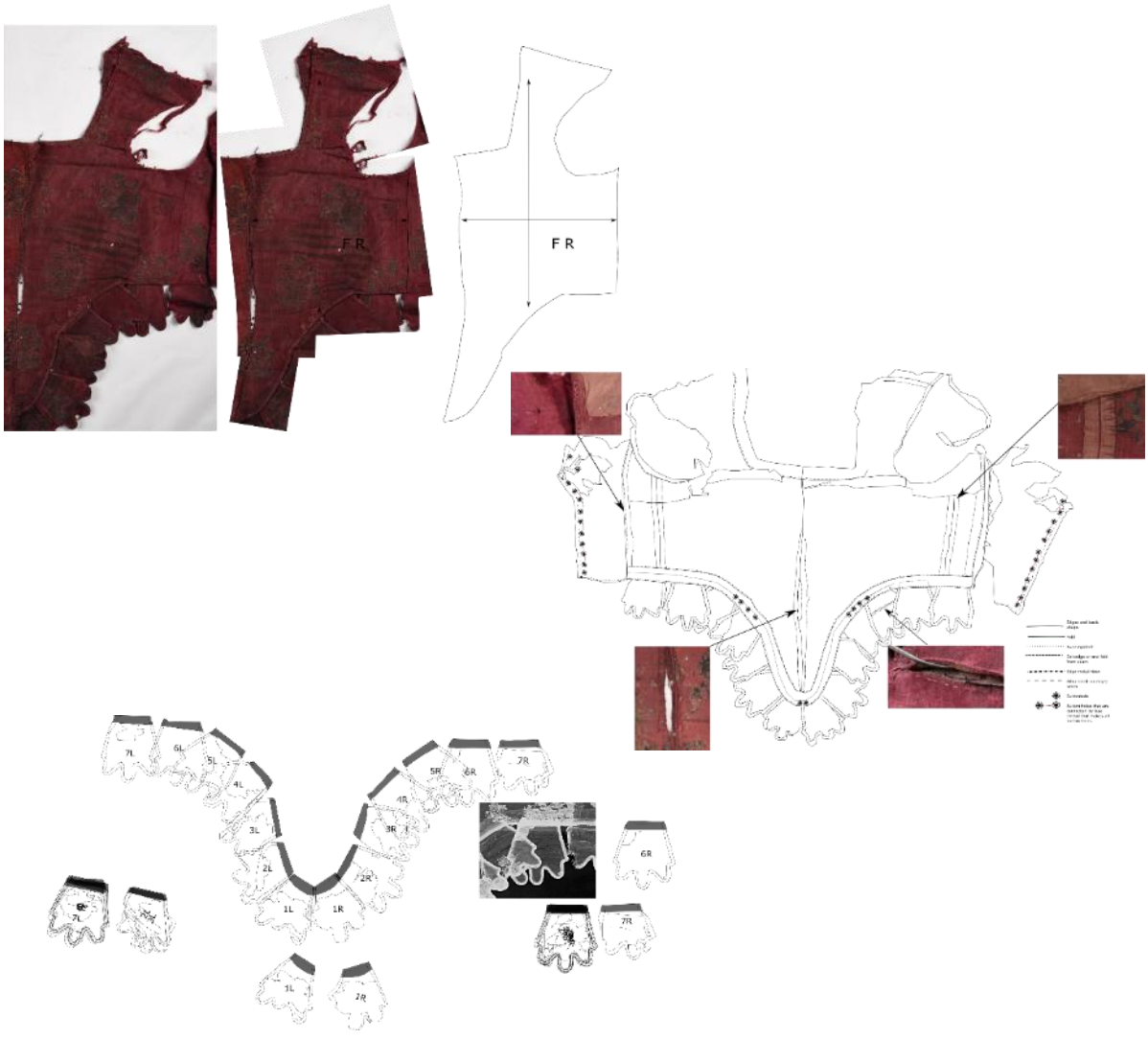
Master Conservation and Restoration of Textiles - ***Master thesis***

Improving understanding

How a replica (approach) can improve understanding of flat-lying costumes



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Drawings and images are available full page in the appendix in addition to the in-text examples.

Glossary abbreviations

RMA – Rijksmuseum Amsterdam

UvA – University of Amsterdam

RCE – Rijksdienst voor het Cultureel Erfgoed

RKD- Netherlands Institute for Art History

Contents

Foreword

This exploration into the field of replica making and 17th century dress was inspired by a simple question: 'What am I actually looking at?' From this question an investigation grew, exploring how a replica approach could help answer this question.

This research would not have been possible without the 2014 discovery of the textiles of the Palmhoutwrak BZN 17, augmenting our collection, and thus our understanding of 17th century garments. It is a wonderful, unique opportunity for a masters student to carry out research on such a special collection. Throughout the process I have had a lot of support from a variety of people. Firstly, I would like to thank René Lugtigheid (UvA), my patient supervisor who always saw where I was going and encouraged me to write about the journey clearly so that this study would achieve a higher academic standard. Similarly, Maarten van Bommel, Professor of the Conservation and Restauration department of the UvA and coordinator of the Texel research project, who stimulated the progress of the research throughout. Special thanks also go out to Ana Serrano who has helped me often to look at the object and discussed ideas and challenges with me. Jenny Tiramani of the school of historical dress, Johannes Pietsch of the Bayerisches Nationalmuseum, Suzan Meyer of the Rijksmuseum Amsterdam (RMA), Floor van de Plas, Paul Sohi, Rob Erdmann (RMA), Emmy de Groot (UvA) and René Peschar (UvA) all helped with questions, advice and information and help to make this research what it is today. I also want to thank my fellow textile students Hanneke Kramer, Paulien Coopmans en Lieke Boerstra, and Marijke de Bruyne and Sjoukje Telleman who also did research on this collection. I thank Annelies van Hoesel (RMA) for taking the x-ray images and Rik Klein Gotink (RMA) for picking up the phone when I panicked in the photo-studio. I want to thank all staff of the Conservation and Restoration department of the University of Amsterdam, especially Professor Ella Hendriks and the staff of the RCE who listened to presentations and commented on the research. Just as well I would like to thank Lilla Dittrich and Mark Lovell for checking the spelling and language used in this thesis. Finally, and most importantly I thank the custodians of the object, the province of north Holland and museum Kaap Skil for being able to exercise this research.

This thesis perhaps has given more questions than answers, but the thorough research of similar objects, paintings with related silhouettes, photographs, drawings and X-

Radiographs gives a good basis for the further investigation into the Texel bodice. It will help understand the object in the future and hopefully inspire the examination of other objects via this method. I am proud of what this project has brought so far and I hope to continue with it in the future.

Summary (English)

Improving understanding - How a replica (approach) can improve understanding of flat- lying costumes by Annelena de Groot, explores the use of a 'replica' approach to help conservators diagnose the damages occurring in a certain object. This was inspired by the Texel textile collection as found in shipwreck BZN 17 in general and the Texel bodice in particular. This recent find (2014) poses a lot of questions and the overall research is in the exploratory stage.

The bodice is one of the most complete garments found, yet several damages are seen that might be caused by the maritime context, while other damages may be caused by internal stress due to the construction. Mounting the object on a mannequin is out of the question, although it would give more insight into what the object would have looked like when complete and worn, and could greatly improve insight into the damages currently seen. A replica of the object as a substitute could help understand the object and its damages. Since creating a complete replica is beyond the scope of this research a replica approach was defined and followed for this particular object. A replica approach is based on the following steps or categories: *research*, *measurements, experiments*, *choice* and *evaluation.* These steps are approached from two tracks: the study into secondary sources such as relevant literature, comparable objects, contemporary paintings, and examination of the primary source, namely the object itself. The knowledge gained through these two tracks is compared and the conclusions are based on a synthesis of the two. To be the least invasive to the object, the main experiment of the thesis lies in the use of photography and x-radiography to capture the object and take measurements based on these documents rather than the object itself. These images were traced, compared, and manipulated to determine the straight of grain of the fabric that helps determine the original pattern of the bodice, thus allowing it to be replicated.

The following results were obtained. The bodice is the only known surviving bodice of this style. Analysis of the style dates the bodice to between 1619 and 1631. This kind of bodice was always worn as part of a *vlieger* costume worn with a millstone ruff and various other accessories - the back of the bodice was never seen. The metal thread ribbons are a common feature in other bodices on paintings. The bodice was enforced and traces of this are seen on the back of the bodice. The seam break in the mid-section is related to the flat

storage of an object that was never intended to be flat-lying. The missing of the shoulder parts might be due to the fact that these parts were reinforced with a different material.

The method developed and carried out in this research can also be applied to other objects.

Summary (Dutch)

Improving understanding, door Annelena de Groot. Hoe een replica (aanpak) kan helpen bij het begrijpen van vlakliggende kostuums. Onderzocht is hoe het gebruik van een 'replica aanpak' voor objecten die niet uitvoerig gehanteerd kunnen worden de conserveringsaanpak en het begrip van schades kan verbeteren. Dit onderzoek is geinspireerd door de Texel textielcollectie gevonden in het 'palmhoutwrak' BZN 17 en met name het Texelslijfje. Vanwege de recente datum van deze vondst is het onderzoek in het algemeen in het verkennende stadium. Deze collectie en dit object komen uit een maritiem-archeologische context die door hun datering en compleetheid uniek zijn.

Het lijfje is één van de meest complete kledingstukken en tegelijk is duidelijk dat het object er 400 jaar geleden heel anders uitzag. Vanwege de conditie van het object is het ondenkbaar het op te stellen op een mannequin, toch zou juist dát helpen het object en de schades die nu zichtbaar zijn beter te begrijpen. Omdat het creëren van een complete replica buiten de kaders van dit onderzoek valt, is er een 'replica aanpak' ontwikkeld en getest met het Texelslijfje. Deze replica aanpak is gebaseerd op de volgende stappen: *onderzoek, metingen, experiment, keuzes* en *evaluatie*. Deze stappen zijn vanaf twee sporen gevolgd en onderzocht en op basis van beide sporen zijn de conclusies getrokken. Enerzijds is er theoretisch onderzoek gedaan naar het lijfje door middel van secundaire bronnen zoals literatuur, vergelijkbare objecten en contemporaine schilderijen. Anderzijds is de primaire bron, het object zelf, onderzocht via digitale beelden en technieken. Om het object zoveel mogelijk te ontlasten zijn fotografische- en röntgenbeelden gemaakt en onderzocht als alternatief voor het hanteren van het object. Metingen en vergelijkingen zijn dus gedaan op basis van digitale beelden van het object. De beelden zijn overgetrokken, vergeleken en digitaal 'recht getrokken' op basis van recht van draad om de vorm van het originele patroon te kunnen determineren. Op basis van de verzamelde data en het verkregen patroon kan een reconstructie het object gemaakt worden.

De volgende bevindingen zijn vastgesteld. Aan de stijl van het lijfje kan het gedateerd worden tussen 1619 en 1631. Het Texelslijfje is het enige bewaarde voorbeeld van deze stijl. Zo'n lijfje of borst werd altijd gedragen als onderdeel van een *vliegerkostuum* en werd gedragen met een molensteenkraag en andere assesoires, de achterkant van het lijfje was nooit zichtbaar. De metaaldraad passementen zijn gebruikelijk en zijn te zien op schilderijen van lijfjes in dezelfde stijl. Het is duidelijk geworden dat het lijfje verstevigd was, waarvan de sporen te zien zijn op de achterkant. De breuk middenvoor lijkt gerelateerd te zijn aan het plat bewaren van het object, wat nooit vlak bedoeld was. De missende schouderdelen waren mogelijk verstevigd met ander materiaal, waardoor ze nu zijn verdwenen. Het gebruik van röntgengrafie en fotografie in het geval van een platliggend kostuumobject met metaaldraad geeft goed resultaat. Het onderzoeken van digitale beelden van het object, om op die manier de patroondelen recht te trekken wanneer dat fysiek geen optie is, is veelbelovend. Deze replica aanpak geeft een verrijkt begrip van een object en de schades. De gepresenteerde methode maakt het mogelijk vlakliggende kostuums te onderzoeken met behulp van gedetailleerde digitale beelden, zonder het object te hoeven hanteren.

Object identification: Texel Bodice

Short Description: Bodice of brocaded silk with square neckline, ending in a point. Neckline, mid center front seam and waistline trimmed with striped metal thread and silk trimming. Waist decorated with fourteen separate flaps, trimmed with the same striped metal-thread and silk trimming. Back panels made out of brocaded silk.

Collection: Provincie Noord-Holland, depot Huis van Hilde Castricum. First brought to and exhibited by Museum Kaap Skil Texel

Inventory number: 061

Context: Textile of shipwreck BZN17 Palmhoutwrak, ca.1640, Found Waddenzee 2014

Size: 62 cm high 83 cm wide.

Cut and parts: *As seen in front*: Two front panels, two side panels, to back panels and fourteen flaps. *As seen in back*: Half lining upper part bodice, damask lining of flaps, facing of waistline.

Material: *Main fabric*: Red plain weave fabric, silk, with brocaded patterns from metal thread with textile core.

*Fabric back panels and lining flaps***:** Red damask fabric , silk.

Trimming: Warp weave timming with alternating metalthread with textile core and silk.

Facing fabrics: Plain weave silk. Pale orange.

Re-enforcement traces on back: unidentified cellulose fiber

Re-enforcement in flaps: Un-identified fiber.

Foreign material: Loose red flowers made out of thread on the left front panel

1. Introduction

This research was carried out as a master thesis project for Conservation and Restoration of Textiles. The master thesis has the following description "The C&R thesis generally consist of independent object-related research, with a focus on the diagnosis of problems regarding conservation and restoration."[1] The research focuses on problem determination and improving knowledge before proceeding to a conservation treatment. This thesis emphasizes more the exploratory and diagnostic phase rather than the treatment phase of conservation, and focuses on a possible solution to diagnose damages in costumes in general rather than on damage in one particular object. In this thesis, a replica approach is developed and tested to find if this can be a good tool to help understand the object in question better. To limit the risk to the object a digital approach was explored, relying on photographs and x-radiographs rather than the actual object.

The object that was selected for the research is a very rare 17th century bodice that originated from a maritime archeological site. The bodice was selected because it is currently flat-lying, with limited creases. This makes it possible to image the bodice flat-lying. Despite lying flat, the bodice does show a lot of pattern pieces, making the pattern extraction more challenging. The bodice shows several damages and deteriorations and, although it is in a reasonably stable condition, handling should be limited. Since it is a quite recent find (2014) the object was described and some material analysis was done, but understanding of the object was still limited. It was expected that creating a replica of the object would improve understanding of the object, particularly because a costume is not fully understood until mounted on a mannequin. The object was selected because it would be a 'grateful' candidate for the research, since it was only superficially researched before, and could only bear minimal handling.

1.1 Relevance for the field of conservation

When creating a replica, a lot of knowledge is needed eg. knowledge of materials, construction techniques, and patterns . Since replica making focuses mainly on the making and meaning of an object it is important to explain why this research was carried out by a

[1] Programme Syllabus for MA Thesis Semesters 1 & 2 Academic Year 2016-2017 . Amsterdam: UvA Conservation and Restauration MA Program, 2016.

textile conservator rather than a technical art historian or historic tailor. Firstly, is important to look at the different roles of the different experts. When a technical art historian looks at an object, examines it and studies the making of a particular object, he or she does so to improve our understanding of art history in general. A historical tailor aims to show the techniques of a costume and replicate it to demonstrate or mimic the fashion of the past. A conservator, however, focuses on the object itself. The main aim of the conservator is to treat this particular object and to do all things that benefit its conservation for the future whether it is for art historical, technical, and educational or entertainment purposes. It was deemed important to research the use of replica making for conservation and the diagnostic phase because often a replica is made by a knowledgeable (historical) tailor rather than a conservator, which in the case of a fragile object is not always desirable. Similarly, the answers and questions that a conservator is interested in, such as how does the construction of the object influence wear and tear, are not the questions any of the other practitioners ask.

Floor van der Plas in her thesis on the use of replicas in textile conservation identifies four different applications for replicas: Research, active and preventive conservation, exhibition and documentation.[2] Research refers to the use in art technological and historical research. The development of an appropriate mannequin based on a replica or completing an object or support based on a replica falls under the category of active and preventive conservation. For exhibitions, various types of replicas are used, for example when an original is not available. Van der Plas also argues that a replica can help to document an object. [3] This conserving nature of replicas is also mentioned in the publication of the Victoria and Albert museum (V&A) about *seventeenth-century women's dress patterns* series. By publishing patterns and extensive documentation these objects do not have to be physically consulted by historians or enthusiasts.[4]

One of the hypotheses that forms the basis of this research is that a replica approach could improve understanding of the object and therefore improve decision-making regarding the object. It is assumed that the information gathering needed to make a relevant replica will improve understanding of the object in general and the damage seen in

[2] Van der Plas Floor. 2010.
[3] Ibid. Pp. 124/125
[4] Tiramani and North 2011. p. 6

particular. Equipping conservators with the skills to make replicas will empower conservators and save objects from handling by non-conservators. Similarly, especially in the case of the fragile Texel bodice it is necessary to know a lot about materials and deterioration to interpret correctly what is seen. One of the first aims of this research was to create a more objective method to evaluate objects and patterns, to elevate the art of replica making to a systematic method rather than a kind of black box process.[5] Creating a method that all textile conservators can use will stimulate the independence of conservators and therefore improve the efficiency of a project and could cut costs.

Due to the limited scope of the master thesis research several decisions were made. Instead of making a full replica and testing how this could help diagnoses of damages and the conservation process, a more limited 'replica approach' was examined. The research focuses on the determination of pattern pieces as basis of the construction of the object, and the experimental research on the use of photography and X-Ray images to digitally deconstruct the object and in being able to reconstruct the object. Rather than exploring the actual process of executing a replica, it regards the data gathering that lies at the basis of replica making. Photography and X-radiography were chosen because they are relatively low-tech, allowing the gathering of the data being done by a conservator with help from a technician. Also, the photography and x-radiography are established techniques, so there are no teething problems to be considered.[6]
Literature was consulted before and during the experiment to inform the approach of the research, the right questions to ask, the value of replicas and experiment in preservation of cultural heritage in general and costumes in particular. The research in no way gives a definite and perfected approach to the use of digital imaging and manipulation techniques to inform replica making and understanding of textiles, but it does show some promising leads and grounds the replica research in the academic field.

