no heigi shohen ni kansuru kenkyū* 『墨子』の兵技諸篇に関する研究 (A study of the chapters on military technology in the *Mozi*), *Daitōhō* 大東報 4 (1941).
- 12) Chihara Katsumi, “*Bokushi hei gikō kō*” 墨子兵技巧考 (A study of military technology in the *Mozi*), *Kenkyū Ronshū* (*Shinshū Daigaku Kyōiku Gakubu*) 研究論集 (信州大學教育學部) 3 (1953).
- 13) Chen Zhi, “‘*Mozi*, Bei chengmen’ teng pian yu Juyan Hanjian” 《墨子·備城門》等篇與居延漢簡 (“Preparation of City Walls and Gates” and other chapters of the *Mozi* and the Juyan Han slips), *Zhongguoshi Yanjiu* 中國史研究 1980-1.
- 14) Li Xueqin, “Qinjian yu *Mozi* chengshou gepian” 秦簡與《墨子》城守各篇 (Qin slips and the chapters of the *Mozi* dealing with the defence of cities), in *Yunmeng Qinjian yanjiu* 雲夢秦簡研究 (Studies in the Yunmeng Qin slips; Zhonghua Shuju, 1981).
- 15) Yinqueshan Hanmu Zhujian Zhengli Xiaozu 銀雀山漢墓竹簡整理小組, “Yinqueshan zhushu *Shoufa*, *Shouling* deng shisan pian” 銀雀山竹書《守法》, 《守令》等十三篇 (Thirteen bamboo books from Yinqueshan including the *Shoufa* and *Shouling*), *Wenwu* 文物 1985-4; *id.*, ed., *Yinqueshan*

Hanmu zhujian 銀雀山漢墓竹簡 (Bamboo slips from a Han tomb at Yinqueshan), Vol. 1 (Wenwu Chubanshe 文物出版社, 1985).

- 16) The main loan characters are dealt with in Zhou Fumei 周富美, *Mozi jiajie zi jizheng* 墨子假借字集證 (Collected annotations on loan characters in the *Mozi*; Guoli Taiwan Daxue Wenxueyuan 國立臺灣大學文學院, 1963), pp. 295-317.
- 17) Murata Jirō 村田治郎, "Chūgoku teito no heimen zukei" 中國帝都の平面圖型 (Ground plans of Chinese imperial capitals), in *id.*, *Chūgoku no teito* 中國の帝都 (Imperial capitals of China; Sōgeisha 綜藝舍, 1981); Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo 中國社會科學院考古研究所, ed., *Xin Zhongguo kaogu faxian yu yanjiu* 新中國考古發現與研究 (New Chinese archaeological discoveries and research; Wenwu Chubanshe, 1984), pp. 270-278.
- 18) For the relevant passage from the *Taiboyin jing*, see n. 19.
