

# Drawing Technology and Method of Digital Restoration of Ancient Chinese Costume Structure

—Take Tibetan Silk Robe in the Qing Dynasty as an Example

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## Abstract

For a long time, most of the research on ancient Chinese traditional costume in the academic circle has remained at the "metaphysical" level, and the historical research based on the "structural mechanism" of costume is very limited. However, the costume structure likes the architectural structure, contains the creation ideas and functional considerations of the ancients, and the digital restoration of the structure is an indispensable part of the in-depth study, protection and inheritance of ancient Chinese traditional costume culture. This paper takes the Tibetan silk robe in the Qing Dynasty as an example, elaborating the structure restoration drawing technology step by step. In order to provide technical solutions for the comprehensive protection and inheritance of the Chinese traditional costume culture from the perspective of costume science.

**Keywords:** ancient Chinese traditional costume, costume structure, digital restoration, drawing technology

## 1. Introduction

The structure of ancient Chinese traditional clothing often implies the function consideration of the wearer, reflects the ingenuity of the tailor, highlights the values of the national group on the use of materials, and flaunts the owner's identification of the national identity. These valuable information is not recorded in historical documents, but retained in the specimen by oral instruction, which is a speechless statement of history. Research by Yuting (2019) supports that the ancients have long had the scientific spirit of seeking knowledge from things. To discuss history with things and to prove literature with cases is only to return to and practice the scientific methods of the ancients. Therefore, the restoration and research of ancient Chinese traditional costume from the perspective of structure will help to deeply and objectively grasp the art and culture carried by costume, and obtain its own political and national historical information. It is an objective and reliable important breakthrough in the study of Chinese costume culture. It has important document value for improving the structure pedigree of Chinese costume, which is urgent and indispensable.

However, at present, the research on costume structure is mostly superficial, and there are still some problems in the existing research, such as non-standard drawing of structure restoration map, inaccurate proportion and inaccurate dimension marking. The reason is that, on the one hand, the number of ancient textiles is rare, and most of them are collected in professional institutions, so the opportunity to get close contact is very limited and rare. On the other hand, the professional knowledge and drawing skills of costume structure involved are rarely explored by non-costume professionals. Therefore, this paper takes a Tibetan silk robe in the Qing Dynasty as the research case, combines the costume structure drawing principles to sort out the specimen structure drawing method step by step. It can provide technical reference for the drawing and research of ancient Chinese costume structure restoration process. Then contribute ideas and methods to the protection and inheritance of Chinese costume culture.

## 2. Step 1: Measuring On-the-spot to Obtain the Information of Size

The first step in drawing the structure restoration picture is to accurately obtain the specimen size information and complete the close measuring task. Ancient textiles are precious and fragile. In the process of surveying and measuring, it is necessary to take protection as the premise, bind hair, wear masks and cotton white gloves, and plan the surveying and mapping sequence in advance. For example, measure the front and back first, and then

measure the inside. The movement is gentle and slow, and try to reduce the number of turns, which increases the difficulty of specimen mapping. Due to the principle of protection, individual data are difficult to obtain, such as seam allowance, inner stitching, process details and other sizes which hidden in the specimen. Due to manual measurement, there is inevitably error, so it is necessary to control the error between 0.2 and 0.5 cm by professional technical means, which will not affect the structural restoration of the specimen and the accuracy of the data.

The selected specimen is the yellow brocade double-breasted robe with the pattern of Phoenix and Lotus in the Qing Dynasty, it is the authentic Tibetan silk robe of the Qing Dynasty. Tibetan silk robe in the Qing Dynasty refer to the general name of robes which made from silk woven, the silk were from the Central Plains and inputted into Tibet (Figure 1). According to the actual situation of the specimen, the measuring steps shall be formulated. First, the specimen shall be imaged with high-definition photographic equipment, including the front, back, interior and details. Then lay the specimen on a clean white cloth, measure the size data and draw the line draft in real time. Before collecting data, first determine whether the specimen has shoulder seams. If there is no shoulder seam, it means that the front and back sides are cut from one piece of fabric. When drawing the structural manuscript, the front and back sides should be connected together to draw a "cross plane structure". When collecting data, first collect the size of main parts, such as through-sleeve length, garment length, cuff width, waist width, collar width and other main data. Besides, also mark the yarn direction (warp direction) of each piece of the main structure. The definition of dimensions for main parts of specimen are in Table 1. The schematic diagram of the main parts is in Figure 2.