1.1.1 Terminology used in thesis

When researching the field of experiments to aid research in archeology, history of science and textile conservation different terms are used. When considering experiment as part of a

[5] The publications about replicas apart from Floor van der Plas's thesis mostly focus on case studies and patterns to make a replica, rather than evaluating the process of replica making.
[6] For more information and research on the subject of imaging for textiles see Coopmans, Unpublished.

research method many terms are used for instance replication, re-enactment and reconstruction.[7] Since the terminology 'replica' is most often used in the field of textile conservation this word was chosen for this particular research. Replica was chosen instead of reconstruction because a reconstruction would suggest going back to the original state, in the case of the replica approach reconstruction is part of the experiment rather than an accurate name for the whole process. Similarly, re-enactment would suggest re-enacting the whole process of the creation of the costume as it was made 17th century, but this research focuses rather on the material evidence we have now and improving understanding what we see today.

When discussing the object, it was chosen to describe the object as having a front and a back. This is mainly due to the fact that the object now lies flat, and a photograph of the 'outside' of the garment is indicated as the front, and the inside of the garment is indicated as the back.

1.2 Main and subquestions

The goal of the thesis is to develop and test a replica approach that is aiming at a better understanding the object with minimal handling of the object, using images as digital information sources to substitute for the object.
The main question addressed in this thesis is:

How can a 'replica approach' to costumes improve the diagnostic process when considering flat-lying costume? How can imaging techniques such as photography and x-radiography substitute for the object when the object considered cannot be extensively handled?

The sub-questions guide the search for the information needed to accurately answer the main question. These questions regard the 'replica approach', the object, and the digital substitution of the object as a source of information.

[7] Title of the 2017 conference : Re-Enactment Replication Reconstruction, Interdisciplinary Workshop on Performative Methodologies, 12 - 16 June 2017, Netherlands

Sub-questions:

1. *What are the right questions and what is needed for a relevant replica approach?*
2. *What does a replica approach tell about the condition of the Texel bodice?*
3. *What are the pros and cons for using digital imaging as a substitute for an object?*

To answer this question a 'replica approach' was formulated and tested on the Texel bodice.

1.3 Structure

In chapter 2 this replica approach is described and the method followed based on this approach is clarified. The replica approach was formulated according to the answers on the following questions: What is important, relevant and vital when approaching replica making from a scientific, academic and conservation point of view? What methods have been employed in the museums, conservation practices and costume history for pattern extraction? What basic ideas and rules do these imply? How can X-Ray and photography and/or photogrammetry help to extract a pattern from an object, and which difficulties are still to be addressed? In this chapter literature on replicas as well as the use of experiments in research is introduced and its relevance for this particular thesis is evaluated.

In chapter 3 this method is formulated. The third chapter focuses on the 'replica approach', the method developed and followed for this research. The *replica approach* consists of the following pillars: *Choices, research, measurements, experiment and evaluation*.

In the fourth chapter, the practical results and products flowing from this project are described; the structure follows the five pillars, choices, research, measurements, experiment, as well as a paragraph on the evaluation of the results gained in the process as a whole. The results of both the technical analysis through x-ray and photography as well as art historical research will be presented.

In the fifth chapter 'discussion', the results will be discussed and connected to each other, to literature and possible further research.

In the sixth chapter, the conclusion, the main learning points from this research will be summarized.

In addition to the main body of the text various additions can be found in the appendices. These can be divided in 3 sections: descriptive content, research and

experimentally produced content, and finally the last appendices give more practical advice such as a checklist and methods derived from the experiments that were carried out in this project based on the literature research findings.

2. Context, Problem, and hypothesis

The thesis addresses various problems which can be divided into several fields. For instance, there are object related problems, technical challenges such as the imaging of textiles with photography and x-radiography, but also the more general problem of costumes and garments and patternmaking. In addition, there is the more philosophical problem of replicas: What is the value of a replica and is there indeed something like a useful or un-useful replica? And how does replica-making fit into the theoretical framework of preservation of cultural heritage?

The following hypotheses are posed. After (digitally) disassembling the costume it can be accurately reassembled later. The pattern pieces defined when taking the bodice apart digitally can serve as a basis for a replica. This replica could then serve as a substitute for the object, and mounting the replica on an appropriate mannequin will greatly improve insight into the original state of the object and similarly the deterioration and damages seen. The second hypothesis is that X-Radiographs of the bodice will make it possible to distinguish and compare different (overlapping) pattern pieces. Complementarily it is expected that due to the close to 1:1 nature of X-Radiographs with digital films, measurement of the object can be taken digitally. Based on a little more research it became clear that there is simulation software that allows to digitally represent garments based on patterns, so the focus should be on pattern extraction rather than the creation of a replica from the pattern afterwards.[8]

In the following paragraphs will discuss, the problems and challenges object itself, the making of garments, the difficulties in the imaging of textiles and understanding of replicas in academic and museum contex. These can be related to the pillars of the replica approach: *Choices, Research, Measurements, Experiment* and *Evaluation.*

[8] Lippstreu, Tina. .2017. Personal communication

2.1 The Texel bodice

The object, although deemed medium stable, still asks for minimum handling. Although the object can be handled to take photographs, because of the extensive damage and distortion and semi-loose parts, it is hard to image the object, and all other options other than having the bodice lie flat are not feasible.' The metal thread present in the bodice is severely corroded making it hard to imagine what the bodice would have looked like when the metal was shiny (see figure 1). A particular challenge is the missing parts in the object, such as the back-shoulder pieces (see figure 2). In addition, the object consists of various layers, some of which overlap with each other. All different pattern pieces and layers show distortion and creases. The fabric used for the garment is a challenge of its own. On the main brocaded fabric, since the ground is a plain weave, the straight of grain is quite readable; unfortunately, in the red damask because of the satin weave present this is nearly impossible.

Figure 1 Texel bodice, front. Photo taken by Annelena de Groot April 19 2017

Figure 2 Texel bodice, Inside or back. Photo taken by Annelena de Groot April 19 2017

2.2 Making garments

The western way of making clothing is called tailoring, and rather than using draping or wrapping techniques or combining several rectangular shapes the patterns are flat cut. This means that they are based on a metric system adapted to the person for which the garment is intended.[9] Traditionally a garment is made from 2D pattern pieces that are subsequently fit onto a 3D model. Today still a lot of designers start from a 2D pattern drawn in a CAD (Computer Aided Drawing) program and these pattern pieces are then 'stitched' together virtually and modeled on a digital 3D model to evaluate the fit.[10] The quality of the pattern is very much based on the skill of the patternmaker, and in that sense today it is not any different from what it was in the 17th century.

When considering costume, one has to consider the art of tailoring. Unlike the art of painting the art of tailoring is more based in commercial craftsmanship and technology than the hand of the artist. There are not many written sources about the tailoring techniques of the 17th century. In this period, the making of clothing and tailoring was regulated via the

[9] Lindqvist and Mottram 2015. *Pp. 56-89*
[10] Au and Ma. 2010 p. 1.

guilds. In the Netherlands, these tailors would work on their own, sometimes with one or two students that were learning the craft of tailoring. As part of finishing their training the student would have to make several pieces of clothing that had original patterns rather than the standard patterns that their master would use.[11] The guilds controlled the work of the cutters and the tailors and this was the case from the 14th to the 19th century.[12] However, the work of stay or corset making was not regulated by the guilds. These workers in the Netherlands were called stik-,keurs- or rijglijfmakers.[13] In his book Art du Taileur Francois Garsault explains the work of these stay makers.[14] Gersault explains that although each garment asks for the unique measurements of the wearer, the tailor has several base patterns available for reference.[15] Although it is written in the second half of the 18th century, because the craft and organization of cutters, tailors and stay makers changed little over time, it is still relevant.[16] The craft of making a good pattern is invaluable, and when a pattern is not good it will always show in the end product. For this reason, the patterns of a specific tailor were highly secret, and that is one of the reasons why very few professional patterns have survived over the ages.[17] There are some early 'pattern books' written by Spanish authors in the 16th and 17th century. However, these do not regard the ways of metrically making patterns, rather they are diagrams of how best to lay out patterns on fabrics to most economically use the fabric.[1819] There is no description of the particular pattern making method and drafting systems or 'recipe' books describing how to make a good garment in the 17th century. Yet the ways of construction- stitches, support layers, linings embroidery stitches have not dramatically changed. The stitches that were used 400 years ago are the same hand stitches one would use today.[20] However, the silhouettes and patterns do change as well as the placements and ways of closure and the needed re-enforcements. In the case of the Texel bodice this means that paintings with similar bodices as well as similar objects with the same cut and material in the 17th century are consulted to better understand the object.

[11] Steur, A. G. van der1983.p. 4
[12] Eeghen, I. H. , 1965. P. 43, 72
[13] Ibid. P. 58
[14] Garsault, François 1769. P. 43-47
[15]Ibid. P.40
[16] Eeghen, 1965. P. 49 zie not 14
[17] Arnold, Janet 1980. P.119
[18]Lugtigheid, Rene. 2015. (website)
[19] Aldrich, Winifred. 2000 p. 165
[20] Tiramani and North, 2011. P. 17 The book lists stitches such as back stitch, running stitch, blanket stitch and whipstitch all of which are still used today.

2.3 Imaging textile

Textiles are some of the materials most difficult to photograph due to various factors such as sheen, flexibility and size.[21] Photography and x-radiography give the best result when an object is lying flat, however, even without distortion there is no such thing as flat textile.[22] Digitation of cultural heritage is an often-discussed topic these days but, unlike the replication of marble statues with plaster casts, textile object replication does not have a long established tradition in the field of the arts, and when done, it is easy an production process. Instead of taking a mold of an object and creating a replica in this way textile objects were literally reproduced or rewoven. One of the main problems that reproduction and reweaving objects have, however, is the change in materials: over time, textile production has changed and products that were already difficult to obtain in the past might not be available today.[23] Whereas sculptures and buildings are solid and can be scanned with 3D scanners, textile and its (digital) replication pose different challenges. The creation of digital replicas is now limited to what can be scanned digitally, and this is not only limited in shape and material but also in size.

X-radiography of textiles is a challenge for two reasons: a textile object is not solid, so it cannot be imaged 'standing up'. A machine has to be used that allows the textile to lie flat. Secondly textiles are often made of organic materials such as protein and cellulose and these materials barely absorb any X-ray photons. A classic example is that skin is not visible on medical X-Radiographs while bones are. To use x-radiography successfully for textile so called 'soft' X-Radiographs or low energy X-Radiographs are needed, below 40 keV.[24]

2.4 General use and understanding of replicas

The following articles mainly focus on the approach to replicas and replication in the case of research, exhibition and history of replication. These articles show the importance of a more detached observation of replicas and make it clear that choices during the creation of a replica and the evaluation of its values are very important.

[21] Klein-Gotink, Rik. 2015. Personal communication
[22] de Groot, Emmy2015-17. Personal communication
[23] Rublack, Ulinka.2016 .P. 23
[24] O'Conner and Brooks, 2007 Pp. 23-56 p. 23

Although focusing on the field of history of science when discussing the use of practical experiments or replication and reenactment, Hjalmar Fors and Lawrence Principe and Otto Sibum give a comprehensive insight into the relevance of replication in any academic field. In their article *'From the Library to the Laboratory and Back Again: Experiment as a Tool for Historians of Science' (2016)* they point out some aspects of replica making relevant to their field that are also applicable to the field of cultural heritage.[25] Indeed, they do not stay in the sphere of case studies and particularities, though these are mentioned, but rather describe the essence of the process that is also useful in the case of costume replication. They point out that it is important to know what the learning objective is when considering the replication of a process. Moreover, when replicating an experiment, it is important to have similar conditions as when it was first carried out. They state that: *The experimental approach is one of many possible historical tools whose purpose is to aid us in our endeavor to understand the past*.[26] According to the authors the result of an experiment, such as a replication of a scientific process or in this case a costume, depends on whether or not the academic knows which questions to ask.[27] When considering an historic process, the academic should have sufficient understanding of the historic context to produce an acceptable experiment.[28] For this thesis the main goal of the research is to understand the influence of the cut and construction on the condition of the object as well as understanding whether or not what we see is 'logical' for the time. The question that the experiment needs to answer is then 'What were the practices and common choices when it came to creating a bodice like the Texel bodice?' 'How was the bodice cut and constructed and how does this relate to the damages and deterioration we see today?'

Constantine Sandis discusses the use and value of replicas in museums from a more philosophical perspective, where he comments on the current obsession, or in his words, "fetish", surrounding 'authentic' objects.[29] In his article *An Honest Display of Fakery: Replicas and the Role of Museums* (2016), Sandis argues with the help of countless thinkers and cases such as forgeries and objects out of context, why original objects and replicas have in fact a similar function. That being said a replica will allow more people to enjoy the object than the

[25] Fors, Hjalmar et al. 2016 p. 85-97
[26] Ibid. p. 89
[27] Ibid. P. 89
[28] Ibid. P. 89
[29] Sandis, Constantine 2016 P.250

original can when it needs to be preserved for future generations.[30] This article is very relevant because it shows both the use and value of replicas for the conservation of objects, as well as the need to rethink the value we put on the original. The Texel bodice as an original object is irreplaceable; however, in the current condition it is quite hard to understand what it looked like, a replica perhaps will better communicate the value of the object. The replica approach and its application to the Texel bodice perhaps will not only improve communication towards the public but other conservators, researchers and custodians as well.

Treating the value of replicas more as a practical problem than a philosophical problem, Sally M. Foster and Neil G. W. Curtis in their 2016 article, discuss the treatment of 19th century replicas.[31] Foster and Curtis have very practical recommendations and their article aims to elevate the 'status' of replicas such as those made in the 19th century of medieval artifacts acknowledging them as authentic objects of their own. Foster and Curtis propose to view and appreciate replicas for their biographies and their socially constructed meaning rather than reviewing them on their accuracy when comparing them with the original object. [32] Foster and Curtis want to stimulate the preservation and the care for replicas because they have such a big cultural implication.[33] Although in their case studies they discuss the 19th century replicas they also point to the use of digital replicas in this day and age, and suggest that these can be understood the same way as the 19th century replicas. [34] When creating a replica of the Texel bodice this will create a new object that will gain meaning of its own. Conscious of the active role of the replica maker as a writer of history, transparency is key to clarify what is similar and different about the replica and the original.

2.5 Costume replicas in museums

In 2010 Floor Van der Plas wrote a thesis examining the use and practices in replica making in the field of costume conservation.[35] In her introduction, Van der Plas explains that

[30] Ibid. P. 254
[31] Foster and Curtis. 2016 pp. 122-48.
[32] Ibid. P. 129
[33] Ibid. P. 142
[34] Ibid. P. 140
[35] Van der Plas, Floor., 2010.

the documentation regarding the use of replicas in textile conservation is very limited and her thesis aims to start a systematic description of the several replica-making practices in the field of textile conservation. [36] Van der Plas states that knowledge of the patterns and cut of historic costume is essential and imperative to the work of a costume conservator because it can explain certain damages seen in an object, damages which are caused by inherent tension in the costume. She explains how the cut and construction of garments is very much influenced by the time and place where it was made.[37] At the same time patterns can be used to create the basis of a conservation treatment. Van der Plas describes that there are two ways to take a pattern from an original object. The first method uses a grid of silk threads that is stretched over the object and the size of the object, and the pattern pieces are defined through this. According to Van der Plas this method is especially useful for objects that can only sustain minimal handling.[38] The second method she describes is also based on a grid. A thin pliable sheet of melinex is marked with a grid of - for instance- 5x5 centimeter. [39] The sheet of melinex is placed upon the object and all edges and darts are identified and copied on the sheet of melinex. This method can be used for objects that are put on a mannequin. For the Texel bodice, a method that uses direct contact is not advisable; however, the idea of a grid following the straight of grain of the textile to reconstruct the pattern shape will be experimented with.

The school of historical dress teaches through four 'C's to explain the different influences on an historical garment: Cut, Construction, Content and Context. The cut refers to the shape of the pattern pieces, the construction to the sewing techniques, content means the material presents such as fabrics, re-enforcements and boning, context relates to the historical era, how the garments are depicted on paintings or who has worn it originally.[40] The four c's show the complexity of looking at a historical garment three out of four concern an aspect of the actual object: the cut, construction and material. In the case of the Texel bodice the object is the main source of information and indeed cut, construction and material will be elaborately discussed. However, the main goal of the replica approach is not to replicate the object per se but to understand better what we are looking at, both in

[36] Van der Plas, Floor 2010. P. 1-3
[37] Ibid. p. 39
[38] Ibid 2010. P.40
[39] Melinex® Is a brand name for polyester films (PET), in the conservation and restauration practice of the Netherlands and Belgium when using this kind of film it is shortly referred to as melinex, which can be different weights and sizes of polyester film of the DuPont Teijin Films enterprise.
[40] School of historical dress. 2017. Personal communicaton

terms of interpretation of the object as well as understanding of the damage seen in the object. The replica approach to objects as tested on the Texel bodice is more elaborate than the 4 ‘C’’s of the school of historical dress.

3. Method

To be able to address the problems and hypotheses satisfactorily the research was twofold. It was both a literature research into the use of replicas in cultural heritage preservation and costume preservation in particular, and a practical experiment. The literature research was focused on both the more philosophical understanding of replicas and experiments in cultural heritage understanding and preservation as well as the more practical do's and don'ts of costume replica making. The practical experiments were based on the information and approaches found in the relevant literature. Since literature on this particular subject is limited different experts in the field were contacted and the problem at hand discussed.

3.1 Methods, ways of thinking and data required for a replica.

When looking at an object understanding the cultural context can improve understanding greatly. When looking at a historical costume from a certain time this information is imperative to interpret what we see now. Objects do not stand on their own, they are created in certain context and tradition. When looking at costume this is the time in which the costume is made and the fashionable silhouette it belongs to, but as well it is the technique of the production of costume, tailoring. When considering costume, one has to consider the art of tailoring. The problems and solutions of the past are often also the problems and solutions of today.

3.2 Principles of making a costume replica

Following several authors and personal communication four pillars of making a 'relevant' replica can be formulated. A good replica is always based on *choices, research*, *measurements* and *experiments*. To make the replica approach relevant for diagnoses in conservation a fifth pillar is added: evaluation. In this subsection, these five pillars of research will be discussed, however, they must not be seen as chronological steps in the process, rather they are principles and ways of thinking that are applied concurrently while developing a replica.