Yingzao fashi 3, "Haozhai zhidu: cheng" 壕寨制度·城：築城之制。每高四十尺。則厚加高一十尺。其上斜收減高之半。若高增一尺。則其下厚亦加一尺。其上斜收亦減高之半。或高減者亦如之。城開廣池。深五尺。其厚隨城之厚。…… *Ibid.*, "Qiang" 牆：築牆之制。每牆厚三尺。則高九尺。其上斜收比厚減半。若高增三尺。則厚加三尺。減亦如之。凡露牆。每牆高一丈。則厚減高之半。其上收面之廣比高五分之一。若高增一尺。其厚加亦如之。(gloss omitted) 凡抽絛牆。高厚同上。其上收面之廣。比高四分之一。若高增一尺。其厚加二寸五分。
- 19) Li Quan, *Shenji zhidi taiboyin jing* 5, "Zhucheng pian" 43: 經曰。先王之制。大都不過三國之一。中五之一。小九之一。故曰。都城過百雉。國之害也。今諸侯之城方兩京之城。闊狹合五之一。其高為邊隅之守。不可為節制。古今度城之法者。下闊與高倍。上闊與下倍。城高五丈。下闊二丈五尺。上闊一丈二尺五寸。高下闊狹。以此為準。
- 20) *Kaogongji*, "Jiangren wei gouxu": 困，窳，倉，城。逆牆六分。Zheng Xuan's commentary: 逆猶卻也。築此四者。六分其高。卻一分以為網。困，圍倉。穿地曰窳。Jia Gongyan 賈公彥's commentary: 假令高丈二尺。下厚四尺。則於上去二尺為網。上惟二尺。其困，倉，城。地上為之。須為此網。其窳入地亦為是網者。雖入地。口宜寬。則牢固也。
- 21) *Kaogongji*, "Jiangren wei gouxu": 牆厚三尺。崇三之。Zheng Xuan's commentary: 高厚以是為率。足以相勝。Jia Gongyan's commentary: 高恒兩倍於厚。不要厚三尺，高九尺。假令厚六尺。高丈八尺。皆依此法。故云。以是為率。足以相勝也。
- 22) *Chunqiu Zuoshi zhuan*, Duke Yin 1: 祭仲曰。都城過百雉。國之害也。先王之制。不過參國之一。中五之一。小九之一。今京不度非制也。Du Yu's commentary: 方丈曰堵。三堵曰雉。一雉之牆。長三丈。高一丈。侯伯之牆。方五里。徑三百雉。故其大都不得過百雉。For Kong Yingda's commentary, see n. 24.
- 23) *Chunqiu Gongyang zhuan*, Duke Ding, year 12 (ed. Ruan Yuan 阮元): '五板而堵'。按毛詩小雅鄭箋引'而'作'為'。下'而雉'同。'八尺板版堵者'。浦鐘云。'堵'衍字。按傳注'版'作'板'。當從此。……五堵而雉。唐石經諸本同。按詩鴻臚正義引王愆期注公羊云。諸儒皆以為雉長三丈。堵長一丈。疑'五'誤。當為'三'。
- 24) Sun Yirang, *Zhouli zhengyi* 84: 詒讓案。左隱公元年傳。……杜注云。……杜說用鄭義。蓋堵雉之根數生於版。鄭說版廣二尺。長一丈。積五版之廣。以為堵之高。則方一丈。積三堵之廣。以為雉之廣。則三丈。雉之廣三堵。即三版之廣。雉之高一堵。亦即五版之積也。而公羊定十二年傳云。……何注云……詩小雅鴻雁毛傳云。一丈為版。五版為堵。鄭箋引公羊傳而釋之云。雉長三丈。則版六尺。檀弓注亦云。版蓋廣二尺。長六尺。大戴禮記王言篇又云。百步而堵。此說版堵度並異。左傳孔疏引五經異義云。戴禮及韓詩說。八尺為版。五版為堵。五堵為雉。版廣二尺。積高五版為一丈。五堵為雉。雉長四丈。古周禮及左氏說。一丈為版。版廣二尺。五版為堵。一堵之牆長丈。高丈。三堵為雉。一雉之牆長三丈。高一丈。以度其長者用其長。以度其高者用其高也。又詩鴻雁孔疏引鄭駁異義云。左氏傳說。鄭莊公弟段居京城。祭仲曰。……中之雉制。書傳各不得其詳。今以左氏說。鄭伯之城方五里。積千五百步也。大都三國之一。則五百步也。五百步為百雉。則知雉五步。五步於度長三丈。則雉長三丈也。雉之廣量於是定可知矣。又引王愆期注公羊云。……焦循云。詩傳云。一丈為版。五版為堵。正義云。五版為堵。累五版也。版廣二尺。然則毛公說版以長言。說堵以高言。與周禮。左氏說同。箋引公羊傳云。五堵為雉。與三堵為雉之說不同。鄭云則版六尺者。蓋雉為高一丈。廣三丈之定名。今日五堵。則由一雉而五之。每堵得一丈。廣六尺。又由一堵而五之。每版得高二尺。廣六尺。毛以一丈為版。則三堵為雉。鄭以六尺為版。則五倍為雉。說版有不同。而雉之數一