Then, measure the size of details of the specimen. Because ancient clothing is handmade and the left and right sides are not completely symmetrical, it needs to be surveyed one by one. Sometimes, the shape of individual details is irregular and the position is difficult to determine. At this time, it is necessary to measure the data information of its "horizontal and vertical coordinates" for assistance. For example, to determine the size and position of the red belt on the sample placket, we need to measure the data information of the red belt sewn on the body to the shoulder line and the placket edge. In the measurement process, we should not forget any details, such as the length of the loop, the splicing position of the fabric, etc. The measurement results should be aimed at restoring the specimen structure completely according to the measured data, which is also a valuable first-hand data for ancient costume.

Table 1. Definition of Dimensions for Main Parts of Specimen

Size Name	Definition
Through-sleeve length	Fasten the sample or button, lay the front and back of the sample flat, and measure from one cuff to the other
Robe length	Measure vertically from the highest point of the front shoulder to the bottom edge, or from the center of the middle seam of the back neck to the bottom edge
Cuff width	Measure the vertical distance between the cuff edges by laying the sample sleeve flat
Waist width	The straight-line distance obtained by making a perpendicular line from the left and right armpit inflection points connecting the sleeve and the body to the shoulder line
Collar width	The straight width of the two cloth edges perpendicular to the collar
Collar height	The vertical distance from the upper neckline to the lower neckline
Side slit length	Opening length of left and right bottom hem

*Note.* Information in the table refers to *Technical Manual for the Protection of Textile Cultural Relics in Museums* which prepared by the department of Museum and Social Cultural Relics of the State Administration of Cultural Relics (2009).



Figure 1. The front and back of the yellow brocade double-breasted robe with the pattern of Phoenix and Lotus in the Qing Dynasty

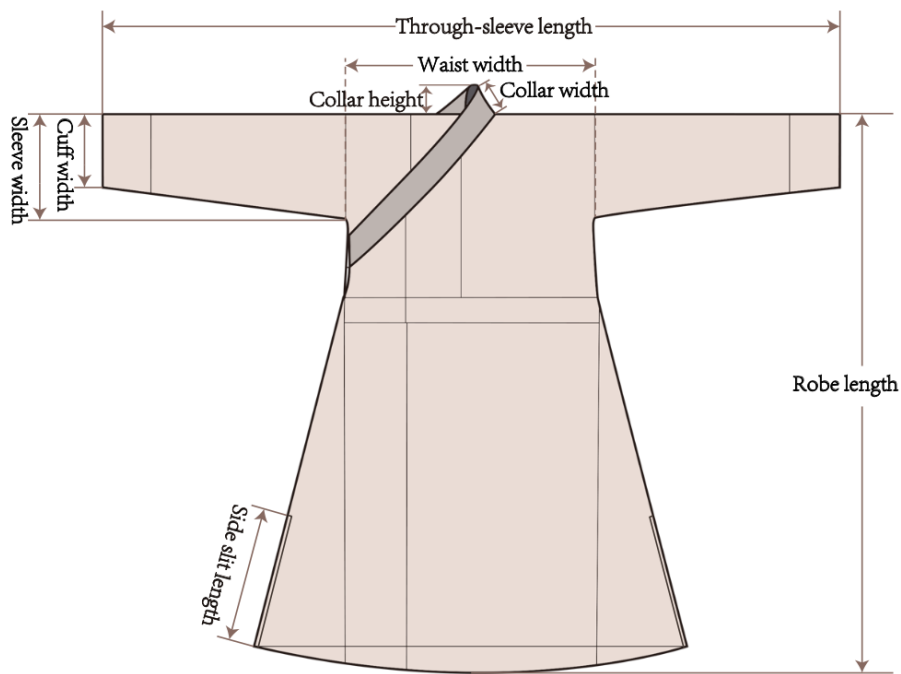


Figure 2. The schematic diagram of the main parts about ancient Chinese traditional costume