3.2.1 Choices

In her research for the master thesis on the use of replicas in the field of textile conservation Floor van de Plas sent out several surveys to professionals in the field asking

about their thoughts and experiences with replicas. [41]One of the views that was widely held was that there was no such thing as an exact replica. The reasons given for why the creation of an exact replica is not possible are mostly related to available material and production methods. The fabrics that were used for the original are not in production anymore and although the reweaving of fabrics is in some cases an option these will often look 'too new'. Similarly, people commented on the missing historical context —the replica is not the same simply because it does not have the same origin. [42] It was noted that making a historic replica for a model to size will distort the size and shape that was different when the style was originally worn.[43] When discussing replica making with practitioners and experts in the field of replicas from the school of historical dress it becomes clear that making a replica is a series of choices. These choices are influenced by the goal of the making of the replica.[44] Is it to simply illustrate the construction of the object? Is it made to show what the object was like when new? Is it necessary to use the exact same materials or does a modern cotton suffice to indicate the construction? In the case of using a replica approach to better understand an object in the field of conservation, questions such as how do the construction and the current condition relate to each other should be answered.

From the beginning of taking a pattern a choice needs to be made. A pattern can be taken from either the inside or the outside of the objects and both have different properties and challenges. Similarly, there is a difference between an archeological approach of pattern making, and the reconstruction of the 'ideal' pattern. The archeological approach considers all damages present and can be seen in Hanna Zimmerman's analysis of archeological textiles.[45] When working with archeological finds, two definitions are used: Replicas refer to exact copies of objects as they are, whereas reconstructions are representations of what the object was before it was damaged. Since most archeological finds are far from complete, replicas are not made but rather reconstructions.[46] The process of replica making asks for a lot of decisions and all these decisions are choices that will influence the outcome of the project.

[41] Van der Plas Floor, 2010 pp.161-82
[42] ibid. Pp.187-188
[43] Ibid. P. 184
[44] Zimmerman, J. A. 2007. P. 90
[45] Ibid. p. 205
[46] S. Y. Comis., 2001. 149-165. Print.

3.2.2 Research

It might seem obvious, but one of the most important things when considering making a replica, is understanding what one is looking at. As previously mentioned, although the principle of clothing might not change, several pieces of fabric sewn together to create a garment, the styles and patterns greatly differ. One of the main distinctions that can be made is that between western and non-western clothing. Non- western fashion such as kimono's, kaftans and saris take the rectangular cloth as a starting point and building block and wrapping and draping as base.[47] The western way of pattern cutting follows the shape of the body, cutting the fabric into a certain shape rather than using the full width of the textile.

The first step is examining the object, for instance identification of materials, layer build-up and construction. A second step is connecting the object to literature and previous research. Even when there are no sources discussing the particular kind of object, knowledge about production pattern books of the time can help to interpret the object. Important as well is looking at other objects or representations of the object at hand. This is both looking at similar objects as well as representations of the object in secondary sources such as old photos or paintings. This will help date the object as well as interpret the object as seen today.

3.2.3 Measurements

Among others, size and shape determine the properties of an object. In this step, the different pattern pieces are determined and their dimensions. When looking at a woven textile one of the starting points is looking at the grain of the fabric, the direction of the weave and how it relates to the object. Textile reacts differently when held straight and when held on the bias; when determining the straight of grain and how it relates to the object measurements can be taken. The grain of the fabric is an inherent grid that can be measured and understood. Measurement can happen directly – (and manually) for instance measuring the object with a measuring tape or indirect and mechanically. Photography and x-radiography measure the reflection of light and absorption of X-Rays in the object. Direct measurements can be taken from photographs and X-Radiographs. *"Photogrammetry is the science and technology of obtaining information about the physical environment from*

[47] Lindqvist and Mottram. 2015. *Pp. 56-89*

images, with a focus on applications in surveying, mapping and high-precision metrology. The aim of photogrammetry is to provide automated or semi-automated procedures for these engineering tasks, with an emphasis on a specified accuracy, reliability and completeness of the extracted information."[48]

Photogrammetry has been practiced since the invention of photography to use images to measure geographic distances. The use of photogrammetry for purposes other than geographic mapping, were called "close-range photogrammetry". Currently photogrammetry is also used in the field of cultural heritage.[49]

When looking at textile objects, it is important to realize that measurements were always playing a big role and often were determined by the size and width of the cloth. Similarly measuring tapes and sticks have been used for a long time to determine the size and shape of the object.[50]

3.2.4 Experiments

Patterns are always tested. Only when making the object from a (test) fabric does it becomes clear which faults are still present. [51] The development of patterns and replicas are always a process of trial and error. In the field of archeology, the use of replicas or reconstructions falls under the field of experimental archeology.[52] Testing and reconstructing a certain technique forces to look in detail and helps to understand production methods: Similar problems ask for similar solutions that would not be understood or found when not experimented with.[53]

In this thesis, most of the experiments are done or prepared digitally. When considering using images rather than the physical object to obtain patterns and other information, the ground rules of textile and computers need to be understood. Pixel based programs such as Photoshop and The GIMP (open-source/free version of Photoshop) and Vector/drawing programs such as Illustrator and Inkscape (open-source version of illustrator) can be used to work with these images. The main difference between pixel based

[48] "Photogrammetry." 2014 Online reference.
[49] Ibid.
[50] When discussing the art of replica making Jenny Tiramani several times commented on the following: the cm and the imperial inch that we use now are not the same kind of system that was used in the 17th century, research into the use of other measurements systems might improve the understanding of the object. However, this currently falls outside the scope of this research
[51] J. A. Zimmerman,: .2007 p. 90
[52] Van der Plas,Floor, 2010. P. 118
[53] Zimmerman, 2007 p.90

and vector based programs is that the pixel based programs allow manipulations of the pixels that are found in these digital images. The vector-based programs on the other hand are more concerned with shapes; they enable us to draw lines which then can be infinitely enlarged without getting blurry. Both programs have specific possibilities and limitations that can be worked around by combining the two. For the understanding and drawing of objects and pattern pieces Illustrator or Inkscape is best.

3.2.5 Evaluation

This pillar challenges the research, experiments, choices and measurements made: Are these all achieving the goal of the replica approach? What do the results of this methods tell us about the object when they are brought together? What choices could or should be made differently in the future? What data is missing, and how could the process be improved?

3.3 Working method

Following the general principles of replica making, the project consisted of choices, research, measurements, experiments, and evaluation. To understand what was seen research into similar objects, representations of similar objects and the visual examination of the object was carried out. X-Ray images and high-quality photographs were made of the object. What follows is the research into the usefulness of X-Ray and photographic images for extracting pattern pieces. To determine these pattern pieces, they were traced and compared. Similarly, the images were manipulated in such a way to create a straight of grain pattern piece. The extracted pattern pieces where traced and compared and reconstructed where necessary. The created pattern pieces were tested by sewing the pattern pieces transferred to un-bleached cotton sewn together with a sewing machine. These dummies where then manipulated to better understand the movement and tension in the object.

4. Results

In this chapter, the results that were gained by this research are reported. These are the results that directly regard the object and its interpretation, following the replica approach. Firstly some of the choices made are explained, secondly the 'research' is considered, in this includes the research into the primary source, the object, for example its tailoring techniques are considered. In addition relevant research into secondary sources such as literature, similar objects and paintings. Thirdly the measurments taken during this process are presented, and fifthly the experiments carried out. The chapter is concluded with an evaluation of the process.

4.1 Choices

Due to the limited scope of this research both in time and resources several choices had to be made. Although sources from other nations were briefly consulted, the literature and art-historical research was focused on sources from the Netherlands. Since there were many relevant paintings found, and literature indeed discussed the style of the bodice, this was seen as sufficient for this attempt to understand the bodice better. Similarly, all the drawings and models and tracings were made by the author, this gives in a way a realistic image of what can be gathered by one person by limited means. However, this also means that drawings, tracings and reconstructions are shaped by the hand of the author, and should be seen as illustration of the methods rather than definite data. Specific choices had to be made by the author to allow the data to be handled. For instance, based on knowledge about garment making and comparing the different parts of the object an 'average' shape was reconstructed, for example with the brocaded pattern or with the bodice textile flaps. To have as reliable and readable data as possible, tracings were made from the photographs taken in Inkscape, a vector based illustration program. Sometimes limitations were there because of the original source of the data.

For instance, although very relevant, the Soutman painting with the Beresteyn family was only available in low resolution. Inquiries into gaining higher resolution image were made, however due to the fact this would cost more than 50 euros it was not obtained. Similarly, some figures of paintings bear watermarks from the RKD, the institution that provides these images online. (figures 16 and 17)

4.2 Research

In this paragraph the findings about the object, its construction, context and original appearance are collected. Subsequently, the object, literature, paintings and similar objects are discussed. Although these are considered in separate paragraphs since each source has its flaws, these sources are related to each-other and critically assessed. This in itself is standard academic practice but is even more needed because the Texel textile collection provides new data on textile and costume in the 17th century. For instance, costume conservator (RMA) Der Kinderen-Besier, who wrote her history of the seventeenth century before 1950, was limited to the research of inventories, paintings as accurate representations of costumes, a few (male) 17th costumes that are in the RMA collection and information given by other writers on the subject at the time.[54] Similarly, in her 1989 article on seventeenth century costume in Frans Hals paintings, costume conservator of the RMA Bianca Du Mortier does not consider real objects but rather paintings and contemporary sources on textile and fashion from inventories to poems. Similarly, Johannes Pietsch when discussing the Darmstadt bodices indicates that not in any collection there are similar bodices of this type, however since the find of the Texel bodice this is no longer the case.[55] Connecting literature, similar objects and paintings will help understand the Texel bodice and comparing the object to the information found in these secondary sources will help test their accuracy. The rare 16th century Spanish pattern books such as Geometria y trazas of Anduxar and Geometria and Traça of Diego Freyle and Juan Alega's tailor's patternbook, were consulted, however they do not yield enough relevant information to discuss them as literature. Still, some images of patterns of bodices are included when discussing similar objects.

4.2.1The Object- Material and construction

A lot can be understood from an object by looking at it, through visual inspection. In this paragraph, the information about construction is shared.[56] Drawings of the front (figure 3) and the back (figure 4) of the bodice help indicate and identify the different materials present in the bodice, and how they are seen on the front and the back of the bodice when viewed with visual light. Twenty pattern pieces were identified. To help identify the same

[54] Der Kinderen-Besier, J. H.,. 1950. P. 8-11.
[55] Pietsch, Johannes. 2007. P. 147
[56] This is a more elaborate examination of the object, for a basic description of the object see object identification and description on page 10-14.

pattern pieces on front and back they are named as seen from the front. The front panels are called F L (Front Left) and F R (Front Right), the side panels S L (Side Left) and S R (Side Right) and the back pieces B L(Back Left) and B R (Back Right). Since there are many flaps (14 in total) and they are closely related to each other it was decided to not identify them with a name but rather with a number, ranging from 1 to 7 left to right seen from the mid-section. This results in names such as 1 L (1 Left) and 4 R (4 Right). (figure 3&4)

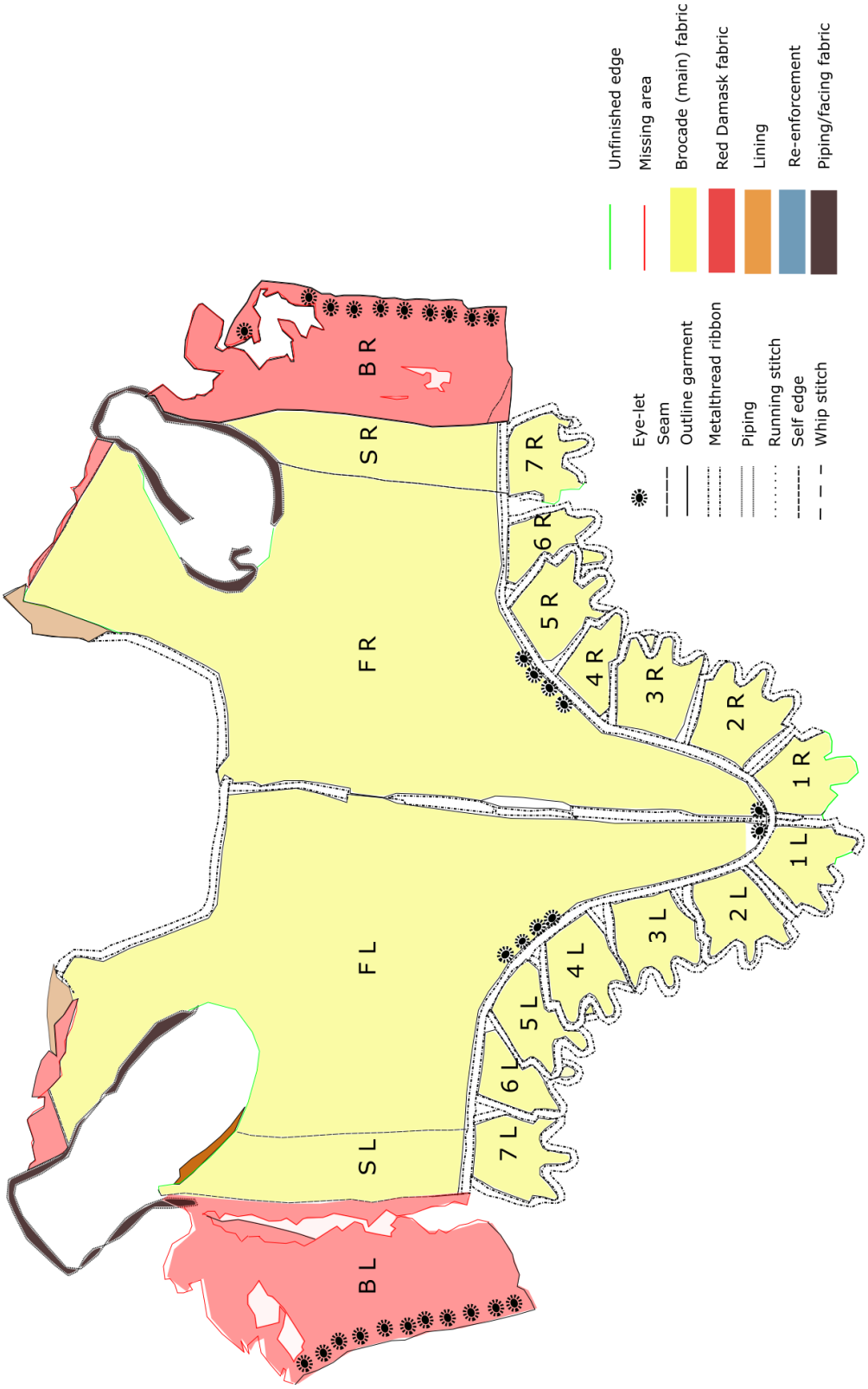

Figure 3 Drawing of front of bodice, based on tracing of photograph

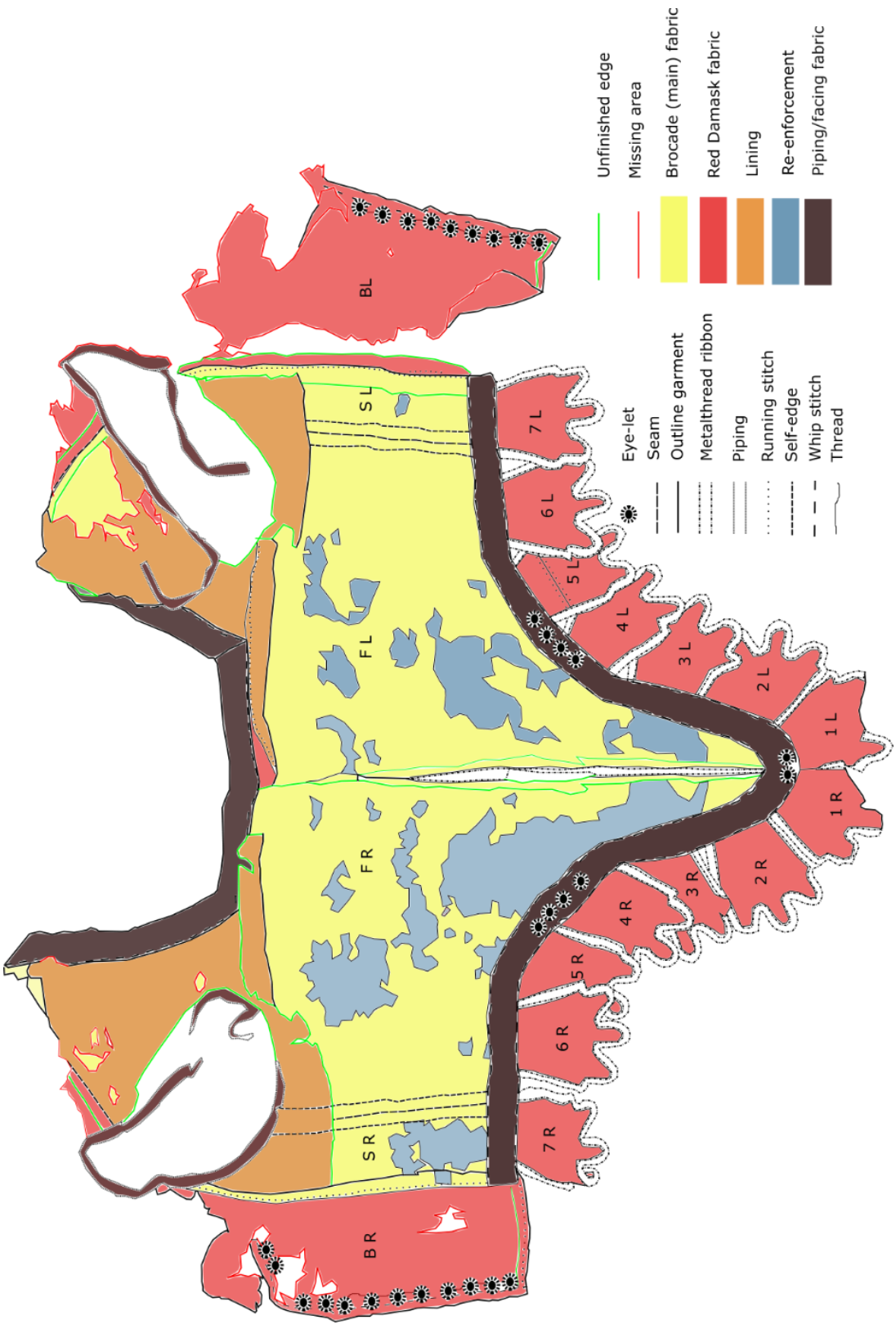

Figure 4 Drawing back of bodice, based on photograph. (see appendix II for full page edition)