- 也。左傳疏引戴禮及韓詩云。……此但版長八尺爲異。五版爲堵。仍累二尺而五。與毛、鄭同也。何休則以累八尺者五之。故以堵爲四丈。又累四丈者五之而爲雉。故雉長二十丈。百雉長二千丈。得十一里三分里之二。制且大於王城。非公羊傳義。案焦說是也。
- 25) In the *Taiping yulan*, 公羊傳曰。城雉者何。五板而堵。五堵而雉。百雉而城 is followed not by 又曰 but again followed by 公羊傳曰。天子之城千雉。……, suggesting that in the latter instance the character 注 of 公羊傳注 has been left out.
- 26) Because this is a topic that is too far removed from our present concerns, this is not the place to discuss it in detail, but it certainly deserves further examination. As examples of the dimensions of city walls, palaces, gardens and other architectures being given in terms of their circumference, mention may be made of the following: *Yuejue shu* 越絕書 2: 吳大城。周四十七里二百一十步二尺。……吳郭。周六十八里六十步。吳小城。周十二里。……, with many further examples; *Huanglan* 皇覽 quoted in *Shiji* 史記, “Qin Shihuang benji: jijie” 秦始皇本紀·集解: 墳高五十餘丈。周迴五里餘; *Sanfu huangtu* 1, “Han Chang’an gucheng” 漢長安故城: (惠帝元年) 九月城成。高三丈五尺。下闊一丈五尺。上闊九尺。雉高三坂。周回六十五里; and *Hou Hanshu* 後漢書, “Xiyu zhuan” 西域傳: 大秦國。……所居城邑。周圍百餘里。From the Northern and Southern Dynasties onwards, this mode of expression is found quite regularly. Moreover, in the *Shiji*, “Shijia” 世家 28: “Liang Xiao wang” 梁孝王 there is a passage that reads: 於是孝王築東苑。方三百餘里。廣睢陽城七十里。大治宮室。爲複道。自宮連屬於平臺三十餘里, and whereas Su Lin 蘇林 as quoted in the *Suoyin* 索隱 interprets the 70 *li* of Juyang 睢陽 mentioned immediately after the Eastern Grove 東苑, said to have been more than 300 *li* square, as referring to its diameter (meaning, in other words, that the city was extended to make it 70 *li* across), in the *Taiping yulan* 192 the sense has been completely altered, with the city being said to have had a circumference of 70 *li* (又〔漢書〕曰。梁孝王廣睢陽城。周圍七十里). This example too could be regarded as further corroboration of the increasing prevalence of this usage.
- 27) The editors of the text read 萬乘之國。郭方〔十〕七里。城方九〔里。……〕, adding 十 after 方。However in view of the fact that the outer walls must have been longer than the inner walls, but taking account of the ratio governing the size of the different grades of cities and also similar examples listed in Table 2, I have altered 十 to 廿。
- 28) According to some authorities, 1 *ren* is equivalent to 8 *chi*, but in the present context it is probably more natural to equate it with 7 *chi* in accordance with the Zhou system of measurements, as is normally the case. See Sun Yirang, *Zhouli zhengyi, on Kaogongji*, “Jiangren yingguo”: 王宮門阿之制五雉。……。
- 29) *Shangjun shu*, “Bingshou”: 發梁撤屋。給從(徙)。徙(徙)之。不治(給)。而燬之。
- 30) The passage ……百步而一積。城守之造也 in the *Shoufa* (slip 812) forms a parallel with ……皆於城下。守城之備也 in the preceding slip 811, and the difference between *zao* 造 (‘construction [materials]’) and *bei* 備 (‘[defence] preparations’) is clear. A further example of a similar usage of *zao* may be seen in slip 806: ……毋下七十枚。長枚毋下冊。所以造城之用……。
- 31) *Erya*, “Shi gong”: 甗甗謂之甗。Guo Pu’s commentary: 甗甗也。今江東呼甗甗。
- 32) Tanaka Tan 田中淡, “Chūgoku kenchiku to sen” 中國建築と塼 (Chinese architecture and bricks), *Sōshoku Tairu Kenkyū* 裝飾タイル研究 5 (1979); repr. with additions in *id.*, *Chūgoku kenchiku shi no kenkyū* 中國建築史の研究 (Studies in the history of Chinese architecture; Kōbundō 弘文堂, 1989).
- 33) See, for example, Fujieda Akira 藤枝晃, “Chōjō no mamori” 長城のまもり (The defence of the Great Wall), in *Shizen to bunka* 自然と文化 (Nature and culture), Sup. Vol. 2: *Yūboku minzoku no kenkyū* 遊牧民族の研究 (Studies of nomadic peoples; Shizenshi Gakkai 自然史學會, 1955); Chen Mengjia 陳夢家, “Handai fengsui zhidu” 漢代烽燧制度 (The system of beacon towers in the Han dynasty), in *Hanjian zhuishu* 漢簡綴述 (Studies of Han slips; Zhonghua Shuju, 1980); Chu Shibin 初師賓, “Han biansai shouyu qibei kaolue” 漢邊塞守御器備考略 (Remarks on the defensive equipment of Han border fortresses), in Gansusheng Wenwu Gongzuodui 甘肅省文物工作隊 and Gansusheng Bowuguan 甘肅省博物館, eds., *Hanjian yanjiu wenji* 漢簡研究文集 (Collected studies of Han slips; Gansu Renmin Chubanshe 甘肅人民出版社, 1984).
- 34) Cen Zhongmian, *op. cit.*: 孫〔詒讓〕疑‘靈丁’爲‘椽弋’。于〔省吾〕又謂是‘鈴鐺’。余按。

