

Research on the Restoration of the Small-sized Post Station Building in the Period of Balhae in the Northeast of China

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Abstract—Balhae was a tributary state of the Tang Dynasty. It was founded in 698 AD and died in 926 AD in northeast China. It is a vast country with a complete network of post stations. At present, there is no original structure of the Balhae post building in the world. According to archaeological investigation, some small post building sites were found on the Balhae Post road, which were named "24 stones" by the academic circle because of their peculiar construction methods. Based on the technology of digital modeling and field investigation, this paper restores the image of the small-scale post station and promotes the cultural value of the post station building in Balhae.

Index Terms—post station architecture, Balhae Post Road, 24 stones, ancient architecture image restoration

I. INTRODUCTION

With the rise of cultural tourism routes, regional cities have strengthened their links with each other by means of the existing road networks in history, and cultural routes link up with the protected buildings of various historical periods along the way, the Regional Architecture Heritage Library is constructed with the routes as the link. The northeast of China was the core of the territory of Balhae in ancient times. In order to strengthen the city communication under the background of the vast territory, a large number of post stations were built on the post road. Based on the digital modeling technology, this paper analyzes the image characteristics of the small post station, which is of great significance to the study of regional architecture.

II. THE ANALYSIS OF THE POST ROAD IN BALHAE

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A. The History of Balhae

Balhae is a local political power which Mohe nationality established as the main body in the Tang dynasty. It belongs to the Tang dynasty administratively and is a subordinate country of the Tang dynasty. With its vast territory, it absorbed the prefectural system of central Plains and formed a four-level administrative jurisdiction system with the system of "Jing-fu-zhou-county". Balhae was governed on a regional scale by five jing, fifteen prefectures, sixty districts and more than one hundred and thirty counties [1]. The prefectures communicated with each other by means of the post-station buildings, which were densely distributed on the post-road (Fig. 1 map of Balhae).



Figure 1. Map of Balhae.(Self-drawn by the author).

B. The Post Road Network

The development of the post roads in Balhae was based on the experience of the post roads in the Tang dynasty. According to the ancient book "New Book of Tang-Balhae biography" records: "The southeast coast of Longyuan, Japan Road. South Sea, Silla Road; Yalu, tribute road; Changling County, Yingzhou Road; Fuyu, Khitan road [2]." It can be seen that during the period of

the state of Balhae, five major transportation routes were formed in the territory under its rule, namely the Japanese Road, the Silla Road, the Tributary road, the Yingzhou Road and the Khitan people road, with the capital city of Balhae as the center of the Shangjing Longquan prefecture, the five roads basically cover most of Balhae(Fig. 2 Balhae Road Network). At the same time, the five transport routes also communicate with other countries around Balhae, and achieve the role of international communication.



Figure 2. Balhae Road Network. (Self-drawn by the author)

C. Distribution of Architectural Sites

The site of “24 stones” is located near the ancient post road of the state of Balhae, which should be the post station building of the state of Balhae after many years of archaeological proof [3]. There are 9 sites of “24 stones” in the northeast of China, all located along the present road and closely related to the distance of the modern road (Fig. 3 distribution of 24 stone sites). In this paper, the site-based restoration design of the “24 stones in Haiqingfang” in Yanbian area of China is studied, this paper discusses the form of plane, the relationship of space and the features of facade image of the small-scale post-station buildings in the period of Balhae.

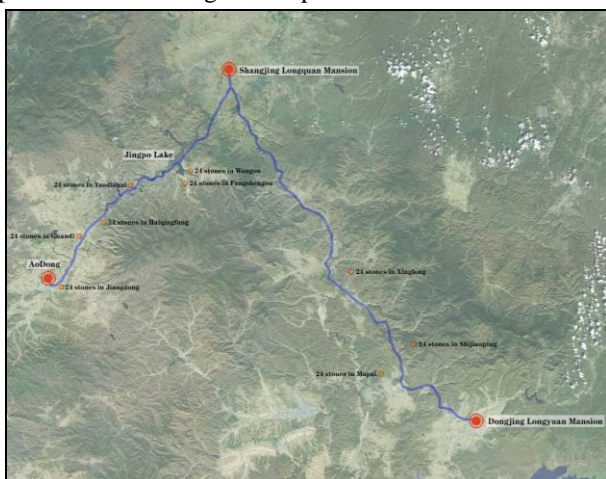


Figure 3. Distribution of 24 stone sites. (Self-drawn by the author)

III. RESTORATION DESIGN OF THE SMALL-SIZED POST BUILDING

D. Present Condition of The “24 stones in Haiqingfang”

Located in Linsheng Township, Dunhua, the “24 stones in Haiqingfang” is arranged in three rows in north-south direction (Figure 4 the photo of the state of the 24 stones in Haiqingfang), each row of 8 foundation stones, totalling 24 foundation stones, each row of which is approximately 10.2(10.4 m) in length, the distance between the center of each row of foundation stones is about 1.3(1.5) meters, and the distance between the two rows of foundation stones is about 3.8 meters in the longitudinal direction [4]. (Fig. 5 archaeological floor plan of the 24 stones in Haiqingfang) According to the arrangement of the foundation stones, we can find that the overall scale of the building is small. The front facade is about three rooms, which is slightly wider in the Ming room and slightly narrower in the two rooms. The side facade is two compartments of equal size. The main body of the building is separated from the foundation stone, the foundation stone frame, the building is made of wood, the whole should be stone-wood combination, quite characteristic.