4.2.1.1 Material in Texel bodice

The Texel bodice consists of a lot of different materials, some of which were identified by using SEM-EDX. A sample was taken from both the warp and weft of the brocade weave and this was identified as silk. In addition, a sample of the re-enforcement fabric from the seam was taken. This seemed to have two kinds of material, partly silk and partly an unidentified vegetable fiber.[57] Several different materials and fabrics can be identified. The main fabric is a brocaded fabric with a floral pattern. Both the front and side panels are made from this material and the flaps as well. The textile has two different floral patterns. The big pattern is ca. 6,8 cm wide and 7,5 cm long. The small pattern is ca. 3 cm wide and 3,7 cm long (see appendix figure III.4-6). The two patterns are used alternating from left to right and the row below features the same figures but mirrored (see figure 5). The tailor has smartly used this alternating pattern and has created a mirror effect. (see figure 5)

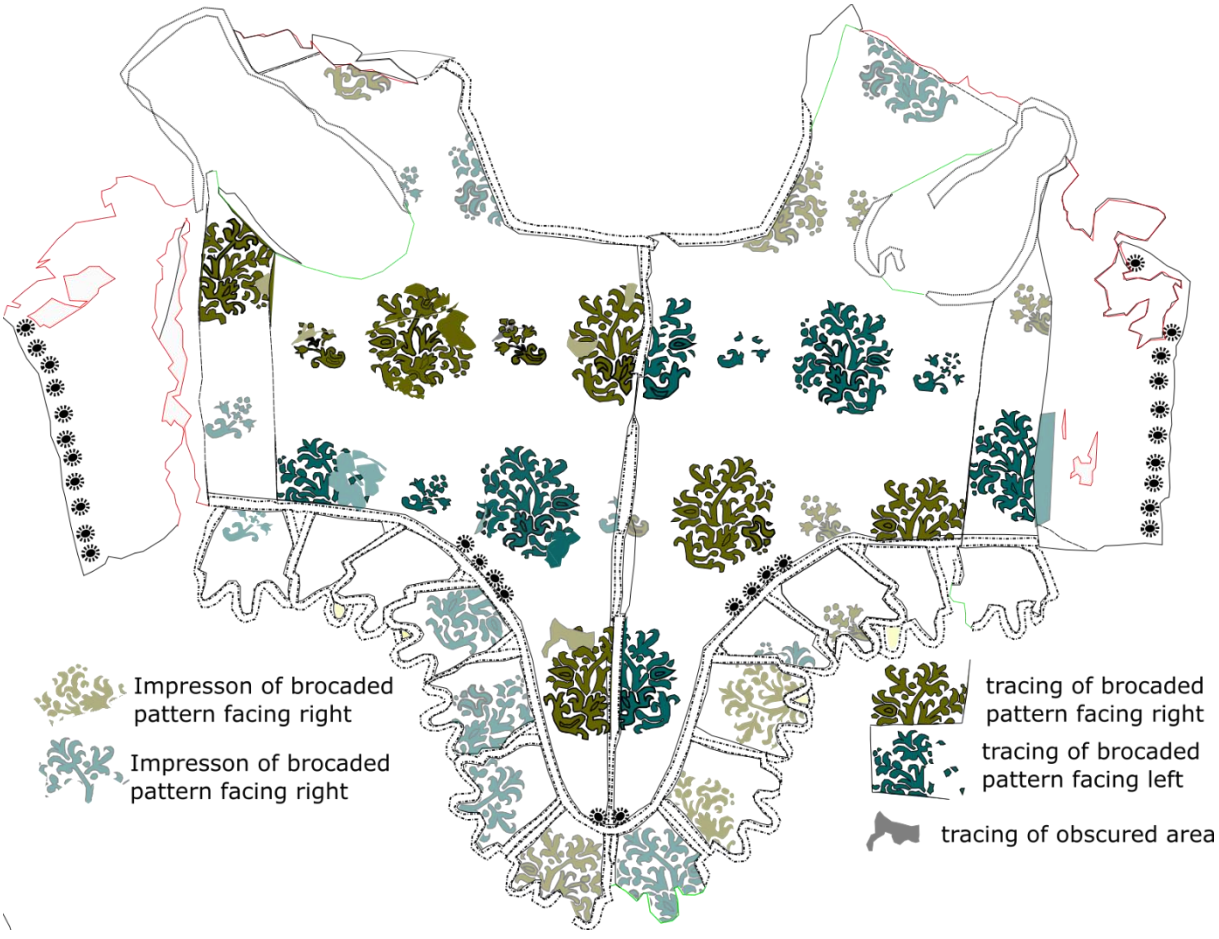

Figure 5 Drawing of left and right facing brocaded pattern.

[57] Telleman, Sjoukje, and Marijke de Bruyne., 2017.

When comparing the different brocaded figures it becomes clear that although they have the same iconography the shape and size may vary. Layering the different tracings of the different brocaded patterns showed that although similar in design each weaving has its own proportions. This shows the handicraft of the weaver. Since the selvedge of the fabric is seen it is possible to reconstruct the edges of the fabric, however not the width. In appendix III (figure III.6) a reconstruction based on an 'average' shape of the small and big pattern and their position towards each other is shown.

The different flaps or leaves were not cut on purpose to create a mirror effect. Instead, some flaps have the big pattern on them, others the small pattern or just a fragment of a pattern. In figure 5 there is an overview of the different flaps, also indicating where the brocaded pattern is. Intuitively and in most of the flaps the straight of grain is along the middle axes of the flaps (see figure 6). Interestingly enough even the straight of grain is not maintained in the same way in the different flaps (See figure 7). Perhaps the tailor started out cutting the flaps straight of grain, but then to save fabric cut one of the flaps on another grain. Because the flaps are lined and re-enforced the direction of the grain of the fabric does not have as much influence as it would have if it was unlined.

Figure 6 7L showing straight of grain alongside middle axis

Figure 7 3 L with straight of grain in different orientation

The bodice is trimmed with a braid or ribbon which is partly red silk (most likely) and metal thread. On the edges of the garment the ribbon is folded around the seams, making it around 4 mm wide (see figure 8). The braid is also used to connect the two front panels

together where it shows to be around 8,5 mm wide(see figure 9).[58] Although the metal thread is continuous because of the weave it looks like it has stripes along the width of the

Figure 8 Metal-thread ribbon detail flap 1L

Figure 9 Metal thread ribbon joining FL and L

ribbon. This is because the ribbon is woven in a warp-faced weave, consisting of two types of warp, the first silk covered with metal thread, the second red silk. Because the warp is alternating metal and silk thread, with each weft the color of the braid changes (See figure 8).

4.2.1.2 Construction order of Texel bodice

The back of the bodice shows a lot of information regarding the construction of the bodice. Here some construction traces such as selvedges, facings and unfinished edges are seen. In general, the bodice is neatly sewn together and finished with either a metal ribbon or facing. Similarly, selvedge is used for the side seams giving a straight seam. The middle section however looks quite messy: the brocade fabric is cut quite roughly. This is clearly visible in figure 4 as the green line along the mid front seam. At the neck, the construction due to distortion and ease for the bust also looks quite messy.

4.2.1.3 Stitches in the Texel bodice

The stitches used in the bodice that are most visible are the whipstitches as identified on the back of the bodice. The front and side panels and flaps of the bodice show no visible stitching; it is unclear how the metal ribbon is stitched to the bodice. The back

[58] These measurements were done through digitally with Inkscape. The image used was the X-radiograph that best shows the metal thread Figure IV.3 'Metal X-ray'

panels however show a running stitch on the bottom seam. This running stitch is also seen in the flap 5 L. The eye-lets are finished with whip stitches. On the back of the panel it is clear that this was done quit economically. Instead of using a new thread for every eye-let (something that would mean a lot of loose threads) several eyelets are sewn with the same thread (see figure 3). Two of these eyelets are situated at the bottom of the front panels, while eight more are placed on either side of the front panels, above the fourth and fifth flap. Ca. 2 cm apart, one eyelet is on the most left side in the case of flap 5L and on the far-right side and the right side of 5R, one eyelet is in between flap 5 and 4, and two are above the most left and right side for 4L and 4R.

4.2.2 Secondary literature regarding similar bodices

Secondary literature on the subject of 17th century dress, and especially on type of garment similar to the Texel bodice is quite limited.[59] In her important history on the matter "Spelevaart der mode: de kledij onzer voorouders in de 17e eeuw" J.H. der Kinderen-Besier discusses the different silhouettes in the 17th century.[60] The Texel bodice is most related to so-called silhouette b, for which Der Kinderen-Besier gives the time span of 1600-1625 (See figure 10).[61] Nevertheless she also comments that this silhouette only loses its structure in 1650.[62] The particular silhouette that best relates to the bodice is the '*Vlieger kostuum'*. This is a Dutch ensemble that consisted of a skirt, a bodice, and a '*vlieger*' a loose hanging overdress.(see figure 11) [63] Der Kinderen-Besier establishes this costume as one of the base types of the seventeenth century.

[59] Waugh, Norah,. The 1968. In her history of the 17th century Nora Waugh does not give a similar silhouette.
[60] Der Kinderen-Besier,, 1950. P.14
[61] Ibid. P.15
[62] Ibid. P. 14
[63] Ibid. P. 14

Figure 10 Der Kinderen-Besier index of fashion changes in the 17th century. 'Silhouet b' highlighted

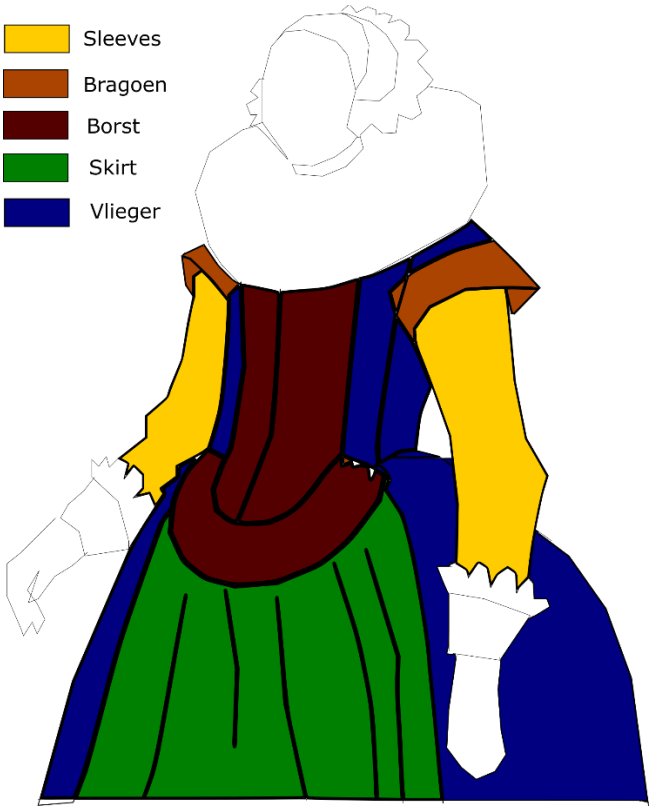

Figure 11 Drawing of woman wearing a Vlieger Costume. Drawing based on Portrait of a woman. Wibrand de Geest. 1630

Der Kinderen-Besier considers the silhouette of the *vlieger* costume as mimicking a pregnancy and suggests that the skirt and bodice protrude with the help of a belly-cushion.[64] This silhouette started around 1615 although according to Der Kinderen-Besier it could have been worn earlier but there is no evidence of this.[65] Der Kinderen-Besier explains the nomenclature of the bodice or rather stomacher, although the Dutch word *lijf* (bodice) is sometimes used, more common is the word *borst* (stomacher) since the back of the garment would not be visible when worn.[66]

Bianca du Mortier also discusses this type of dress in her contribution to the 1989 Frans Hals catalogue on costume in the paintings of Frans Hals.[67] In this she discusses the *vlieger* dress that is worn in many paintings by Frans Hals. Du Mortier makes several claims about this kind of dress and to be true to her wording and since there is so limited text written on this subject several claims will be transcribed here to test them later on. First some general remarks on the paintings of Aletta Hanemans and Catherina van der Eem that show bodices very similar to the Texel bodice:

> *"They (Aletta Hanemans and Catherina van der Eem) may be wearing their bridal borst or stomacher both of which are heavily embroidered with intricate floral patterns. From around 1615 onwards, the silk or satin of the stomacher was embroidered with multicolored silk, gold, silver and pearls. This kind of stomacher was known as a 'Borst' and may have originated in the southern Netherlands. In contemporary sources, it is frequently mentioned in relation to courtship and marriage when it would probably have been specially decorated to suit the occasion."*[68]

Although not embroidered, the Texel bodice does also show floral patterns from metal thread. Based on this citation and that of Der Kinderen-Besier it becomes clear that the correct term for the Texel bodice is perhaps not bodice but stomacher. Even though it is not the same as the 18th century stomachers, that are a piece of decorated fabric pinned on the front of the bodice of a dress, it does better describe the object.[69]

[64] Der Kinderen-Besier, 1950. P. 14, 53
[65] Ibid.. P. 53
[66] ibid. P. 54
[67] du Mortier, Bianca. 1989.
[68] Ibid. . P.47
[69] Newman, and Shariff, 2009. P. 182-183

Du Mortier does also give some indication to how the bodice is worn as part of the *vlieger kostuum:*

> *"No ensemble was complete without a ruff, cuffs and a little cap."*[70]

Du Mortier gives an example of an inventory of Feyntje van Steenkiste, also painted by Frans Hals. In 1640 the inventory states that Feyntje owned three *vliegers* and six bodices and another six skirts.[71] Although always worn together the skirt, bodice and *vlieger* were exchanged.[72] Similarly, sleeves were added to the bodice and could be of the same or different fabric. The joint between the bodice and the sleeve would be covered by a padded coil or 'bragoen', that would both cover and accentuate the joint between the bodice and the sleeve.[73] (see figure 11) Du Mortier also gives some indication how the bodice and *vlieger* were attached to each other and how a bodice like this was constructed:

> *"It (the vlieger red.) was always worn open with the two front panels attached to the bodice by metal pins."*[74]

> *"The garment (borst red.) has obviously been boned at the bottom to make it protrude."*[75]

Du Mortier does not give sources for either of these indications, and these claims can only be verified when looking at similar objects and paintings that indicate construction and attachment. The following section will concern objects similar to the Texel bodice.

[70] du Mortier, Bianca. 1989. P.46
[71] Ibid.. P.49
[72] Ibid. P. 49
[73] Ibid. P.45
[74] Ibid.. P.45 . du Mortier does not give any source for this claim.
[75] Ibid. . P.48

4.2.3 Similar objects in other collections

Most similar to the object are the Darmstadt bodices number 7 and 8 as discussed in Johannes Pietsch dissertation on the tailoring techniques of the 17th century.[76] The construction and model are very similar, both have a square neck line and 6 main pattern pieces: two front parts, two side parts and two back parts.[77] The Darmstadt bodices also show eye-lets on the waist of the bodices. Like the Texel bodice the Darmstadt bodices armholes are finished with piping.[78] However, unlike the Texel Bodice, the Darmstadt bodices do not have flaps that are separated, rather the bottom looks like a peplum attached to the bodice. The two bodices that are most similar, both have boning present, unlike the Texel bodice. The Darmstadt bodices also have re-enforcing fabric on the front panels and the back shoulders. The re-enforcing fabrics are basted to each other and to the upper layer.[79] Unfortunately, these shoulder parts have not been preserved in the Texel bodice so it is unclear if these were present. When comparing the patterns of the bodices it becomes clear that the Texel bodice is shaped more 'dramatically', the front is longer and pointier (see figure 12).[80]

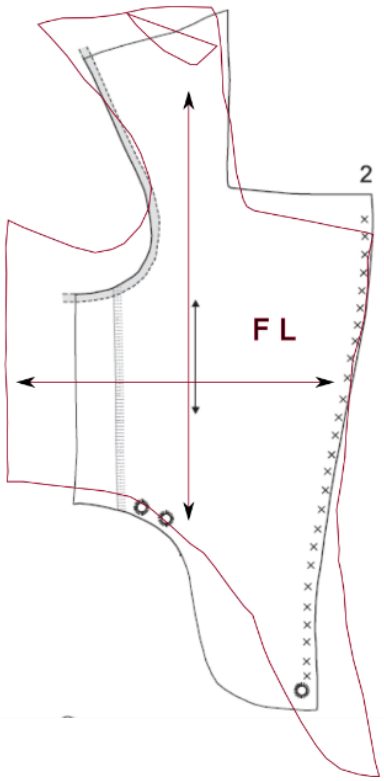

Figure 12 Left comparison Texel bodice (red) and Darmstadt bodice nr.7 (black) Drawing by Johannes Pietsch

When comparing the shape of the Texel bodice with the Spanish pattern books it becomes clear that the shape of a bodice that is pointing forwards is very common. Although the patterns show much larger designs that are for full dresses, the shape of the bodice can be recognized (see figure 13). [81]

[76] Johannes Pietsch, 2007,
[77] Ibid. pp 146-160 Bodices catalogue number. 7, 8 and 9
[78] Ibid. P. 146
[79] Ibid. 151
[80] Image Darmstadt bodice nr. 7 Pietsch, Johannes., 2007 München.p. 150
[81] Anduxar, Martin de,. 1640. P. 42. Image source: Google. 2013