- 犬牙，交錯也。涿弋是門丁。無所謂三丈交錯。鈴鑄亦無需乎交錯。其實乃‘瓠瓠’之音轉。廣韻。瓠瓠以罍有耳。卽前所謂‘五步一罍’也。運〔王閻運〕疑‘靈丁’爲樓窗。更屬臆測。
- 35) *Ibid.*: ‘令耳’運〔王閻運〕注爲‘瓦溝備水’。與下文要嚴守令耳之情狀不符。余疑‘令耳’應一逗。卽‘屬城爲再重樓’的名稱。試看下文‘樓若令耳’。他可爲證。See also Emura Haruki 江村治樹, ed., *Maōtai shutsudo isho jikei bunrui sakuin* 馬王堆出土醫書字形分類索引 (Classified index of character forms in medical works unearthed at Mawangdui; 1987 [2nd report of “Nourishing Vitality in Ancient China: Comprehensive Studies on Theory and Practice”]).
- 36) *Zuozhuan*, Duke Xiang, year 6: 甲寅。堙之環城。傅於堞。Du Yu’s commentary: 堞，女牆也。堙，土山也。周城爲土山及女牆。
- 37) *Shiming*, “Shi gongshi”: 城上垣曰睥睨。言於其孔中睥睨非常也。(畢沅曰。‘睥睨’當作‘俾睨’)。亦曰睥。睥，裨也。言裨助城之高也。亦曰女牆。言其卑小。比之於城。若女子之於丈夫也。或名堞。取其重疊之義也。
- 38) Sun Yirang, *Mozi jiangou* 14: 此當讀‘樓五十步’爲句。‘堞下爲爵穴’又爲句。爵穴，謂於城堞間爲孔穴也。後文云。城上爲爵穴。下堞三尺。與此堞下爲爵穴。文足相證。
- 39) *Shuijing zhu* 水經注, “Gushui” 穀水: (金墉城)城上西面列觀。五十步一睥睨屋。臺置一鍾。以和漏鼓。
- 40) Chen Gui, *Jingkang chaoye qianyan houxu* (*Shoucheng lu* 1): 築城之制。城面必作女頭牆。女頭中間立狗脚木一條。每兩女頭中掛搭笮籬。惟可以遮隔弓箭。於砲石則難以遮隔。若改作平頭牆。不笮籬。只於近下留品字方空眼。與女頭相似。亦甚濟用。
- 41) Chen Gui, *Shoucheng jiyao* (*Shoucheng lu* 2): 一。女頭牆。舊制於城外邊約地六尺一箇。高者不過五尺。作山字樣。兩女頭牆間留女口一箇。女頭牆上立狗脚木一條。挂搭皮竹笮籬牌一片。遮隔矢石。若禦大砲全不濟事。又女頭低小城。外箭鑿可中守禦人頭面。須是於城上先築鵲臺。高二尺。闊五尺。鵲臺上再築牆。高六尺，厚二尺。自鵲臺向上一尺五寸。留方眼一箇。眼闊一尺，高八寸。(一云。方徑及尺)。相離三尺又置一箇。兩眼之間向上一尺又置一箇。狀如品字。向上作平頭牆。……。
- 42) Hebeisheng Wenwu Guanlichu 河北省文物管理處 and Handanshi Wenwu Baoguansuo 邯鄲市文物保管所 (Sun Dehai 孫德海 and Chen Guangtang 陳光唐), “Zhaodu Handan gucheng diaocha baogao” 趙都邯鄲故城調查報告 (Report on investigations of the ancient city of Handan, capital of Zhao), *Kaoguxue Jikan* 考古學集刊 4 (1984). Two storeys of tiling have been discovered, with each approximately 2 metres high, and they were covered with rather thin tiles laid in the so-called *yanghewa* 仰合瓦 style. According to Chen Guangtang, director of the Handan City Depository of Cultural Relics (Handanshi Wenwu Baoguansuo), the tiles were laid for drainage, and although the reason for the tiers is unclear, there are thought to have been originally at least six storeys with a total height of 10 metres, while the upper width of the city walls was 7-8 metres and the base width 15-16 metres (explanation given to “Investigation Party for the Comparative Study of Ancient Cities in Japan and China” [leader: Tsuboi Kiyotari 坪井清足; secretary: Goi Naohiro 五井直弘] in May 1987). The fact that the inner face of the city walls at Xiagu 下菰 in Huzhou 湖州, Zhejiang, dating from around the Chunqiu 春秋 period, have a remarkably gentle batter of about 40° may also be instructive in this regard; see Lao Bomin 勞伯敏, “Huzhou Xiagucheng chutan” 湖州下菰城初探 (Preliminary investigations of Xiagu city, Huzhou), in *Zhongguo Kaogu Xuehui diwuci nianhui lunwenji* 中國考古學會第五次年會論文集 (Collected articles from the 5th annual conference of the China Archaeological Society; Wenwu Chubanshe, 1988).
- 43) Sun Yirang, *Mozi jiangou* 14: ‘遠廣’。義不可通。疑‘遠’當爲‘道’。謂城上下當陞之道也。下文云。道陞高二尺五寸，長十步。下‘廣’字。道藏本，吳鈔本作‘唐’。文選甘泉賦李注引鄧展云。唐，道也。則唐義亦通。
- 44) Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo Henan Dier Gongzuodui 中國社會科學院考古研究所河南第二工作隊, “1983 nian Henan Yanshi Shangcheng fajue jianbao” 1983 年河南偃師商城發掘簡報 (Brief report on excavations of the Shang city at Yanshi, Henan, in 1983), *Kaogu* 考古 1984-10; Zhao Zhiqian 趙芝荃 and Xu Diankui 徐殿魁, “Yanshi Shixianggou Shangdai zaoqi chengzhi” 偃師尸鄉溝商代早期城址 (Early city remains of the Shang period at Shixianggou, Yanshi), in *Zhongguo Kaogu Xuehui diwuci nianhui lunwenji* (see n. 42).