Figure 4. The photo of the state of the 24 stones in Haiqingfang. (Image source: Internet)

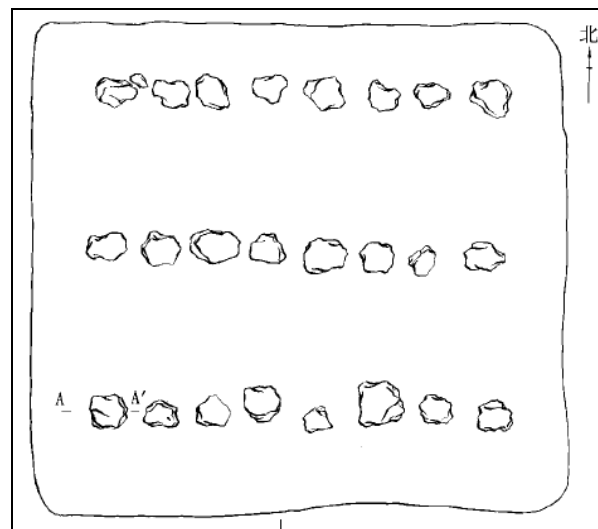


Figure 5. Floor plan of the 24 stones in Haiqingfang [5].

A. Reference for Restoration of Post Building Image

The Nanzen Temple is the oldest surviving timber structure in China (Fig. 6 Elevation of the Main hall of Nanzen Temple), built around the same time as the “24 stones in Haiqingfang”. Hall face wide, into the depth of each 3, nearly square, using a single-eave “xieshan”gray tubular tile roof [6]. The volume of the Nanzen Temple is similar to that of the small-scale post station in Balhae, so there should be many similarities between the two facades.

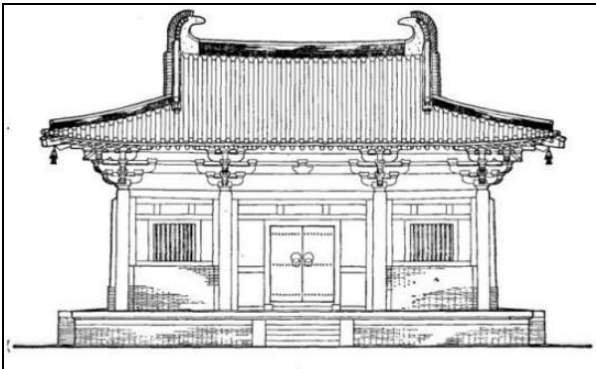


Figure 6. Elevation of the Main hall of Nanzen Temple [6].

Korean ancient buildings are modeled after those of the Tang dynasty. The overall style and features of Korean ancient buildings are similar to those of the Tang dynasty in China [7]. The Jiangling Guest House is a well-preserved post station complex in the Republic of Korea, with a three-bay door at the beginning of the group building (Fig. 7 The gate of Jiangling Guest House), the style and overall scale of the columns are very similar to the “24 stones in Haiqingfang”. Therefore, the gate of Jiangling Guest House can also serve as an

important reference for the restoration of the image of the small-sized post building in Balhae.



Figure 7. The gate of Jiangling Guest House.(Image source: Internet)

B. Determination of Building Modulus

In the period of Balhae, the modular system was formed, in which the proportion of each component and the whole image was controlled by the unified modular system. According to the usage of “Material” in this chapter of the volume of the 《Yingzao Fashi》, “Every structural house is made of material, and has eight grades, so it is used [8].” (Table I Table of size and scope of use) Therefore, in the construction of housing, different grades, different sizes of housing, modular size also has a certain difference. According to the overall size of the “24 stones in Haiqingfang” and the opening scale, the building scale of “Pavilion or small hall” stipulated in ancient books is relatively similar to it. Therefore, “Six-grade timber” is adopted as the modulus for the building as a whole, then it is more appropriate to study the composition of the facade image.