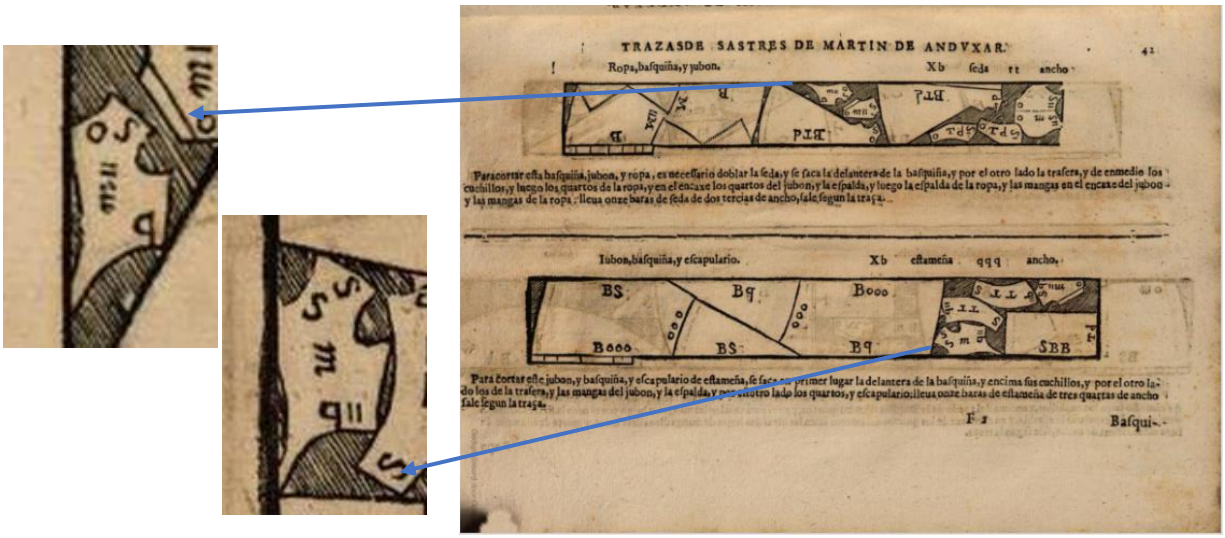

Figure 13 Patterns of Bodices- taken from page 42 of Geometrica, Martin de Anduxar.1640

Although not directly similar objects, garments found in the V&A's patterns of fashion do show the pattern shape of the time. The front of the women's garments does not show any darts to allow space for the female figure. However, this lack of shaping is especially in the case of Margaret Layton's waistcoat compensated for in the side seam.[82] Also the joint between the front panels and the back panels is not on the side of the body as it is made today; rather the front panel is quite a bit wider than the back panel and covers 2/3 of the armhole. The back panel actually shows no particular room for the armhole; however, the shoulders are slanted, in the same angle as the front shoulder. [83]

4.2.4 Survey of Paintings depicting similar bodices

To understand the bodice better in its historic context, paintings were examined to see how the style of the bodice fits in the Dutch seventeenth century fashion. A survey of thirty-four paintings with similar bodices was carried out. These paintings were examined for clues and similarities. Although it is not possible to elaborately discuss every painting found, a few are highlighted because they give important information. The list of paintings is included in appendix VI as reference.[84] Most paintings were found via the database of the RKD, the Netherlands institute for Art History. Contemporary paintings painted in the Netherlands with similar bodices, were selected according to the following criteria:

a. No buttons in front but rather a mid-center seam decorated with a ribbon.

[82] Tiramani and North 2011. P. 28
[83] Ibid. P. 22-69, four waistcoats between 1615 and 1630s all show these characteristics.
[84] See appendix VI Paintings with similar bodices.

b. Floral or leave motive in the flaps.

c. Metal embroidery or brocaded pattern or damask weave in textile.

Paintings were accepted as 'similar' if they scored on at least 2 of the 3 criteria. Although the Texel bodice is not embroidered this does give a good indication of similar objects. The survey was carried out to gain clues of how common this kind of construction of a bodice was.

4.2.4.1 Dating

Through comparing similar bodices, it is possible to roughly date the Texel Bodice. When comparing the dates on the paintings with similar bodices the bulk is dated between 1618 and 1631. Twenty-two of the 34 paintings are dated in this period. This number does not include the broader dated paintings such as '1600-24', which are excluded even though they follow the trend, and were probably painted in the same period. The earliest dated painting is dated at 1613 and the latest at 1650. Although the 1613 painting of Maria van Beeveren by Jan van Ravensteijn is dated as a pendant, the painting of Johanna Martens by Jonson van Keulen is dated 'circa' 1650 and based on this comparative research can probably be dated earlier.[85] More interesting is the painting of Maria Graswinckel which is dated 1637, although the bodice is of a style very similar to the earlier paintings it features a high waist band with rosette. This higher waistband was more fashionable between 1620 and 1640 (see figure 10 type e), making Maria's dress more conform the fashion of its time.[86]

4.2.4.2 The *vlieger* ensemble paired with similar bodices

All the paintings show that these bodices were worn with an over gown, a so-called *vlieger*, a lace ruff of the millstone variation and lace cap and a lace cuffs. Many also show gold chains going from the waist to the bottom of the stomacher.(see figure 15) The *vlieger* in front has 'folds' left and right, sometimes decorated and always ca. 5 cm wide. This *vlieger* is attached at the waist obscuring the side and the back of the stomacher. The flaps or leaves are sometimes over and sometimes under the *vlieger (*See figure 16 and 17).[87]

[85] See appendix VI nr 15 and 16.
[86] Der Kinderen-Besier, J. H.,. 1950. P. 15
[87] See Appendix VII similar paintings

Perhaps the most similar bodice is found in the painting of Pieter Claesz. Soutman of Paulus van Beresteyn and His Wife Catarina Both van der Eem with Their Children and Servants (see figure 14). The painting is currently in the Musée du Louvre and was painted around 1630-31. The bodice that Catarina Both van der Eem wears is similar in design and decoration. Similar to the Texel Bodice it has flowery shaped flaps as part of the 'skirt' of the bodice, and metal thread ribbons on the edges of the flaps, the bodice and the center seam. Here, it is also clear how the bodice would be worn as part of an outfit: the bodice would be very stiff and worn over a skirt, and with an overdress or gown that was attached to the bodice where we find the eyelets. In addition to the gown there a ruff is worn, a so-called 'molensteenkraag'. We here also see that the eyelets in the front are laced with ribbon. It is not clear what the function of this is: the red ribbon is also seen on the top of the bodice (figure 14 and 15). Perhaps this is used to lace the bodice into a layer worn under the bodice.[88] In the Texel bodice, there are no eyelets in the top of the bodice. Unique is the show of the neckline of the bodice, in the other paintings this neckline is not visible but obscured by the broad ruff. (See appendix VI for other paintings consulted)

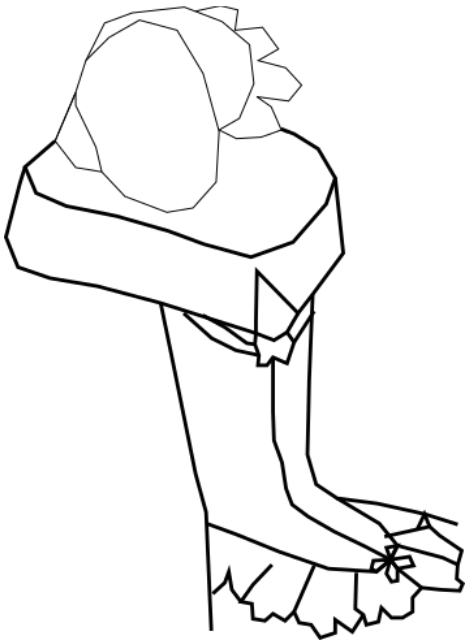

Figure 14 fragment Paulus van Bersteyn and his wife Catherinabothvan der Eeem with their children and servants. Pieter Claesz.Soutman 1630-1 Musee de Louvre. 167 cm high x 241 cm width, and Figure 15 trace drawing of the bodice made by Annelena de Groot.

[88] In appendix X the construction and attachment of bodices is more eleboratly discussed.

When comparing the data on the Darmstadt bodices, the Soutman and the bodice it becomes clear that the 3 flaps on either sides that are to the left and the right of the eyelets would not be visible when the bodice was worn. In fact, when looking at the Darmstadt bodice the 'skirts' or 'flaps' of the bodices are only in the front of the bodice, the part that would be visible when worn with a gown or overdress.[89]

4.2.4.3 Comparing material and cut from painting to the Texel bodice

When comparing the material and cut of the textile in the different paintings it becomes clear that the cut and construction and material of the Texel bodice are not uncommon. Portrait of a woman by Wibrand de Geest dated 1630 (figure 16) and Portrait of Johanna van Heyst (1599-) attributed to Michiel van Miervelt (figure 17) dated 1627 are show a very similar textile to that used in the Texel bodice. The *de Geest painting* also shows large circular flowery motives, which are mirrored on the second row. However, unlike in the Texel bodice, this feature of the textile is not used to create a mirror effect, rather the pattern is aligned, simulating a continuous line. The flaps similar to the Texel bodice do not show any particular design. Although the bodice has buttons in front rather than a metal thread trimming, the edge of the protruding front and the flaps are finished with a similar trimming.

[89] Pietsch, 2007 p. pp 146-160

Figure 86. Portrait of Johanna van Heyst (1599-) attributed to Michiel van Miervelt. Dated 1627 . 103,5 x 77,5 cm Brussels, Koninklijke Musea voor Schone Kunsten. Permalink https://rkd.nl/explore/images/123362 Similarities a, b, c.

Figure 97. Portrait of a woman. Wibrand de Geest. Dated 1630115 x 93,5 cm. Private collection Permalink https://rkd.nl/explore/images/128318 Similarities b, c.

4.2.4.4 Silhouettes of similar garments as seen in paintings

Looking at early seventeenth century dress there is one thing that is remarkably absent: bosom. The Spanish fashion did not allow for a décolleté and before the bare necks

and shoulders in the later seventeenth century no skin was shown.[90] In the surveyed paintings indeed the body from the front looks completely flat, until the bodice protrudes. Despite the lack of bosom there is still an hour glass figure, the skirts make wide hips and the shoulders are elongated and accentuated, as is the waist by the protruding bodices and *vlieger* (see figure 16 and 17).

4.3 Measurements

In this paragraph the results of measurements are given. Since photography is the measurement of light, and x-radiography the measurement of the absorption of X-Rays, the creation of useable X-radiographs, and photographs are discussed in this paragraph. In addition, measurements of the garments from the digital X-Radiographs are discussed.

4.3.1 Photography of the Texel bodice

The high definition photographs of the front and the back that are taken for this project count as a very useful reference tool for what the object actually looks like in real life. The images due to their quality and size, although taken from the object as a whole, allow us to zoom in and see details such as grain and stitches easily. Since these images do not necessarily show more than can be seen with the naked eye there were no surprising results, yet they did help understand the construction of the mid center seam, which could be identified as the two front panels F L and F R sewn unto the metal ribbon. The photos were taken in the photo studio of the conservation and restoration department. The object was laid on the table and the camera was attached to the big tripod arm that allowed the camera to be parallel to the table and the object. The photographs were taken with a Nikon D750 with a 35-mm lens. A studio flash was used from two sides at 8 and 8,5. The ISO was 100, the shutter speed 1/40 sec and the F-stop 16. This setup gave the best result. To ensure the quality of the colors and to check the angle and distortion in the photo a x-rite color checker and 5x5 checkerboard were added.[91]

[90] See figure 11
[91] See appendix VIII to find an elaborate step by step description of how to approach photography.

4.3.2 X-Radiography Images of the Texel bodice

Two sets of images were made: the first image with a higher voltage focusing on the metal thread present, this image was taken at 35 Kev with the exposure of 1 minute.[92] The second set of images was made on 10 Kev with 2,5 minutes exposure which allowed the textile to be seen although the detail in the metal thread was less. The film was scanned at the highest resolution resulting in a 16-bit gray scale image of ca. 300 MB per image. Six images were taken to fully document the bodice and to have some overlap to allow stitching of the images.[93]

Two kinds of stitching methods were used- one by hand with Inkscape by Annelena de Groot, (see figure 18) the other automatically with Adobe Photoshop (see figure 19).[94] The automatic stitching software of Photoshop adjusts color and orientation to 'fit' the images together, improving readability but lowering reliability as the original images are tampered with.

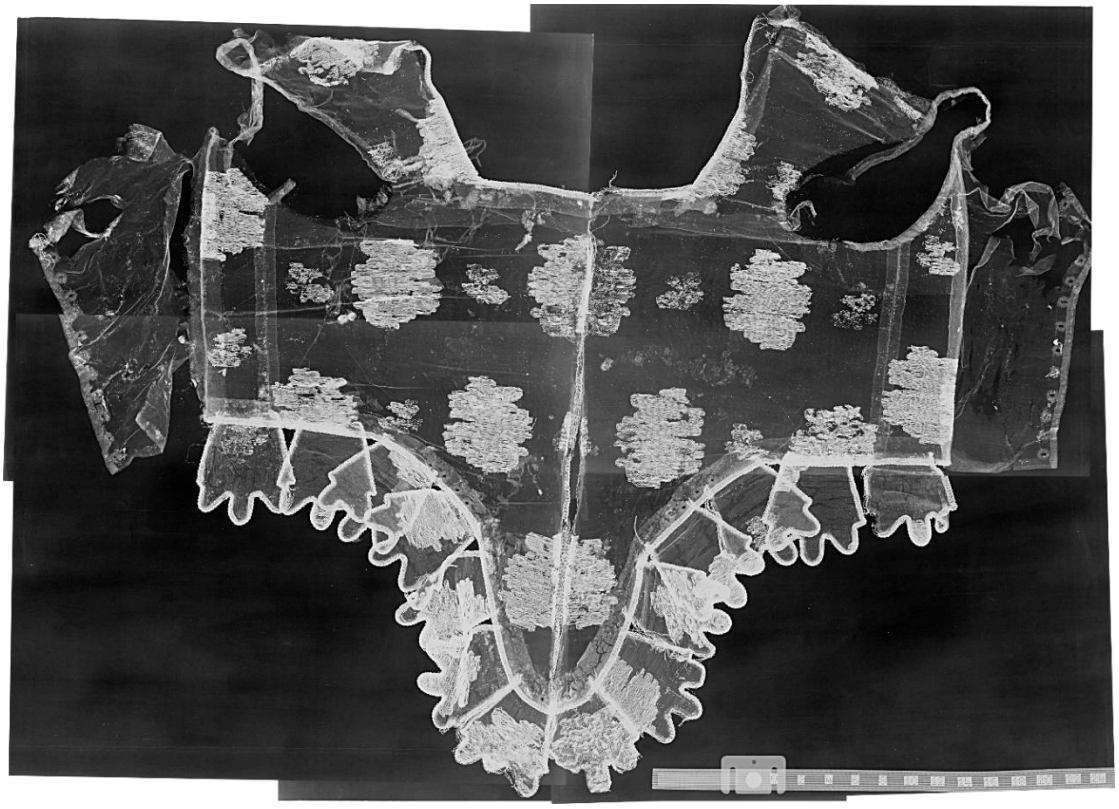

Figure 18 Composite X-radiography image as stitched by Annelena de Groot using Inkscape. Original images are recorded with 10 Kev with 2,5 minutes exposure

[92] See appendix IV.3 for this image.
[93] See appendix IV, figure IV.3 - 9
[94] See appendix IV figure IV.1 and IV2

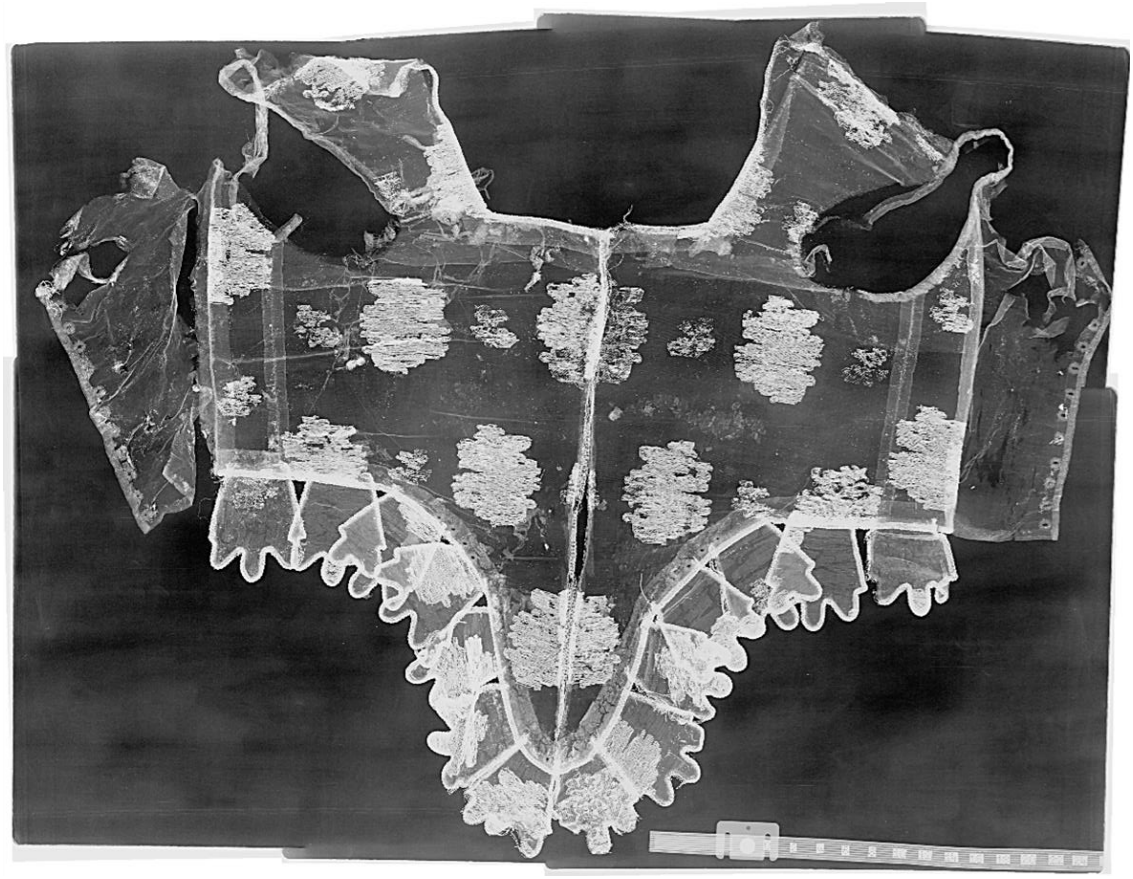

Figure 19 Composite X-radiography image as stitched by Adobe Photoshop, Original images are recorded with 10 Kev with 2,5 minutes exposure

Although the images were taken while carefully handling the object -when putting the exposure film under the object- there is still some difference between the pictures. For example, looking at the joint between the left top and bottom images it becomes clear they do not connect.