- 45) For instance, the extant horse ramp beside the Guanghua Gate 光化門 of Jiayuguan 嘉峪關, Gansu, is 2.83 metres wide and 24.73 metres long (Yu Jin 郁進, ed., *Changcheng* 長城 [The Great Wall; Wenwu Chubanshe, 1980]). Assuming that the height of the walls was 3 zhang 5 chi, mentioned above, then the tread would have been about 4.3 chi (0.95 m) wide and the gradient about 0.58 (30°), figures which seem quite reasonable.
- 46) *Erya*, “Shi gong” (with Guo Pu’s commentary): 宮中門謂之闈。 (謂相通小門也)。其小者謂之闈。
- 47) *Shuowen*: 闈, 特立之戶。上圓下方。有似圭。
- 48) Jiaxing Diqu Wenguanhui 嘉興地區文管會 and Hainingxian Bowuguan 海寧縣博物館, “Zhejiang Haining Dong-Han huaxiang shimu fajue jianbao” 浙江海寧東漢畫像石墓發掘簡報 (Brief report on the excavation of a decorated stone tomb of the Eastern Han in Haining, Zhejiang), *Wenwu* 1983-5.
- 49) Zhang Lianggao, “Guiyu xiaoshi” 圭窬小識 (A note on guiyu), *Wenwu* 1984-3.
- 50) *Shouyufa* quoted in *Tongdian* 252: 城外四面。壕內去城十步。更立小隔城。厚六尺。仍立女牆。 (謂之羊馬城)
- 51) Li Quan, *Taiboyin jing* 3, “Zhucheng pian” 43: 其羊馬城。於壕內築高八尺。上至女牆。計工準上。
- 52) *Taiboyin jing* 3, “Fengsuitai pian” 46: 經曰。烽燧於高山四望險絕處置。無山亦於平地高迴處置。下築羊馬城。高下任便。常以三五爲準。臺高五丈。上闊一丈。形圓。上蓋圓屋覆之。屋徑闊一丈六尺。一面跳出三尺。以板爲之上覆下棧。……
- 53) *Wujing zongyao*, I.12: 門外築甃城。去大城約三十步。上施釣橋。壕之內岸築羊馬城。去大城約十步。凡城上皆有女牆。……羊馬城。高可一丈以下。八尺以上。亦偏開一門。與甃城門相背。若甃城門在左。卽羊馬門在右也。女牆高可五尺。壕面各隨其地爲闊狹。大要在面闊底狹。其深及泉。使箭砲難及卽住。……甃城。上各設戰棚。其制與敵樓同。則又擇前後左右。以去大城近處。隨山形別築一城。令與大城相接。必盡據高地。外亦開壑。兩城之中。或設烽臺。以爲遠候。……
- 54) Wang Deqing 王德慶, “Suzhou Panmen” 蘇州盤門 (The Pan Gate of Suzhou), *Wenwu* 1986-1.
- 55) Chengxiang Jianshe Huanjing Baohubu Zhongguo Jianzhu Jishu Fazhan Zhongxin Jianzhu Lishi Yanjiusuo 城鄉建設環境保護部中國建築技術發展中心建築歷史研究所, *Beijing gu jianzhu* 北京古建築 (The old architecture of Beijing; Wenwu Chubanshe, 1986), p. 7.
- 56) Katō Shigeru, “Jōkaku no hanashi” 城郭の話 (A talk about city walls) and “Hoppō no toshi toku ni sono jōkaku ni tsuite” 北方の都市特にその城郭について (About northern cities, especially their walls), in *id.*, *Shinagaku zassō* 支那學雜誌 (Miscellaneous studies in Sinology; Seikatsusha 生活社, 1944).
- 57) Meng Yuanlao 孟元老, *Dongjing menghua lu* 1, “Dongdu waicheng” 東都外城: 城門皆甃城三層。屈曲開門。唯南薰門, 新鄭門, 新宋門, 封丘門, 皆直門兩重。蓋此係四正門。皆留御路故也。See also Iriya Yoshitaka 入矢義高 and Umehara Kaoru 梅原郁, tr., *Tōkei muka roku* 東京夢華錄 (*Dongjing menghua lu*; Iwanami Shoten 岩波書店, 1983).
- 58) Qiu Gang 丘剛, “Bei-Song Dongjing waicheng de chengqiang he chengmen” 北宋東京外城的城牆和城門 (The walls and gates of the outer city walls of Dongjing in the Northern Song), *Zhongyuan Wenwu* 中原文物 1986-4.
- 59) Wang Wencai, *Chengdu chengfang kao* 成都城坊考 (A study of the city wards of Chengdu; Bashu Shushe 巴蜀書社, 1986).
- 60) Wang Hui, *Chuangzhu luocheng ji*: 南北東西凡二十五里。護門却敵之制復八里。其高下蓋二丈有六尺。其上建樓廊廡五千六百八間。
- 61) Du Guangting, *Shenxian ganyu zhuan*: 始築羅城。壅門却敵共三十二里。
- 62) Li Hao, *Chuangzhu yangmacheng ji*: 其新城周圍四十二里。竦一丈七尺。舍四千九百五十九間。
- 63) Chen Gui, *Jingfang chaoye qianyan houxu*: 宜便於城裏脚下取土爲深闊裏壕。去壕數丈。再築裏城一重。對舊城門。更不作門。却於新築城下緣裏壕入三二里地。新城上開門。使人入得大城直行。不得須於裏壕上築新城。脚下繚繞行三二里。方始入門。若此則假使敵善填壕。止不過填得裏壕。若由門入城。須行新城脚下裏壕上築新城。上人直下臨敵何物。不可施用。正是敵人死地。必不敢入由正門入城。
- 64) Gai Shanlin 蓋山林 and Lu Sixian 陸思賢, “Nei Menggu jingnei Zhanguo Qin Han changcheng