TABLE I. TABLE OF SIZE AND SCOPE OF USE [8]

Material Grade (inch)	First Class	Second Class	Third Class	Fourth class	Fifth class	Sixth class	Seventh class	Eighth class
size	9*6	8.25*5.5	7.5*5	7.2*4.8	6.6*4.4	6*4	5.25*3.5	4.5*3
Scope of application	palace 9-11 bays	palace 5-7 bays	palace 5-7 bays or hall 7 bays	palace 3 bays or hall 5 bays	palace 3 small bays or hall 3 big bays	pavilions or small halls	small halls and small pavilions	an inner caisson or mini pavilion

E. Restoration Design of Architectural Image

1) Uniform material composition

The stone-wood combination construction mode of the building determines that the lightweight frame construction is adopted as a whole. In order to avoid the large load on the whole building and the influence on the bearing capacity of the foundation stone at the bottom, it is less likely that the adobe wall will be used for the wall part of the building body, then greatly reduce the overall weight, so that the stone foundation part and the wooden house body part can achieve a good connection [9]. In order to achieve the effect of rain protection, it is not enough to rely on the timber alone. Therefore, the timber

constitutes the roof framework, and the tile surface is laid on top of it, so as to achieve the sustainable use of the roof.

2) Simple facade form

Taking the “24 stones in Haiqingfang” as an example, the volume of the small-scale post station buildings along the National Post Road in Balhae is less than 100 square meters. On the other hand, the post station building is located on the countryside, and this non-life building is used less frequently. Therefore, there is no need to carry out the fine elevation design, and the overall aesthetic taste should be lower.

According to the above analysis, the building facade is divided into three compartments, the side facade is divided into two compartments, the composition of doors

and windows is extremely simple, the middle of the facade is made of wooden doors, the two sides are made of the most simple straight edge windows, the side facade does not open windows, only wood-paneled walls are used for enclosure.

The curve is also reflected in many aspects of the building facade: according to the general architectural practice of the Tang dynasty, the columns used in the building should follow the traditional pattern of ancient architecture, that is, the columns used in the four corners of the building have a slight inclination to the interior space of the building, the combination of the roof and the body is strengthened by the gravity of the roof, which makes the structure more stable [10]. At the same time, the corner columns on the facade are slightly higher than the middle columns, shaping the architectural image of the facade's top and gentle curves; The roof of the building still retains the architectural features of the Tang style, the upper and lower eaves keep the curve shape, and coordinate with the facade image, and the application of the curve can also make the roof appear more lithe and graceful.

3) The overall division of the three parts

Whether it is ancient architectural design or modern architectural design, the building facade is usually divided into three sections. It is the same for the small post station building in Balhae. The facade is divided into three parts — the "lower part" is the foundation, the "middle part" is the body and the "upper part" is the roof [11].

The lower part of the foundation consists of 24 stone foundations laid with wooden planks as the building's overall load bearing structure; the "middle part" of the facade image is relatively simple, considering the building is small, and located in the countryside, the lower grade, therefore, the building housing should not use the "bucket arch" for weight transfer, only relying on the close combination of beam and column, for gravity to travel from top to bottom; the style of the roof, which is the "upper part" of the building, is determined according to the grade of the building. The hierarchy of the roofs of ancient buildings was strict: The hip roof has the highest level, and is used above the large hall; The level of the gable and hip roof is lower than that of hip roof; the overhanging gable roof has the lowest grade, it is used in the lowest grade of buildings and dwellings [12]. According to the volume of the "24 stones in Haiqingfang", it is speculated that the small-sized post station building is most likely to use the overhanging gable roof.

On the whole, the architectural image should be simple and concise, fully integrated into the rustic environment of the countryside, and be able to meet the construction of simple, convenient materials, strong durability and so on.

4) Possibly strict proportional control

The facade design of the post station follows the ancient architecture design standard system, and most likely applies the strict proportional modulus to control the overall image generation. The height of the column should be 1/3 of the width of the facade [13]. For

example, the "24 stones in Haiqingfang", the width of each row of foundation stones is about 10.2-10.4 meters, therefore, the width of the building facade is about 9-9.5 meters, according to the scale conversion, the building facade column should be about 3 meters high.

The size of the post is also strictly proportional to the height of the post, which is usually 1/10th of the height of the post, so the post should be 30 cm in diameter. For the building roof, in strict accordance with the ancient "Sung term" system, the height of the building is about 1/4-1/3 of the distance between the front and back eaves [13]. Based on the width of the building's side facade, the height of the roof is estimated to be about 2.5 meters. The proportion system runs through the facade image of the building (Fig. 8 Facade image of the "24 stones in Haiqingfang" restored), from which can also be seen, the ancient Balhae craftsmen design and construction of the strict attitude.