Aside from a good overview of the bodice and easy identification of the shape of the different flaps, in the overlapping areas another set of data was gained. It is clear that all flaps are lined with a plain-woven fabric that shows clear signs of breakage. Although there do not seem to be any missing pieces, the fractures suggest that the pieces have shrunk. Similarly, an extra layer of fabric and perhaps glue was seen on the textile band on the back of the bodice covering the attachment of the flaps. It was clear that the metal woven designs are woven locally with one metal-thread that goes back and forth. This is not easily visible on the photos of the back of the bodice because of the remnants of the lining or reinforcing fabric. It was surprising to see some kind of 'drawing' in the metal thread especially in the 1R flap. However, it was compared with visible light images and the right side of the bodice where this is seen the metal thread seems less black than on the left side. The conclusion

now is that where the X-radiograph shows no white reflection in the metal-thread area, the metal-thread has deteriorated to such an extent that it does no longer give the same measure of absorption.

4.3.3 Measurements of bodice based on measuring X-Radiographs

One of the great advantages of x-radiographs is that they are a close to 1:1 record of the object. This is especially useful when measuring the object. In the condition report of the object its size is indicated as 62 cm high 83 cm wide.[95] Since the object is not square this gives little information of how big the garment actually is. In figure 20 several measurements are indicated in a drawing of the bodice, indicating the bust, waist, shoulder, mid-center and side seam lengths.

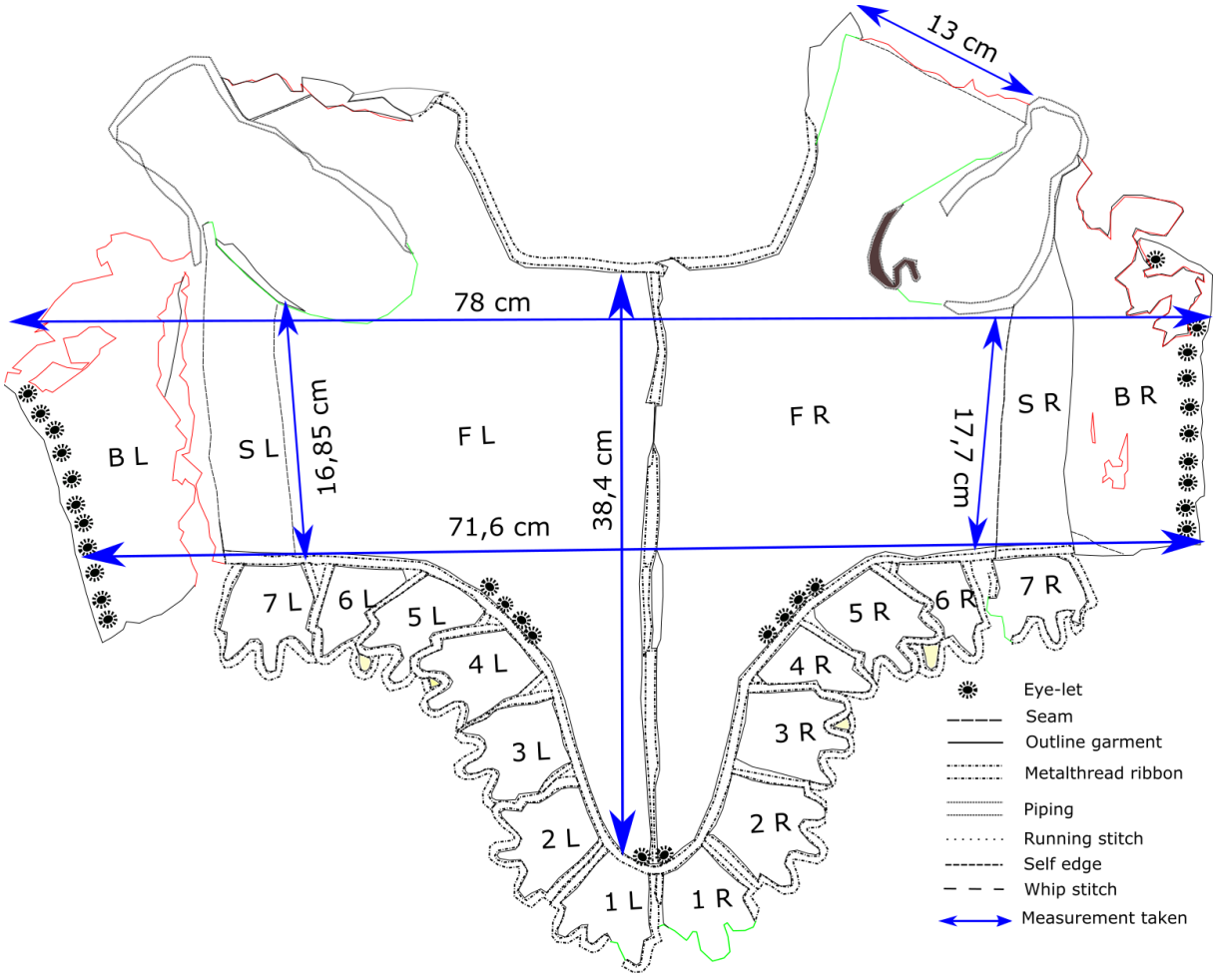

Figure 20 Measurements of shoulder, bust, waist mid-center and side seams width indicated

[95] In Sjoukje Telleman added a schematic drawing indicating the width of the front panels (24cm), side panels (5cm) and back panels, Similarly Telleman notes that the back panel becomes a little wider, from 9 to 13 cm. Telleman, Sjoukje, and Marijke de Bruyne. Conditiebeschrijving Textielvondst Texel. Provincie Noord-Holland, depot Huis van Hilde Castricum, 2017. P. 5

To give some context for these measurements they are compared to the modern European body size 38. (see figure 21) This might seem trivial but it shows how the proportions as seen in the Texel bodice are quite different from what we see today. The Texel bodice has a waist of 71,6, which is 5,6 cm more than the waist for a modern size 38.[96] Comparing the waist measurement to the bust measurement clarifies that the proportions are quite different the bust size is 78 cm, which is 6 cm below size 38.

Measurements	Modern size 38 or 10 (in cm)	Texel bodice (in cm)
Bust	84	78
Waist	66	71,6
Front shoulder to waist	40	33
Shoulder	12	13

Figure 21 Measurements (in cm) of the Texel bodice compared with modern size 38, as given Metric Pattern Cutting by Winifred Aldrich (2004) p. 10-11 (see note 96)

There are several explanations to think of when posed with the difference between a 17th century and modern bodice. Firstly, it is important to account for the fact that there lies 400 years between the measurements given. Secondly the measurements of the Texel bodice relate to the measurements of a finished garment, rather than the generalized measurements of a modern body. This is quite misleading because that size relates to the actual size of the body, and a bodice like this would not be worn on the body, but over layers of clothing. Similarly, the desired silhouette of the 17th century is quite different to what is desired today as discussed in 4.2.4.4. Similarly, the bodice is however quite wide for how short it is, the shoulder seam to waist is only 33 cm, which for a modern woman is 40 cm.[97] When worn as part of the *vlieger costume*, *the vlieger* would have been attached a little below the waistline, at the eyelets. This, and the long protruding waist, would make the body look longer than it actually is.

4.4 Experiment

In the following section creating a pattern for the Texel bodice, image manipulation and the preliminary testing of this pattern are discussed, as well as the reconstruction of the back

[96] Aldrich, Winifred, 2004. P.11.
[97] Idem. P. 11

panels and the testing of the pattern full-size. The sequence of these subjects was determined by how they were carried out subsequently over time.

4.4.1 Creating a pattern

One of the main questions leading up to this thesis was: can a reliable pattern be created from digital images of an object? Determining a pattern for a replica has various challenges without attempting to do it from a digital image. For example: how are missing parts and damages accounted for? What did the object originally look like? To answer these questions literature research and looking at (images) of comparable objects is invaluable. However, experiments and tests can give more information that is otherwise missed. Since the Texel bodice poses unique problems, simply because the object is unlike anything that is known in literature, the answers to these tests are not necessarily straightforward. In addition to this, one of the hypotheses of this thesis: photographs and x-radiographs can substitute for handling a fragile flat-lying object, creates challenges that have, to my knowledge, not been tackled before. Surely, people make replicas based on images of objects, rather than on objects themselves, interpreting what they see, adjusting it to for instance their own bodies.[98] However, this was not the goal of this particular research; the method that is sought should be as precise and true to the object as possible. Due to the limited scope of this thesis a definite method to creating a pattern based on digital images cannot be given, rather this section elaborates on some of the tests carried out during this project.

Given the exploratory nature of these tests they should perhaps not be called tests but instead experiments. This does not mean that these are unfounded frivolous experiments, all experiments are based on a few ground rules such as: x-radiographs give 1:1 measurements, the straight of grain of the fabric when followed and measured carefully will give an accurate pattern. Similarly, historical and practical influence of fashion and sewing style were taken in account. Although still experimental and hampered by a few shortcomings, these tests do give relevant insight. Several experiments are shared from

[98] There is a large community online that gathers so-called costumers, (amateur) seamstresses that create historical garments to wear themselves.

image manipulation to testing a preliminary pattern to scale and to full-size. Each of these are steps that a conservator can take to tests the theories about an object.

4.4.2 Image manipulation

Several image manipulations were carried out. Firstly, a drawing was traced from the back of the fabric, different points of interest indicated with photographs. The sewing techniques were indicated on this image as well. All information was based on what was seen with visual examination. Later drawings of the front and the back of the bodice were made to indicate the different material and layer buildup as seen in figure 22.

Based on the X-Radiograph the different flaps were traced in Inkscape and layered to compare them.

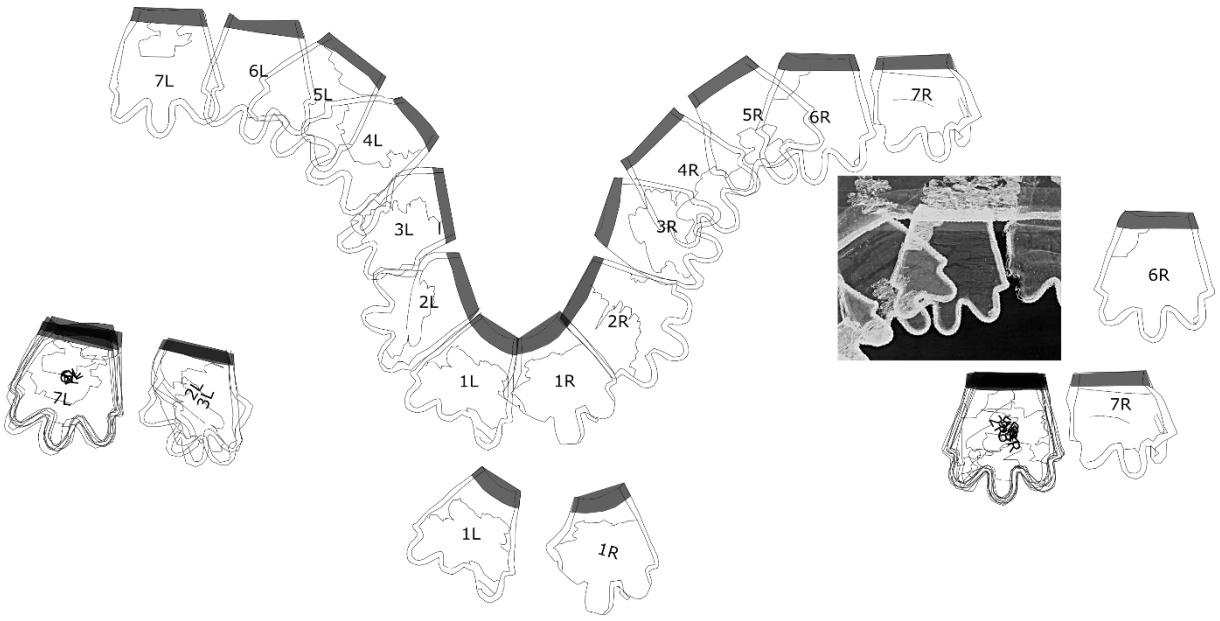

Figure 22 Tracing and comparison of flaps, example of how the drawing of 6R relates to the X-Ray. The metal weave is also traced in these flaps.

All flaps are slightly different, and some seem a lot more different because of the fact that they are distorted and tracing them results in different shapes. However, since this bodice is handmade and because of the complexity of the shape of the flaps it is not strange that these do not completely match. The left and right flaps 2-7 probably have been based on the same shape, and an 'average' shape of these flaps was drawn on the flaps 2R, 3R, 4R, 5R and 6R (see figure 22 and 23). When looking at 1L and 1R it is very clear that these are distorted,

however, they do seem to have a similar shape that mirrors. For that reason, a new shape was drawn based on the equilibrium between the two (see figure 23).

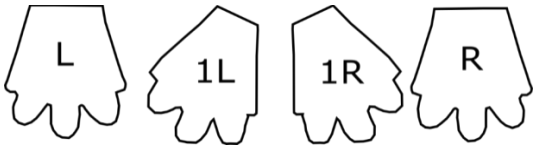

Figure 23 Newly drawn pattern for flaps based on average shape

When reviewing ways that patterns are taken, it became clear that the straight of grain of the textile is the most vital when taking a pattern. To verify the straight of grain of a fabric that is distorted, usually threads and pins are put in to follow the straight of grain. The measurements based on this natural grid of the fabric are then transferred to paper to reconstruct the original shape of the pattern.[99] In the Texel bodice due to the folds in the textiles the straight of grain does not have the same orientation when looking at the photographs. Since the grain of the fabric is clearly visible in the photographs it was thought to 'straighten' the fabric digitally instead of copying it on a grid. The grid function of Inkscape was used to turn the images straight- the image was cut up in sections that had grain in the same direction and this was then adjusted to the grid in the computer program, making sure to attach separate images as they relate in reality. Although very experimental the technique shows very promising results (see figure 24).

[99] Zimmerman, J. A. 2007 p. 90

Figure 24 Adjusting the straight of grain of fabric in a photo left: photo before adjustment, middle adjusted image, right newly traced pattern

Since the Front Right bodice is not fully visible because of the fold mid front where the Front Left 'falls' over the right, the pattern was completed by following the shape found in the straightened image of the front left. Creating a straight of grain patterns of the sides seemed rather straightforward: since the seams follow the selvedge of the pattern this can be drawn as a straight-line, and there were no extremities expected as with the front panels. Still, some folds were visible in S L that had to be ironed out. It became clear that although the seam that followed the straight of grain of the fabric should be straight, it was not so on the photo, a distortion that can sometimes happen near selvedge because it is woven differently than the main fabric. For S R there was another challenge: on the photo the pattern piece is partly covered by the back panel. This inspired the decision to straighten this pattern piece from the backside photo. This was also thought important because this seam is top-stitched together, and it was assumed that the backside pattern would be slightly larger because it included this topstitched area. Straightening SR also showed that straightening the pattern piece according to the straight of grain as seen in the fabric or as present in the self-edge gave quite a different result. In the end, a synthesis between the front and the

backside was made to get the most reliable pattern piece. It was noted that S R and S L are not identical at all: along the width of the pattern piece they differ 1cm.

4.4.3 Testing the pattern

To verify the usefulness of the straight of grain pattern the pattern was copied unto plain woven unbleached cotton. The unbleached cotton was then sewn together with the sewing machine. The test version was pinned onto a modern bust on scale to have some indication of the 3D shape (see figure 25 and 26). It quickly became clear that to have a flat front reinforcement was needed (figure 26). This was added as well as reinforced flaps to show how these relate to the object. To better understand the bodice in context a skirt was pleated unto the dress form and a piece of fabric was attached from shoulders to the eyelets, in order to give an indication of what the bodice would have looked like paired with a *vlieger* and skirt (see figure 27).

When laying the re-enforced dummy flat, this simple test version of the bodice clearly shows how the bodice is full of inherent tension. Even though the bodice is flat lying now, this was not a natural position (see figure 26).

Figure 25 Bodice when pinned to a mannequin to indicate how it would look 3D without re-enforcement

Figure 26 Side-view of un-reinforced garment: clear trouble with bottom-front

Figure 10 Simulation of how the bodice would be seen when worn with a Vlieger and skirt

Figure 28 Flat-lying re-enforced bodice showing the inherent tension in the object.

4.4.4 Reconstructing back pattern

To complete the reconstructed pattern the back panels need to be discussed. One of the most challenging aspects of creating a pattern for the bodice was the reconstruction of the back panels. Not only are these back panels severely damaged and distorted they also are made from very shiny damask that makes it impossible to reconstruct the straight of grain on the photo. Luckily enough both back flaps show different damages allowing for instance the right back panel to indicate the width of the back panel at the waist (8,5 cm). Similarly, the length of the joint of the back and side panels was known (21,5 cm) and the width of the shoulders (13cm) which the back panel was attached to. Because the piping of the right armhole is still connected it became clear that the armhole on the back panel would have to measure ca. 14 cm from the shoulder to side seam. These were the parameters on basis of which the back could be reconstructed. When first reviewing the x-radiographs, it seemed that the damask fabric was too thin and distorted to be properly documented via x-radiographs. However, after further inspection it became clear that, although indeed a lot of the panels were too distorted to read, the grain of the fabric was still visible on these images. It was clear that the mid-center back followed the straight of grain. Similarly, since the back panel started at 8,5 cm, and at least had to be 13 cm wide for the shoulder seam the back panel was not straight but quite shapely. It became clear that the ease was added from 13 cm up. A rectangle of 8,5 by 13 cm was created as a representation of the first part of the bodice and the shape was developed from there. To reconstruct the shape of the back of the bodice the angle between the straight of grain of the fabric and the added room was measured and triangles based on these measurements added to simulate the shape of the garment (see figure 29).[100] Similarly, the left shoulder seam showed that the shoulder as well was cut at an angle and this as well was added to the base rectangle.