- yiji" 內蒙古境內戰國秦漢長城遺迹 (Remains of the Great Wall from the Warring States, Qin and Han within Inner Mongolia), in *Zhongguo Kaogu Xuehui diyici nianhui lunwenji 1979* 中國考古學會第一次年會論文集 1979 (Collected articles from the 1st annual conference of the China Archaeological Society, 1979; Wenwu Chubanshe, 1980).
- 65) Gansusheng Bowuguan 甘肅省博物館 and Dunhuangxian Wenhuaquan 敦煌縣文化館, "Dunhuang Majuanwan Handai fengsui yizhi fajue jianbao" 敦煌馬圈灣漢代烽燧遺址發掘簡報 (Brief report on excavations of the remains of a beacon tower of the Han dynasty at Majuanwan, Dunhuang), in *Hanjian yanjiu wenji* (see n. 33).
- 66) Gansu Juyan Kaogudui 甘肅居延考古隊, "Juyan Handai yizhi de fajue he xin qutu de jiance wenwu" 居延漢代遺址的發掘和新出土的簡冊文物 (The excavation of Han-dynasty remains at Juyan and newly unearthed slips, documents and artifacts), *Wenwu* 1987-1.
- 67) Chu Shibin, *op. cit.* (n. 33).
- 68) Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo Xinjiang Gongzuodui 中國社會科學院考古研究所新疆工作隊, "Xinjiang Jimusar Beiting gucheng diaocha" 新疆吉木薩爾北庭古城調查 (Investigations of the ancient city of Bishbalik at Jimsa, Xinjiang), *Kaogu* 1982-2.
- 69) Yan Wenru 閻文儒, "Tulufan de Gaochang gucheng" 吐魯番的高昌故城 (The ancient city of Gaochang in Turfan), *Wenwu* 1962-7/8.
- 70) Nanjing Bowuyuan 南京博物院 (You Zhenyao 尤振堯), "Yangzhou gucheng 1978 nian diaocha fajue jianbao" 揚州古城 1978 年調查發掘簡報 (Brief report of investigations and excavations at the ancient city of Yangzhou in 1978), *Wenwu* 1979-9; Ji Zhongqing 紀仲慶, "Yangzhou guchengzhi bianqian chutan" 揚州古城址變遷初探 (Preliminary investigations of changes at the site of the ancient city of Yangzhou), *Wenwu* 1979-9.
- 71) Wei Cuncheng 魏存成, "Bohai chengzhi de faxian yu fenqi" 渤海城址的發現與分期 (The discovery and periodization of the remains of cities of Bohai), *Dongbei Kaogu yu Lishi* 東北考古與歷史 1 (1982).
- 72) Shafukunuofu 沙弗庫諾夫 (Lin Shushan 林樹山, tr.), "Sulian binhai diqu de Bohai wenhua yicun" 蘇聯濱海地區的渤海文化遺存 (Vestiges of Bohai culture in the Littoral Province of the Soviet Union), *Dongbei Kaogu yu Lishi* 1 (1982).
- 73) Feng Yongqian 馮永謙 and Jiang Niansi 姜念思, "Liaodai Raozhoucheng diaocha ji" 遼代饒州城調查記 (An account of investigations of the Liao-dynasty city of Raozhou), *Dongbei Kaogu yu Lishi* 1 (1982).
- 74) Zhu Guochen 朱國忱, "Tazicheng diaocha jilue" 塔子城調查紀略 (Brief account of investigations of the city of Tazi), *Liaohai Wenwu Xuekan* 遼海文物學刊 1987-2.
- 75) Feng Yongqian and Jiang Niansi, "Ningchengxian Heicheng guchengzhi diaocha" 寧城縣黑城古城址調查 (Investigations of the remains of an ancient city at Heicheng, Ningcheng district), *Kaogu* 1982-2.
- 76) Ma Hanyin 馬翰英, "Gumunacheng yange kaolue" 固木納城沿革考略 (Brief consideration of the history of the city of Gumuna), *Heilongjiang Wenwu Congkan* 黑龍江文物叢刊 1983-1.
- 77) Xu Zirong 許子榮, "Jin Shangjing Huiningfu yizhi" 金上京會寧府遺址 (Remains of Shangjing Huiningfu of the Jin), *Heilongjiang Wenwu Congkan* 1982-1.
- 78) Suihua Diqu Wenwu Guanlizhan 綏化地區文物管理站, "Hulanhe zhongyou kaogu diaocha jianbao" 呼蘭河中游考古調查簡報 (Brief report of archaeological investigations in the middle reaches of the Hulan River), *Heilongjiang Wenwu Ziliao Congkan* 黑龍江文物資料叢刊 1982-2.
- 79) Tian Guangjin 田廣金, "Siziwangqi Hongger diqu Jindai yizhi he muzang" 四子王旗紅格爾地區金代遺址和墓葬 (Jin-dynasty remains and graves in the Hongger region of the Siziwang banner), *Nei Menggu Wenwu Kaogu* 內蒙古文物考古 1 (1981).
- 80) Zheng Long 鄭隆, "Zhungerqi Dashata bihuamu ji fujin de gucheng" 準格爾旗大沙塔壁畫墓及附近的古城 (A tomb with murals at Dashata in the Jungar banner and ancient cities in the vicinity), *Nei Menggu Wenwu Kaogu* 1 (1981).
- 81) Li Yiyou 李逸友, "Nei Menggu Yuandai chengzhi gaishuo" 內蒙古元代城址概說 (An introduction to Yuan-dynasty city remains in Inner Mongolia), *Nei Menggu Wenwu Kaogu* 4 (1986).
- 82) Chen Gui, *Shoucheng jiyao*: 一. 馬面. 舊制六十步立一座. 跳出城外不減二丈. 濶狹隨地利不定.