### 3. Step 2: Structure Restoration after CAD Drawing

After completing the preliminary data collection, the manuscript should be sorted out by digital means using CAD software. The reason for choosing CAD software is that it is a professional clothing plate-making software, which has many advantages in drawing the costume structure. It can accurately input the size, draw the length of the line segment accurate to two decimal places by 1:1, and the curvature of the pen-end line is also very suitable for drawing costume, which can minimize the drawing error, ensure the correct proportion, and restore the original appearance of ancient costume.

In the process of drawing, it is mainly divided into surface structure and interior structure, indicating the name of

the structure of each part, marking the direction of the silk path, and if necessary, using text for annotation to avoid forgetting or confusion later. It should be noted here that the auxiliary lines drawn during the drawing process should be retained in the form of dotted lines, which can play a key role in the future refinement of specimen details. In addition to the main structure, the collar, bottom, trim and other structures need to be drawn separately if necessary, and the drawing process should be as complete and careful as possible (Figure 3).

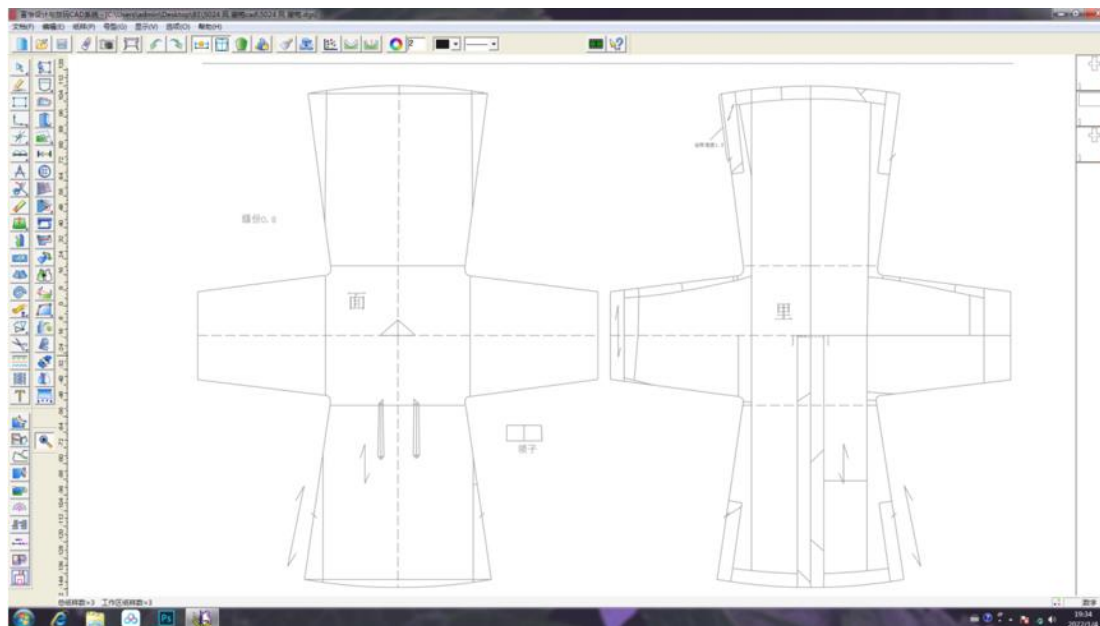


Figure 3. CAD Sketch Drawing of Specimen Structure

#### 4. Step 3: Marking Part Names and Sizes

After drawing the CAD picture, considering the completeness, systematicness and aesthetics of the structure restoration drawing, it is necessary to import the structure picture into Adobe Illustrator software for further refinement. Because the CAD software is an industrial drawing software, it cannot directly export the PDF format for the time being, there are two main ways to put the drawings in the CAD into Adobe Illustrator: First, you can install the PDF Factory plug-in in the CAD, and set the paper size, so as to accommodate the widest part in the horizontal direction and the longest part in the vertical direction of the costume. When exporting, select PDF Factory, and then debug the size and location to export PDF files. The disadvantage of this method is that sometimes the