[100] See appendix IX.2 Reconstructing a pattern- using straight of grain

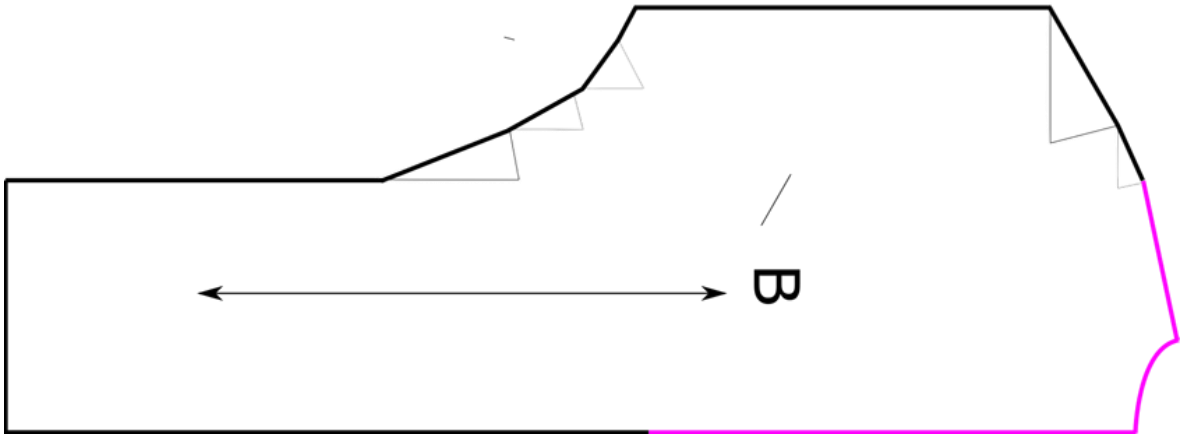

Figure 29 Reconstruction of the back panel, showing the triangles based on the straight of grain to reconstruct the back.

4.4.5 Testing the pattern full-size

During the development of the bodice and to test a preliminary version of the back (without slanting shoulders and little space for the back) a full-size test garment was made. The bodice was made out of pre-washed unbleached cotton and was sewn together with a sewing machine. The main reason why this experiment was carried out was to get a good idea about the size of the object. At the same time, it allowed the 'final' pattern to be tested.

From the beginning of looking at the Texel bodice it was clear that it was not natural for it to lie flat, not necessarily because it was reinforced before and there are creases and tears in the material but because the back panels are not attached to the shoulders, which allows the back panels to lay flat, something that would always cause tension around the shoulders otherwise (see figure 30). Also based on the research on similar garments and patterns and based on the measurements done it was clear that the side seams would probably not be on the sides but on the back (see image 31). The following photos were taken to indicate the stress in an object not made to lay flat (figure 30) and how narrow the bodice would be if it would be laced (see figure 31). This still however, shows how little shape is in the bodice present, due to the lack of darts.

Figure 30 Dummy-simulation of what the bodice would look like if the back panels were still attached at the shoulder

Figure 31 Dummy showing where the sidelines should be when the back panels were laced

4.6 Evaluation

Several different observations are made and not all do indeed seem to say the same thing, however, bringing all these steps together helps understand these observations better. For instance, the bodice shows a relatively wide waist and a very short upper body. However, considering that the bodice was worn with a *vlieger* and this would be attached to the eyelets, this changes the view of the object. These eyelets are located a little below the natural waist, elongating the upper body. The different theories on how the bodice would gain its protruding shape, and the lack of clear evidence of how this was done in the bodice, makes this a topic for further research. The clear skill of the cutter and the use of a mirroring effect is also seen in many different paintings in the paintings survey.

When setting up the replica approach for this particular garment the goal was to better understand the object and its current state, as well as its original appearance in the past. This was hoped to help understand some of the damages and deterioration seen in the object. To see if these damages were due to inherent stress and cut and construction patterns based on digital images and reconstructions were developed. When testing the patterns it became clear that indeed some of the tension and damage seen is due to the cut

of the garment, especially with the tension and damage seen in the protruding front area. At the same time the dummies and tests are not enough to give explanations to all damage and deterioration seen. This is both due to the fact that the research and measurements gave more information than could be tested, and because of a lack of clear structure and evaluation of experiments and tests. For now, there are no conclusive answers about the reasons of damage, perhaps as well because the biography of the object, the way it was stored after it was salvaged from the sea-bottom for instance, was not considered.

Throughout the 'Research' phase it became clear that there are many factors in the object itself and other objects to consider that ask for a more elaborate reconstruction to be considered or ruled out in reason for damage. For example the use of the metal thread as the connection between the two front panels as well as the possible re-enforcement of the shoulders, and the re-enforcement traces found on the back of the bodice.

The goal of the replica approach, to better understand the damages seen in the bodice has not been satisfactorily achieved, however, the data gathered in the process give solid basis for more elaborate research and similarly the results achieved show what could be gained in the future.

5 Discussion

In this chapter, a synthesis of the different results and the main takeaways about the condition of the object are discussed. Similarly, areas that deserve further research are highlighted, lastly the research is reflected on from a practical and personal point of view.

5.1 Synthesis

When looking at the different experiments and data found in literature several things about the bodice become very clear. Throughout practicing the replica approach, it became clear that this was a stimulating and enabling format. Instead of having to focus on a particular aspect of the object, such as the conservation history or material aspects, all fields of the arts came together. It is clear that the bodice as part of an outfit would look very different than it looks today, and parts of the object would be covered. Similarly, the examples (paintins and other bodice) show that it is not unlikely to have a different colored dress and gown paired with such a bodice. The particular style of the bodice: with metal thread decoration, several flaps in floral like shapes and a mid-center ribbon is quite common. Indeed, when comparing the object to paintings of similar objects, the ribbons seen in these objects seem to have been made in a similar way as in the Texel bodice. Since the shoulder parts are missing in this bodice, and similar Darmstadt bodices show that there was re-enforcement fabric in these areas, perhaps this is the reason why these have not been preserved. Looking at silhouettes from the time period of the construction the perhaps surprising proportions of the Texel bodice are easier to understand. More challenging is to decide whether or not the bodice can be considered a *Borst* and whether or not it would have had stays or boning, and if this would put it in the stay-makers field, putting its production outside of the guidance of the guild.

5.2 Condition

The bodice is now greatly distorted and this mostly relates to the inherent structure of the pattern and storing the object flat. The tests carried out with the pattern clearly show tension when the object is lying flat. Through the X-Radiographs it also has become clear that the metal thread present in the bodice is very much in varying condition- some areas seem intact whereas others are greatly deteriorated. It is highly recommended to analyze the broken/fractured pieces of reinforcement fabric in the different flaps since from the X-Radiographs it is clear that the material is similarly damaged in all flaps. Since this cannot be

seen as wear and tear, it is assumed that this has been caused by the maritime environment that the bodice was in for 400 years. Since the other fabric in the flaps does not show similar deterioration, probably the material in these flaps is different; perhaps a cellulosic fiber that only has been preserved because it was enveloped in the silk of the flaps. When looking at a reconstruction of the bodice without re-enforcement it becomes clear that the material will not give the required shape for the silhouette. Interestingly, the damage in the bodice such as the disappearance of most of the re-enforced layer, the lack of back shoulder parts, and the seam that came loose at the mid center, allow the bodice to lie flat, something that would not be possible if it was in its original condition.

5.3 Future research

Whether or not the object originally had boning, it is clear that it had to be very stiff to follow the silhouette of the time. Since there was no glue found in the Darmstadt bodices, it is of much interest to explore in future research a possible the glue re-enforcement fabric or perhaps starch lining of the bodice.[101] There is a lot to gain looking at the pattern of the bodice: it is quite different than that of the Darmstadt bodices that before the discovery of this bodice were the only bodices of this style to survive. This shows the great importance of this bodice and the unique opportunity to research that it gives. It is highly recommended to analyze the broken/fractured pieces of reinforcement fabric in the different flaps since in the X-Radiographs it is clear that the material is similarly damaged in all flaps. Material analysis might give a clue for why this is the case. It is also curious that on the back of the bodice the reinforcement fabric seems to have stayed attached better on the areas where there is metal thread. The 'straight of grain' method that is followed when manually taking a pattern, has been experimentally converted to a digital approach. An automatization of this process may make it quite easy in the future to generate patterns based on photos. The pattern of the brocaded fabric is known and, when more elaborately documented and compared, perhaps it could become clear how the bodice was cut from the cloth, and how the pattern pieces were positioned.

Much of the data presented in chapter four is proof of what can be gathered by one person in a limited amount of time, however, all of these could be elaborated on. For

[101] In personal communication with Johannes Pietsch he explained that even though supporting layers are glued together sometimes to create more stiffness, these are only glued to the outer fabric during conservation.

instance, the measurements as presented in 4.3.3 can be elaborated on. This does however ask for a more effective way of working: the X-radiographs should be stitched in a more reliable way, which allows for more precise measurements to be taken. A main problem during the research process was the computation power needed to process the high definition images. It would be very interesting to have a better and more reliable software to measure, trace and manipulate images in the future. The reconstruction of the back pattern and the digital straightening of the pattern pieces should be redone to reflect on the results found in this thesis.

5.4 Reflection

Although the research of this particular object and the experiments carried out evolved organically, the author has developed lists of 'how to approach replica making' based on these experiments that can be found in appendix VIII and IX. This gives added value to this document and hopefully will lead others to test the experiments developed during this research. It should be noted however, that one of the most challenging parts of this thesis was manipulating the x-ray images, simply because they are such large files. Even when converted from 300mb to ca 65mb, a lot of time was spent waiting for the computer to read the files. This should definitely be taken into account, attempting to study an object from digital images asks for a computer that can handle files this size.

6. Conclusion

How can a 'replica approach' to costumes improve the diagnostic process when considering flat-lying costumes, and how can imaging techniques substitute for the object when the object considered cannot be extensively handled?

When looking at the general literature that is written on the subject of replicas it is clear that the making of replicas or a replica approach has more value than just a tool conservator, being forced to look very carefully and systematic to an object. A replica or reconstruction can also very well serve as an educational tool, a tool to learn more about material and techniques used in the time the original was created. Similarly, it has become apparent that historical replicas have inherent value and are also quite tricky since they can be mistaken for originals in the future. It is also evident that in a way by creating a replica a facsimile is created that can be consulted for further research which in turn saves the original from unnecessary handling. The making of a replica, whether fully carried out or not, serves as a very detailed documentation of what is seen and at the same time makes it very clear what is missing. In this way, it serves both the documenting and the diagnostic and conservation treatment. Having a pattern for a particular object also helps with conservation when considering adding support layers and mounting the object.

All in all a replica approach forces the conservator to be very thorough in visual, technical and art historical examination of an object, it challenges the conservator not only to look, but also to test and compare. The replica approach is an integral approach connecting the fields of art history, technical art history, computation and imaging, and conservation together. A background in material history, the patterns of deterioration and tailoring are all needed to fully understand the object. Similarly, the hope for a most truthful replica forces to do thorough art historical, technical and literature research. This approach results not only in a better understanding of the object as a material artifact, but also clarifies the value of the object in costume history. Similarly, through this object the costume history of the 17th century will be better informed.

6.1 In short

When splitting the main question in two, the answering of these questions based on this research becomes clear.

How can a replica approach improve the diagnostic process?

The replica approach following choices, research, measuring, experiment and evaluation forces the conservator to step on the next level when it comes to identifying construction techniques, patterns and original intention. All of these helps to understand the object better, and as such, and will influence conservation decisions in the future as well as further (diagnostic) research. At the same time it became clear that it is not a quick and easy approach, and the diagnoses via tests with dummies need more research. Yet, at the same time damages might be identified 'by accident' for example the condition of the metal thread as seen through the x-radiography. The wide scope of research carried out following the replica approach makes the conservator more aware of damages as seen in the object, and helps to understand damages seen in a broader perspective.

How can imaging techniques substitute for flat-lying objects that cannot extensively be handled?

By being very particular about ways of recording and ways of improving and using images to create drawings and measurements, the research into an object can be done to a large extent from the computer. In this thesis only X-radiography and photography were examined, but in the future promising techniques such as photogrammetry may enlarge the potential of using images as substitutes for the original. After studying the object very well, through working with these images, very specific research question can be formulated. This ensures that there is less stress on the object and the images that are taken are of such quality that they do not have to be taken over and over again, saving the object from handling for imaging. However, in some cases and to verify that the data gathered by the imaging techniques are reliable, the examination needs to be carried out that will need handling of the costume. Still, since the replica approach looks into more than just what is seen on the images, it will be easier to help people to understand an object that they have never seen before and perhaps only will see behind glass on an exhibition.

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Appendix

Contents

I Elaborate object description

I.1 Front of bodice

The front of the bodice shows two front panels of brocade fabric, two side panels of brocade fabric and two back panels of damask weave. Front and side panels are extended with flaps or leaves that are also made from brocade fabric. In the mid front below there are two eye-lets, as well as four eye-lets on either side of the bodice on the waist. The back panels also contain eye-lets of which there are respectively 12 on the left side and 13 on the right side that are still visible. The neckline, mid front seam and the leaves are finished with a braid or ribbon which is made of metal-thread and silk. The back panels are severely damaged and the left back panel is almost completely loose of the object. The armholes are still identifiable due to the piping that is still left and on the right side still attached. The shoulder parts of the back panels are gone although the shoulder seam is intact and shows that the back panels did go all the way to the shoulders. The right back panel is less damaged, the fabric is still attached with the seam to the side panels but several holes are visible. The brocade fabric shows highly oxidized metal thread, some imprint of another object on the right-side panel, and a tear in the mid front seam. In general, flat lying the bodice shows distortion in the form of folds and 'waves' in the different pattern pieces. On the bodice textile fragments in the form of flowers are found. These are not original to the object rather they are fragments of another object.

I.2 Back of bodice

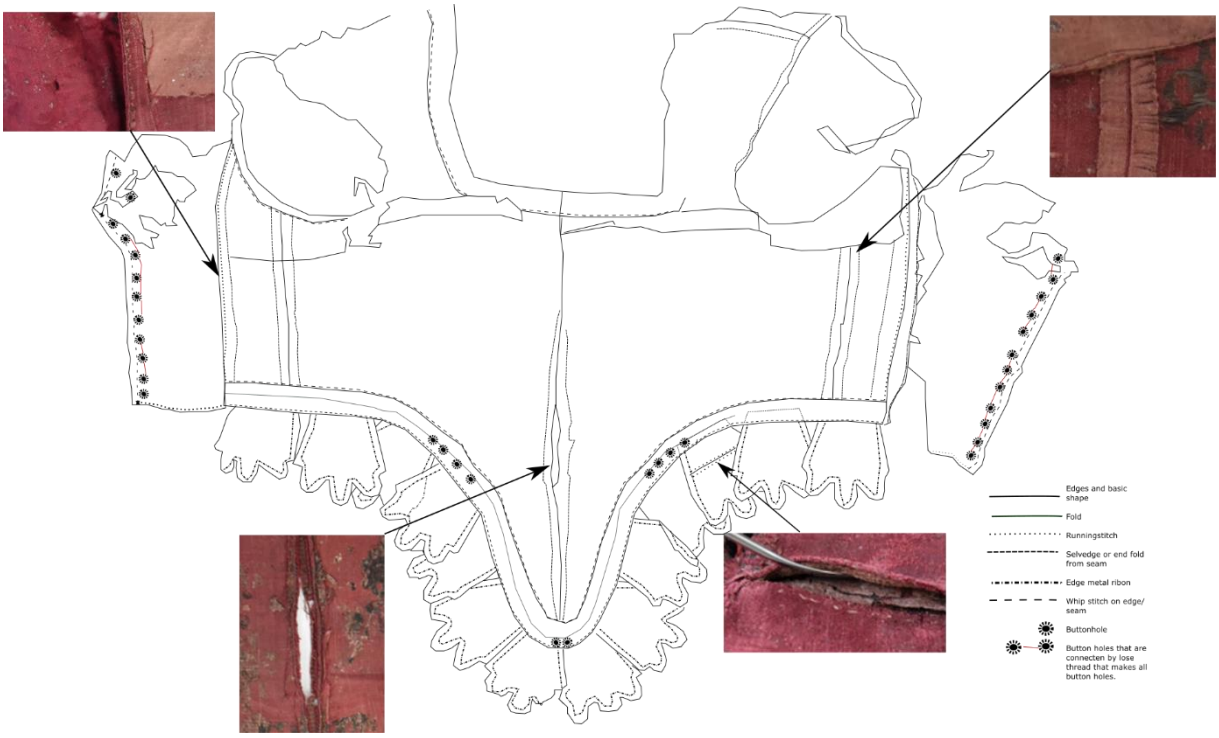


Figure I.1 Drawing of back of the bodice with details. See III.3

The back of the object shows the construction of the object. The front and side panels are both seamed on the self-edge (see figure I. 1 detail top right). The side and back panels are sewn together and topstitched resulting in the fact that the natural movement of the back panels is towards the front (see figure I.1 detail top left). Rather than sewn together the two front panels are sewn to the metal thread ribbon (see figure I.1 detail bottom left). The neckline has a facing with the same fabric as the piping of the armholes. The bodice is also lined on the front of the shoulders and the side panels with a light colored plain-woven silk. This lining is quite damaged but seams found in the fabric suggest that it was never a full but always a half lining. The flaps or leaves are lined with damask fabric. One of the leaves shows an opening: the lining was created out of two pieces of fabric with selvedge, this self-edge is folded back and seamed. Because the two fabric pieces are not sewn together, it is possible to look inside the flap and this shows that the flaps are enforced with a plain weave fabric that is now fragmentized (see figure I.1 detail bottom right). The joint between the flaps and the front and back panels is obscured with a facing of the same fabric as the neckline facing. The front and side panels show remnants of a facing fabric that seems to be glued to the silk.