兩邊直觀城脚。

- 83) Shakeshi, *Hefang tongyi* 1, “Zhucheng: wuliao fu” 築城·物料附: 每築高五尺。橫紘木一根。甕城至馬面之類準此。
- 84) Mao Yuanyi, *Wubeizhi* 110, “Junzisheng: shou—chengzhi” 軍資乘·守·城制: 凡雉出城身外。大者三丈。次者二丈。次者一丈五尺。直出三丈者。橫長五丈。直出二丈者。橫長三丈。直出一丈者。橫長一丈五尺。比城原身高三丈者。加高三尺。二丈者。加高二尺。每五十塚一雉。城闊加之。不拘幾雉。左右遇角遇門。或多少幾數丈。從便均勻。每面除樓角所占不等約一里者。樓角之中各二雉。二里者。樓角之中各四雉。以此加之。不足丈尺者。五十塚以外。亦可以五十塚計。五十塚以內。亦可以五十塚計。通變在人。此大概耳。
- 85) Jiang Zanchu 蔣贊初, Li Xiaohui 李曉暉 and He Zhongxiang 賀中香, “Liuchao Wuchangcheng chutan” 六朝武昌城初探 (Preliminary investigations of the city of Wuchang during the Six Dynasties), in *Zhongguo Kaogu Xuehui diwuci nianhui lunwenji* (see n. 42).
- 86) Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo Han-Wei Gucheng Gongzuodui 中國社會科學院考古研究所漢魏古城工作隊, “Luoyang Han-Wei cheng beiyuan yihao mamian de fajue” 洛陽漢魏城北垣一號馬面的發掘 (Excavation of ‘horse face’ no. 1 on the north wall of the Han-Wei city of Luoyang), *Kaogu* 1986-8.
- 87) Tao Zhenggang 陶正剛 and Ye Xueming 葉學明, “Gu Weicheng he Yuwang gucheng diaocha jianbao” 古魏城和禹王古城調查簡報 (Brief report of investigations of an ancient Wei city and the ancient city of King Yu), *Wenwu* 1962-4/5.
- 88) Hebeisheng Wenwu Yanjiusuo 河北省文物研究所, “Hebei Pingshan Sanji gucheng diaocha yu muzang fajue” 河北平山三汲古城調查與墓葬發掘 (Investigations of an ancient city at Sanji in Pingshan, Hebei, and excavations of graves), *Kaoguxue Jikan* 5 (1987); Shi Yongshi 石永士, “Yan Xiadu, Handan he Lingshou gucheng de bijiao yanjiu” 燕下都, 邯鄲和靈壽故城的比較研究 (A comparative study of the ancient cities of Xiadu of Yan, Handan, and Lingshou), *Zhongguo Kaogu Xuehui diwuci nianhui lunwenji* (see n. 42).
- 89) Li Yiyong, “Han Guanglucheng de kaocha” 漢光祿城的考察 (An examination of the Han city of Guanglu), *Nei Menggu Wenwu Kaogu* 3 (1984).
- 90) *Shujing zhu*, “Gushui”: 其一水自千秋門南流。逕神虎門下。東對雲龍門。二門衡楸之上。皆刻雲龍風虎之狀。
- 91) *Yingzao fashi* 19, “Chengmendao zhidu” 城門道制度: 排叉柱長二丈四尺。廣一尺四寸。厚九寸。……洪門楸。長二丈五尺。廣一尺五寸。……永定柱。事造頭口。……。
- 92) Fu Xinian, “Tang Chang’an Daminggong Xuanwumen ji Chongxuanmen fuyuan yanjiu” 唐長安大明宮玄武門及重玄門復元研究 (Research on the restoration of the Xuanwu Gate and Chongxuan Gate of the Daming Palace in Tang Chang’an), *Kaogu Xuebao* 考古學報 1977-2.
- 93) *Shoucheng jiyao*: 更於鵲臺上靠牆每相去四寸。立排叉木一條。高出女牆五尺。橫用細木夾勒兩道或三道。攻城者或能過品字眼。亦不能到平頭牆上。更兼牆上又有排叉木限隔。……。In the *Jingkang chaoye qianyan houxi* we also read: 城樓處兩頭橫直深埋排叉木。以防敵急登城上。分甲兵兩向攻打。城裏從下斜築。至城面外垠。向下陡峻。It is thus evident that these stakes were hammered into the walls along the outer parapets.
- 94) Sun Yirang, *Mozi jiangou* 14: 畢云。說文云。棧。棚也。詒讓案。疑當作‘棧’。與弋同。卽下文之涿弋也。然杜君卿所見已作棧。未敢輒改。…畢云。說文云。樁。壁柱。植。戶植也。薄。假音字。蓋卽鑿孔以涿弋。然不當云版尺。疑有誤。Cen Zhongmian, *op. cit.*: 門扇及柱皆鑿孔。孔深半寸或一寸。以安棧弋(‘涿’同‘棧’) 棧弋係尖圓狀之木(近代宮門, 廟門之門丁。當卽棧弋之遺制), 使敵矢易於滑下也。見一寸者指突出部分之長度。……因弋長二寸。孔深半寸或一寸。故突出之部分長一寸。
- 95) Sun Yirang, *Mozi jiangou* 14: 畢云。‘弋’舊俱作‘代’。以意改。詒讓案。‘代’疑‘棧’之誤。Cen Zhongmian, *op. cit.*: 涿弋是門丁。見前9。彼云弋長二寸。與此異。
- 96) *Shoujufa* quoted in *Tongdian* 252: 城門扇及樓檣。以泥塗厚備火。
- 97) *Taiping yulan* 337: 又〔通典衛公兵法〕守城篇曰。……縣門(縣板爲重門也)。The same passage is quoted in the *Taiboyin jing* 4, “Chengju pian” 城具篇。
- 98) *Wujing zongyao*, I.12: 右挿版。與城門爲重門。其制用榆槐木。廣狹準城門。漫以生牛皮。裹以鐵葉。兩傍施鐵環貫鐵。凡大城門。去門闔五尺立兩頰木。木開池槽。亦用鐵葉裹之。若寇至。