plug-in installed will be unstable, resulting in the lines of the exported image being damaged and not smooth. The advantage is faster and more convenient. The second method is to take a screenshot of the structure diagram in CAD, directly import the screenshot into Adobe Illustrator, set the image transparency to about 60% and lock the layer. Then put the new layer on it and redraw the structure diagram on the new layer. The advantage of this method is that the lines are clearer and more beautiful, but the disadvantage is that the workload is greater.

After the drawing of the basic structure, the data restoration picture (inside and outside) of the specimen structure and the separate specimen structure (Figure 4, Figure 5) need to be made respectively. The data picture shall proofread the size of each part in the CAD one by one, and mark the data in the AI picture. The data marking shall cover the full details, with the goal of one hundred percent restoring the specimen structure in equal proportion through the structural data picture. The lines used for marking data shall not cross each other. According to the structure division line, separated every part from each other to make a plate diagram exclude the seam, so as to clearly see the cutting, splicing and structural layout of the specimen.

It can be clearly seen from Figure 5 that the inner structure of this Tibetan silk robe in the Qing Dynasty is finely divided, while the outside structure is more complete. Through the comparison of a large number of relevant data and the field research, it is known that this cutting and layout method is not an exception. It is closely related to the wisdom of Tibetan creation and the traditional virtue of saving things and using them. It can be seen that the in-depth study of the structure is an important prerequisite for continuing to explore the deep cultural

implications reflected behind the structure. So far, through this set of drawing technology, we have completed the structure digital restoration of this Tibetan silk robe in the Qing Dynasty and the exploration of its structural implications.

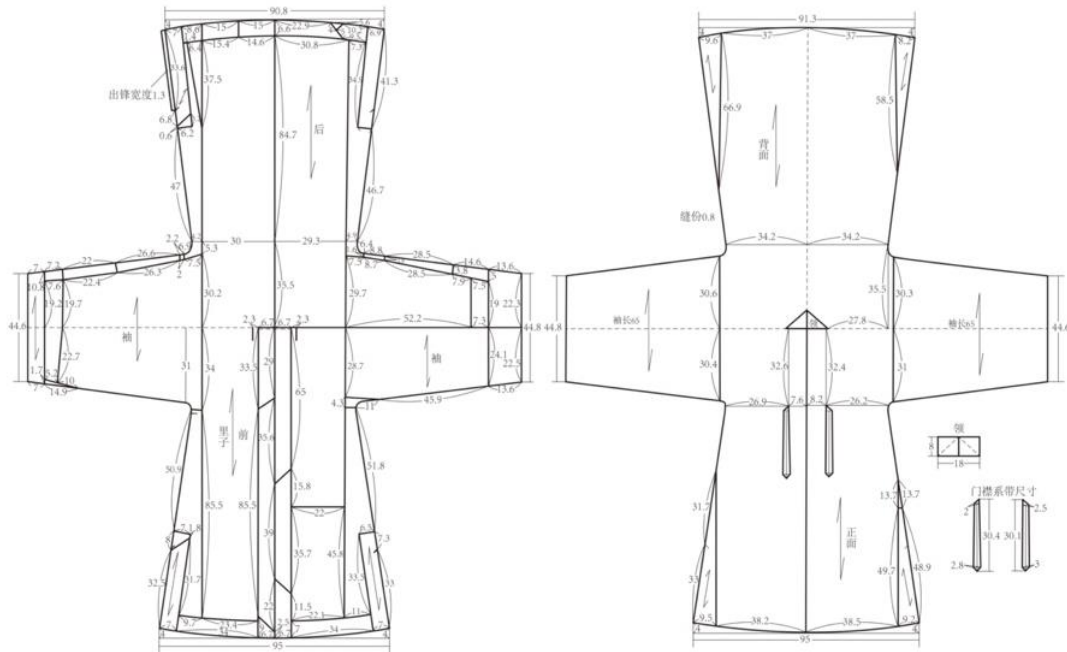


Figure 4. Inside (Left) and Outside (Right) of Specimen Structure Data Restoration Picture