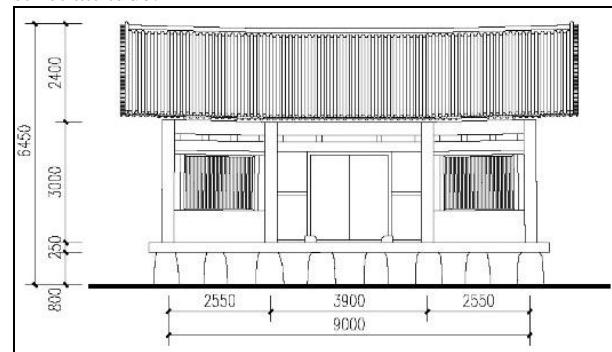


Figure 8. Facade image of the "24 stones in Haiqingfang" restored. (Self-drawn by the author)

IV. SUGGESTIONS ON THE PROTECTION AND UTILIZATION OF THE POST STATION ARCHITECTURE IN THE PERIOD OF BALHAE

A. Overall Protection of Historical Features

As an important part of the history of Northeast China, the protection of the relevant architectural sites in Balhae period should be paid more attention to. The "24 stones" site is an important heritage site and an important part of Balhae's architectural and cultural system [14]. Therefore, when it comes to the protection and repair of architectural heritage, we should take the overall protection measures of the building and surrounding environment.

As for the architectural sites themselves, the boundaries of the sites should be precisely demarcated to prevent man-made damage, and the remaining foundation stones on the ground should be detected and properly repaired with modern technology. As for the environment of the ruins, it should be brought into the scope of protection. The environment is the key to create the spirit of the site, which can set off the main body of the building. If the surrounding environment is destroyed, the building can not achieve the best protection effect. Therefore, in view of the protection of the small-scale post station buildings in Bohai Sea period, it is necessary to carry out protection and repair in the light of the current environmental situation, to maintain the

authenticity of the countryside environment, and to put an end to the large-scale construction of modern buildings around the ruins.

B. Focus on Cultural Heritage

Architecture is the carrier of cultural expression. The post-station architecture of Balhae bears the national culture of the northeast area in Balhae period, and expresses the development history of the post-road in China [15]. The post station architecture is an important part of the national architecture system. It can combine the palace architecture and temple architecture of Balhae Period to form the regional architecture culture group, and effectively protect and utilize the architectural heritage. Through the study and excavation of the image characteristics of the small-scale courier station in Balhae period, this paper provides the foundation for the integral research of the regional architectural image. The unified research and analysis of the buildings in the same historical period can expand the depth and breadth of the research of regional architectural culture and promote the expression and inheritance of architectural culture.

C. Long-term Promotion of the Economy

The combination of architecture heritage and tourism can not only transmit regional culture, but also increase local economic benefits as a way to stimulate the economy. With the development of cultural route tourism, it is necessary to expand regional tourism and promote regional economic development [16].

Using the existing sites of post station architecture in Balhae, combining the ancient post road, connecting the ancient cities, ancient buildings and ancient settlements, the tourism circle of Balhae's cultural relics and historic sites will be shaped. Combined with the ancient post road and post station architecture, the tourist route has the characteristics of cultural integration, spatial concatenation and historical continuity. The introduction of the concept of cultural route tourism can bring the development of regional cities and buildings into full vitality, it can promote the activation and utilization of ancient buildings and stimulate the vitality of regional economic development.

V. CONCLUSION

The cultural heritage of the state of Balhae is not known to many people, but in fact, the culture of the state of Balhae is an extremely important part of the history of regional studies in Northeast China. It inherited the culture of Koguryo upwards and opened the culture of Liao and Jin downwards, the state has existed for over 200 years. At that time, the domestic economy is developed, the construction scale is grand, has established the extremely close contact with the periphery each country, the post road embarks the horse to exchange frequently, opens the sea transportation, to Japan and so on countries. Compared with the splendid civilization, today, the level of protection of Balhae's cultural relics and heritage is relatively low, and the degree of attention paid by various places is not enough.

At the moment, more attention is being paid to the construction of regional heritage groups, the revitalization of cultural relics and heritage values, and the dredging of regional historical and cultural information, more importantly, we should follow the policy step, deeply excavate the cultural value of the post-way station system in Balhae, study it from the perspective of coordination, renewal and renovation, and enhance the cultural heritage value of the post-way station system and the post-way station architecture in Northeast Asia, to inject new vitality into the development of regional cultural heritage.

AUTHOR CONTRIBUTIONS

1. Lead author: Yueliang Xia

- (1) Topic selection and conception of this paper
- (2) Collect relevant research materials and data
- (3) Analyze and draw the building elevation
- (4) Write the paper
- (5) Revise the paper according to the feedback

2. Corresponding author: Jianfei Dong

- (1) Paper check
- (2) Assist in the process of writing a paper
- (3) Provide reasonable advice for the completion of the paper
- (4) In charge of the outlay

CONFLICT OF INTEREST

The authors declare that there are no conflict of interests, we do not have any possible conflicts of interest.

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