- 即以絞車自城樓上抽所貫鐵索。下插版于槽中。外實以土防火攻。內枝以柱防傾折。
- 99) *Taiboyin jing* 4, “Shouchengju pian” 36: 轉關橋。一梁爲橋梁。端着橫枱。拔去枱。橋轉關。人馬不得渡。皆傾水中。秦用此橋。以殺燕丹。
- 100) *Wujing zongyao*, I.12: 右釣橋。造以榆槐木。其制如橋。上施三鐵環。貫以二鐵索。副以麻繩。繫屬於城樓上。橋後去城約三步。立二柱。各長二丈五尺。開上山口。置熱鐵轉輪爲槽。以架鐵索并繩。責其易起。若城外有警。則樓上使人挽起。以斷其路。亦以護門
- 101) In Chapter 52.45 it is recommended that a pile of firewood be placed every 100 *bu* along the road encircling the city walls (城下州道內百步一積薪), and Sun Yirang comments as follows: 畢云。疑‘周道’。詒讓案。‘周道’見後備水篇。周禮量人云。營軍之壘舍。量其州涂。鄭玄注云。州涂。環市朝而爲道也。又考工記匠人云。環涂七軌。杜子春注云。環涂。環城之道。此州道與州涂。環涂。義並略同。
The Shoufa (slip 808) also advises to “make an encircling road 20 *chi* wide” (爲周道。廣廿尺)。Mozi, Chapter 58.1 reads: 城內塹外周道廣八步, implying that the perimeter road, 8 *bu* wide, was situated beyond the moat outside the city walls. But as has been suggested by Cen Zhongmian, there is a possibility that a preceding sentence is missing or that scribal omissions or errors have occurred (城內→城下, 塹外→外塹?). Although one cannot be certain, I tentatively assume on the basis of other passages that the encircling road ran between the city walls and the moat.
- 102) Sun Yirang, *Mozi jiangou*: 格, 即備蛾傅篇之杜格, 旗幟篇之牲格也。蓋於城外樹木爲之。以撤敵人之傳城者。或云。格與落通。六韜軍用篇, 漢書鼂錯傳。並有虎落。即此。Lao Gan, “Shi Handai zhi tingzhang yu fengsui” 釋漢代之亭障與烽燧 (Interpreting the blockhouses and beacon towers of the Han dynasty), *Lishi Yuyan Yanjiusuo Jikan* 歷史語言研究所集刊 19 (1948).
- 103) Gansu Juyan Kaogudui, *op. cit.* (n. 66).
- 104) *Shoucheng jiyao*: 一。修城舊制。多於城外脚下或臨壕。栽了叉木。名爲鹿角。大爲無益。若城中人出至鹿角內。壕外人施放弓弩。鹿角不能遮隔。……。
- 105) Tanaka Tan, “*Bokushi jōshu shohen no chikujō kōtei (zokkan)*” 『墨子』城守諸篇の築城工程 (續完) (The construction of city walls in the chapters on the defence of cities in the *Mozi* [contd. & comp.]), in *Chūgoku kodai kagakushi ron zokuhen* 中國古代科學史論續篇 (Studies in the history of science in ancient China [contd.]; Kyōto Daigaku Jinbun Kagaku Kenkyūjo 京都大學人文科學研究所, 1991).
- 106) Li Xingsheng 李興盛, “Nei Menggu Zhuozi Sandaoying gucheng diaocha” 內蒙古卓資三道營古城調查 (Investigations of an ancient city at Sandaoying, Zhuozi, Inner Mongolia), *Kaogu* 1992-5.
- 107) Tang Xiaofeng 唐曉峰, “Nei Menggu xibu Qin-Han changcheng diaocha ji” 內蒙古西部秦漢長城調查記 (An account of investigations of the Qin and Han Great Wall in western Inner Mongolia), *Wenwu* 1978-5.
- 108) Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo 中國社會科學院考古研究所, ed., *Xin Zhongguo de kaogu faxian he yanjiu* 新中國的考古發現和研究 (New Chinese archaeological discoveries and research; Wenwu Chubanshe, 1984).
- 109) Li Xingsheng, “Nei Menggu Qingshuihexian Guaizishang gucheng diaocha” 內蒙古清水河縣拐子上古城調查 (Investigations of an ancient city at Guaizishang, Qingshuihe district, Inner Mongolia) (special publication, quoted in Li Xingsheng, *op. cit.* [n. 106]).
- 110) Zhongguo Lishi Bowuguan Kaogubu 中國歷史博物館考古部, Shanxisheng Kaogu Yanjiusuo 山西省考古研究所 and Yuanquxian Bowuguan 垣曲縣博物館, *Yuanqu Shangcheng (yi) 1985-1986 niandu kancha baogao* 垣曲商城 (一) 1985-1986 年度勘察報告 (The Shang city at Yuanqu [1]: Reconnaissance report for 1985-1986; Kexue Chubanshe 科學出版社, 1996).
- 111) Sun Ji, *Handai wuzhi wenhua ziliao tushuo* 漢代物質文化資料圖說 (Illustrated material on the material culture of the Han dynasty; Wenwu Chubanshe, 1991).
- 112) Xun Qi, “Wengcheng suyuan—Yuanqu Shangcheng yizhi yanjiu zhi yi” 堯城溯源—垣曲商城遺址研究之一 (Tracing the origins of the barbarian: A study of the remains of the Shang city at Yuanqu [1]), *Wenwu Jikan* 文物季刊 1994-4.
- 113) Liu Jianguo 劉建國, “Xinjiang Gaochang, Beiting gucheng de yaogan tancha” 新疆高昌, 北庭古城的遙感探查 (Explorations of the ancient cities of Gaochang and Bishbalik in Xinjiang by means of remote sensing), *Kaogu* 1995-8.

Sources of Illustrations

Figs. 1, 2, 11, 12: Diagrams by author.

Figs. 3, 4, 13, 15: *Wujing zongyao* (Wenyuange Siku Quanshu 文淵閣四庫全書 edition), Section I, fascicle 12.

Figs. 5, 9, 14: Photographs by author.

Fig. 6: Jianzhu Gongchengbu Jianzhu Kexue Yanjiuyuan Jianzhu Lilun ji Lishi Yanjiushi 建築工程部隊建築科學研究院建築理論及歷史研究室, ed., *Beijing gu jianzhu* 北京古建築 (The old architecture of Beijing; Wenwu Chubanshe, 1959), fig. 6.

Fig. 7: Gai Shanlin and Lu Sixian, *op. cit.* (n. 64), fig. 3.

Fig. 8: Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo Xinjiang Gongzuodui, *op. cit.* (n. 68), fig. 2.

Fig. 10: Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo Han-Wei Gucheng Gongzuodui, *op. cit.* (n. 86), fig. 2.