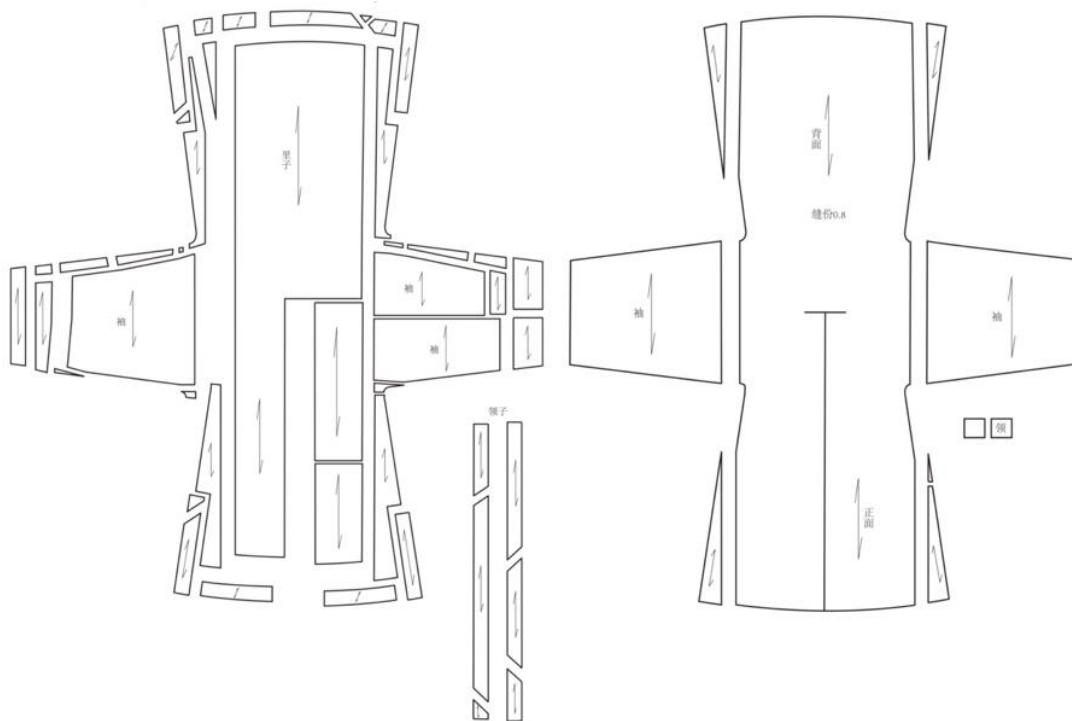


Figure 5. Inside (Left) and Outside (Right) of Separate Specimen Structure

### 5. Conclusion

Using this set of scientific and professional ancient costume drawing technology, the goal of information

collection and restoration of ancient costume specimens can be realized systematically and completely. According to the actual situation of the specimen, the first step is to formulate the measurement steps, which are subdivided into four stages: the first stage is to collect the image of the specimen. The second stage is to collect dimension data and draw the structure line draft in real time. In the third stage, the image and data information will be digitized in time, and the specimen structure data map will be drawn to obtain the full size data information. In the fourth stage, the results of basic research are compared and analyzed with written documents, image documents and field survey materials, and then corresponding conclusions are drawn. The case study itself has the documentary value of supplement to the presentation of the "map system" of Tibetan silk gowns in the Qing Dynasty. It is not only the first-hand material evidence in the research process of Tibetan silk robes in the Qing Dynasty, but also provides important structural forms and reliable data support for the mutual verification and comprehensive analysis of documents, specimens and image data. This set of drawing techniques and research methods is not only applicable to the cases in the text, but also applicable to the ancient Chinese traditional costume of different shapes and sizes, with high universality and practicality.

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