II Photographs

Figure II.1 Front or outside of bodice. Photo by Annelena de Groot. Date April 19 2017

Figure II.2 Back or inside of the bodice Photo by Annelena de Groot. Date April 19 2017

III Drawings

Figure III.1 Drawing Back Details

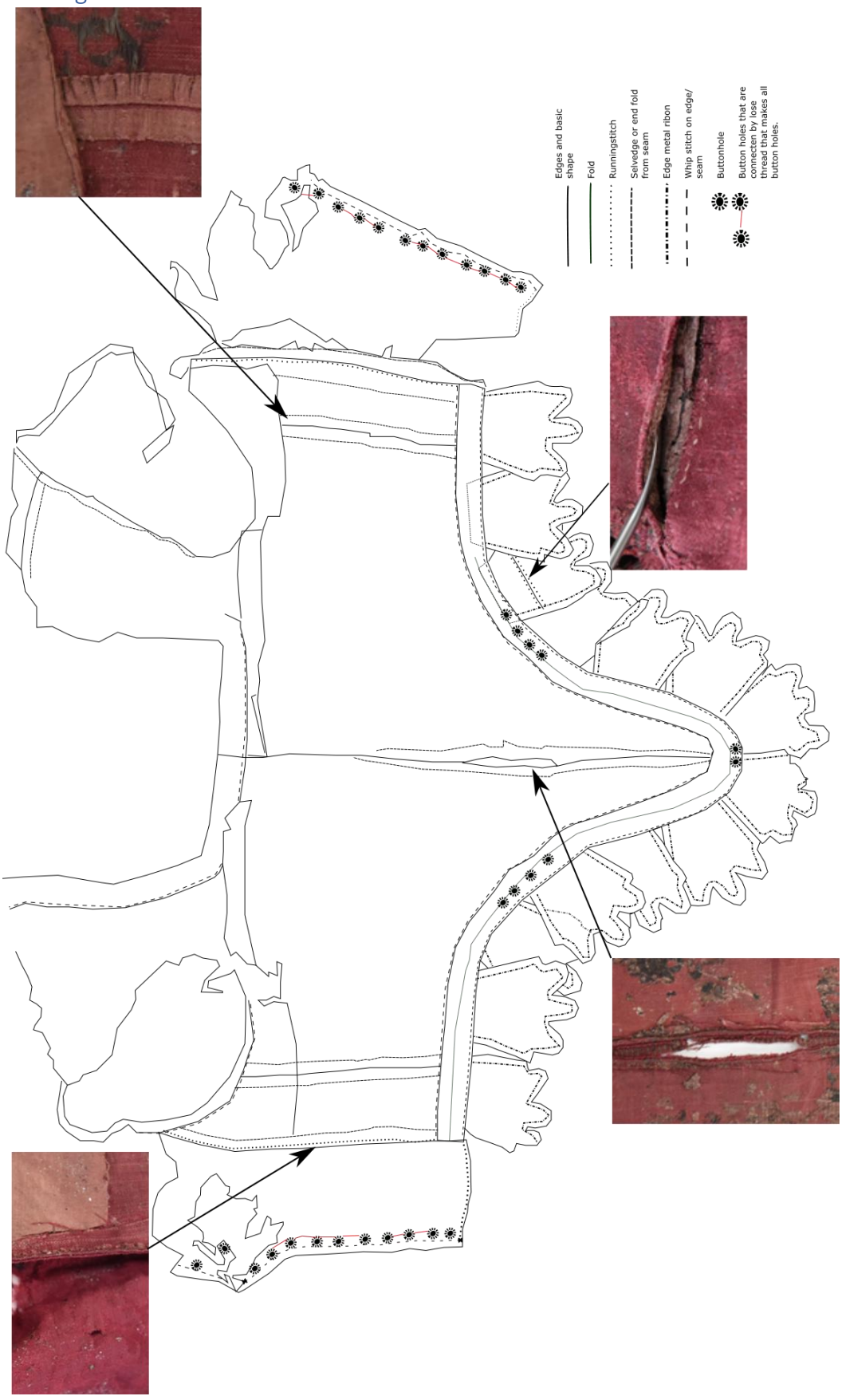


Figure III.2Drawing Materials (back)

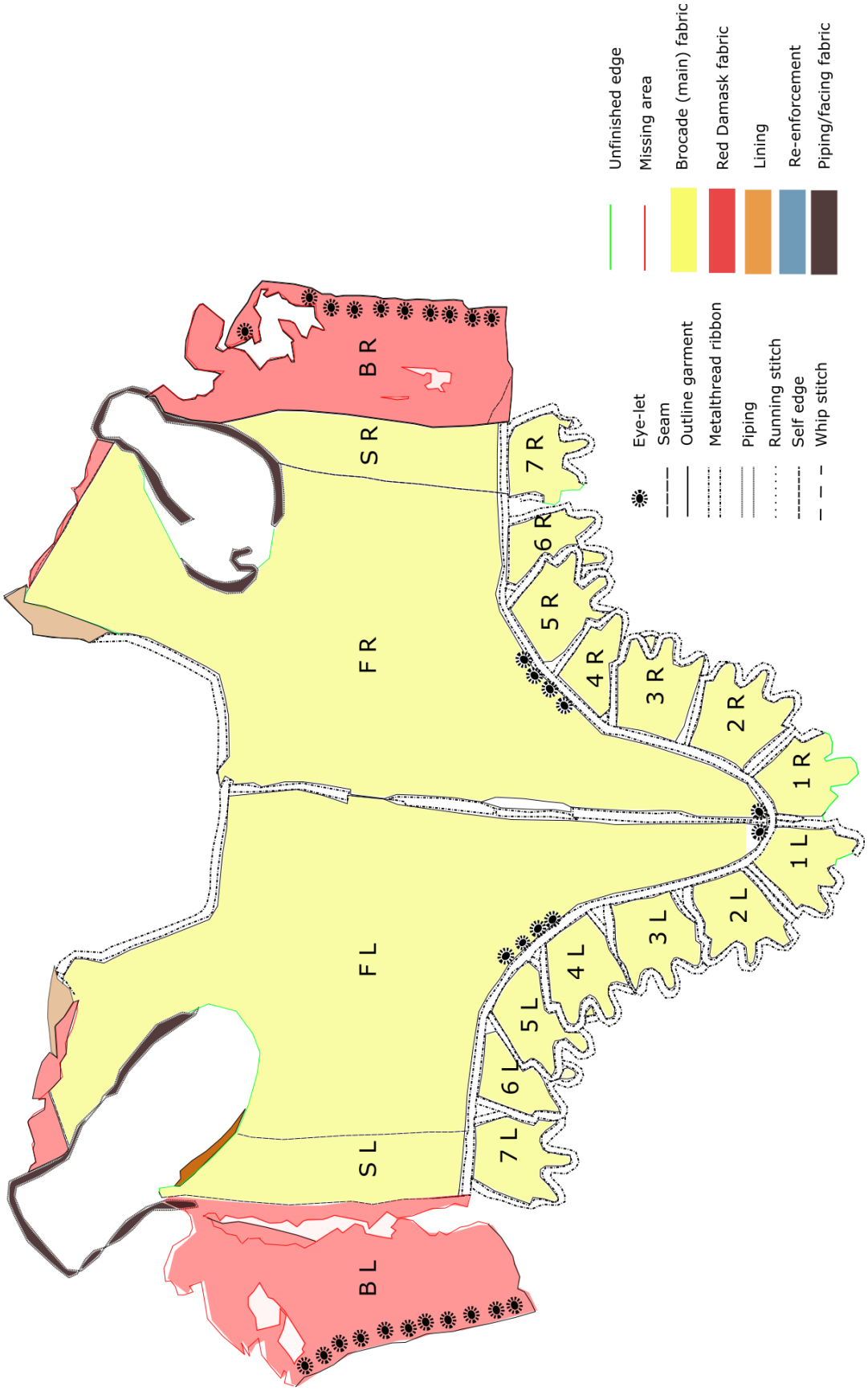


Figure III.3 Drawing Materials (Back)

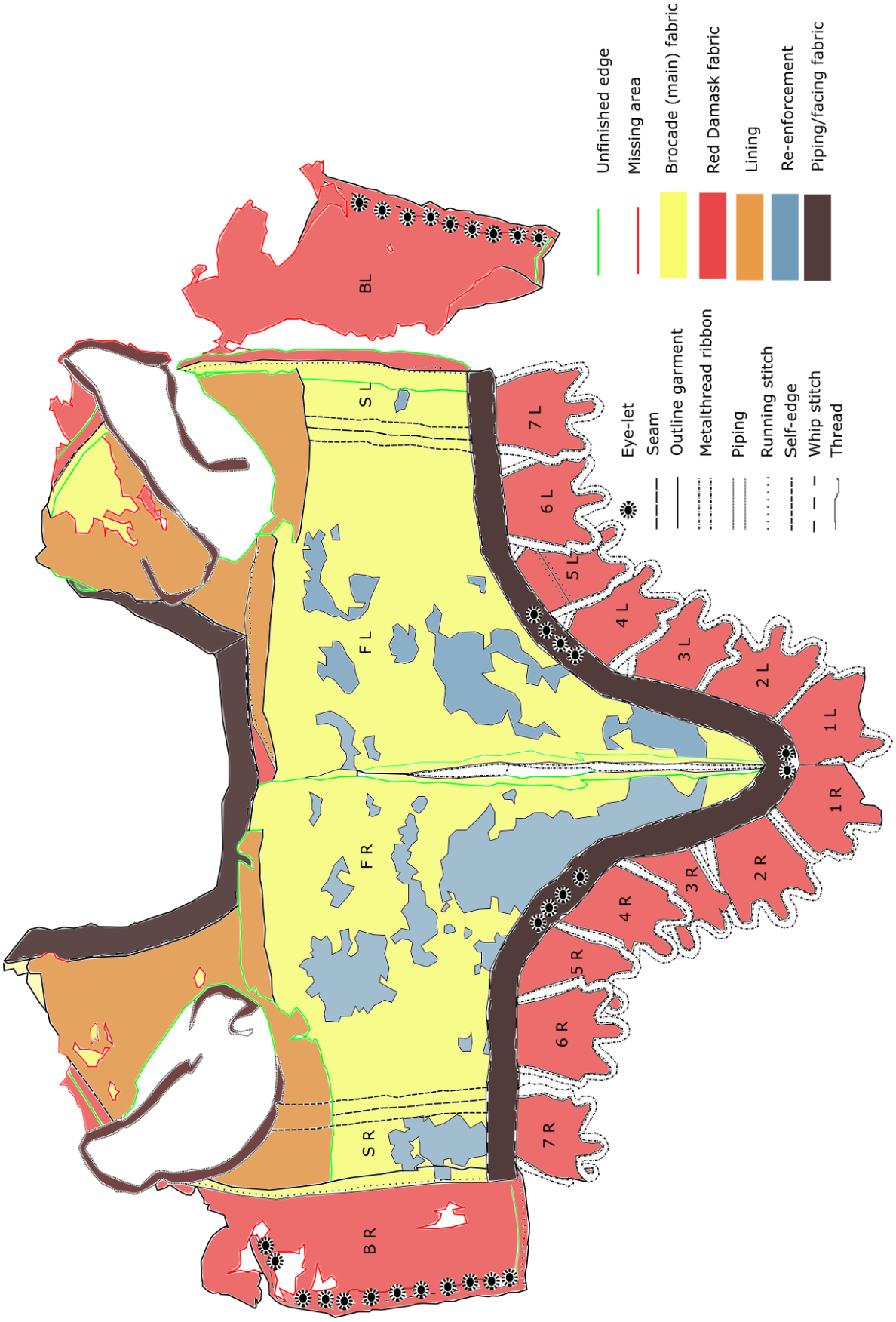


Figure III.4 Measurements of bodice

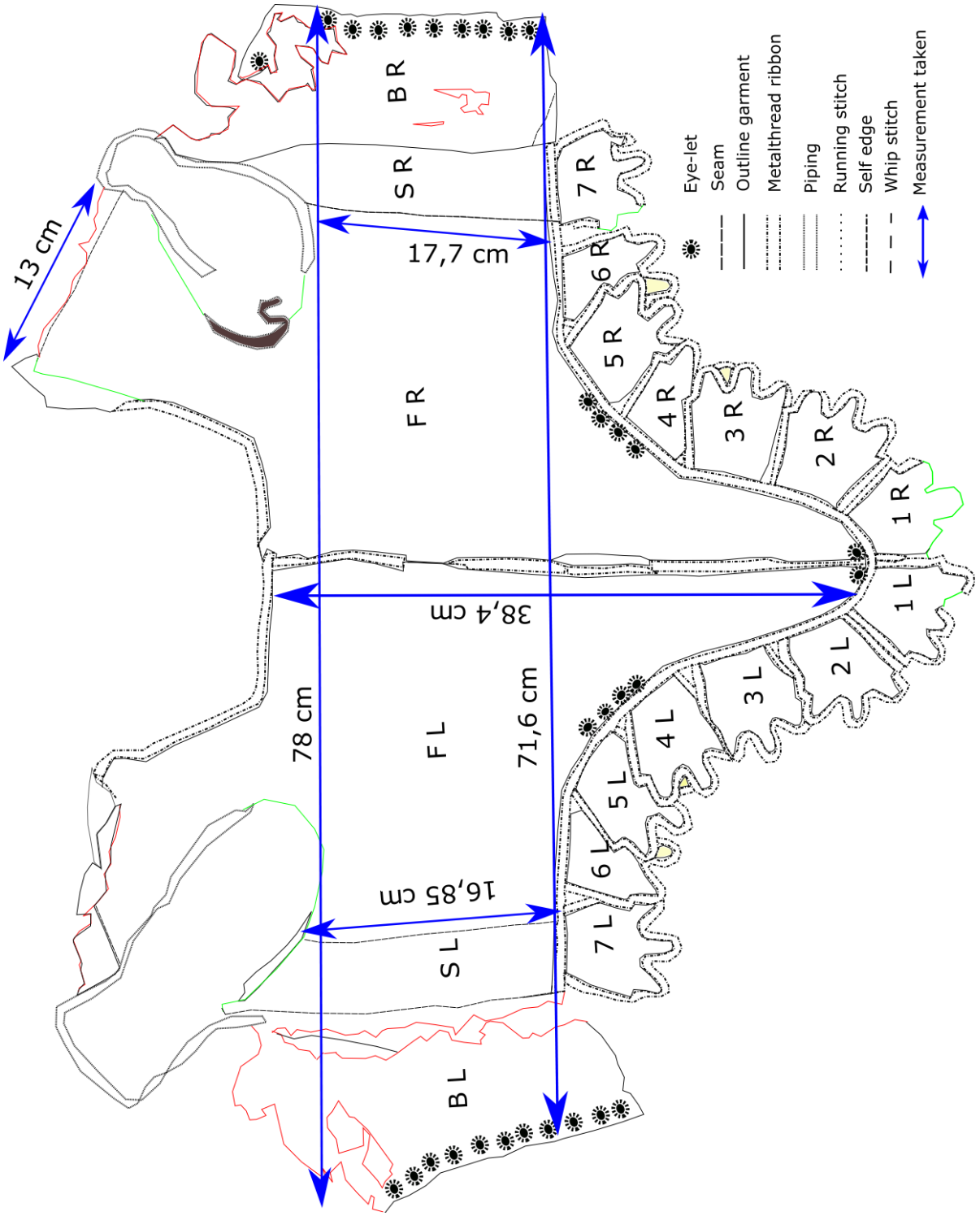


Figure III.5a traced brocaded pattern

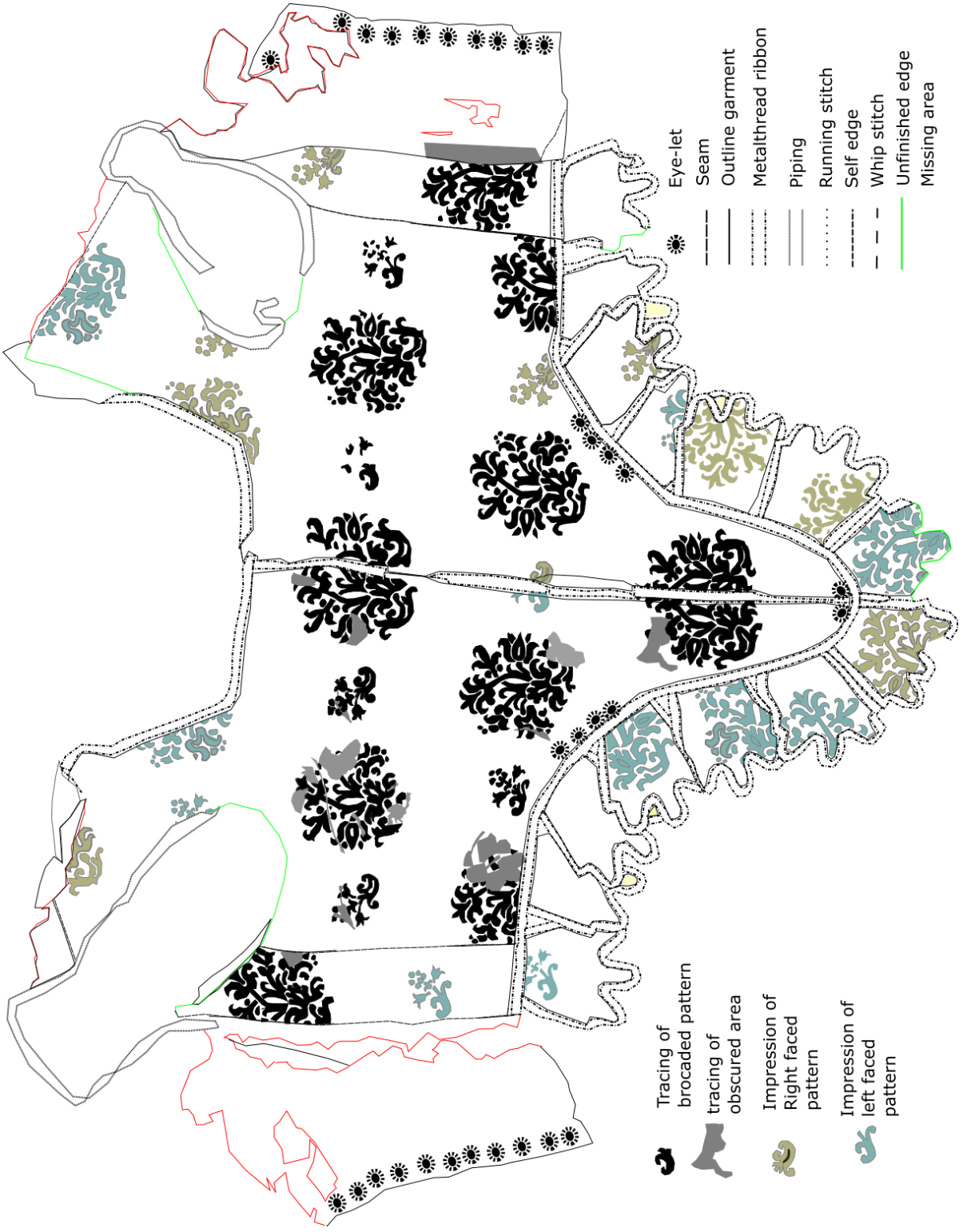


Figure III.4b traced brcaded pattern color-coded.

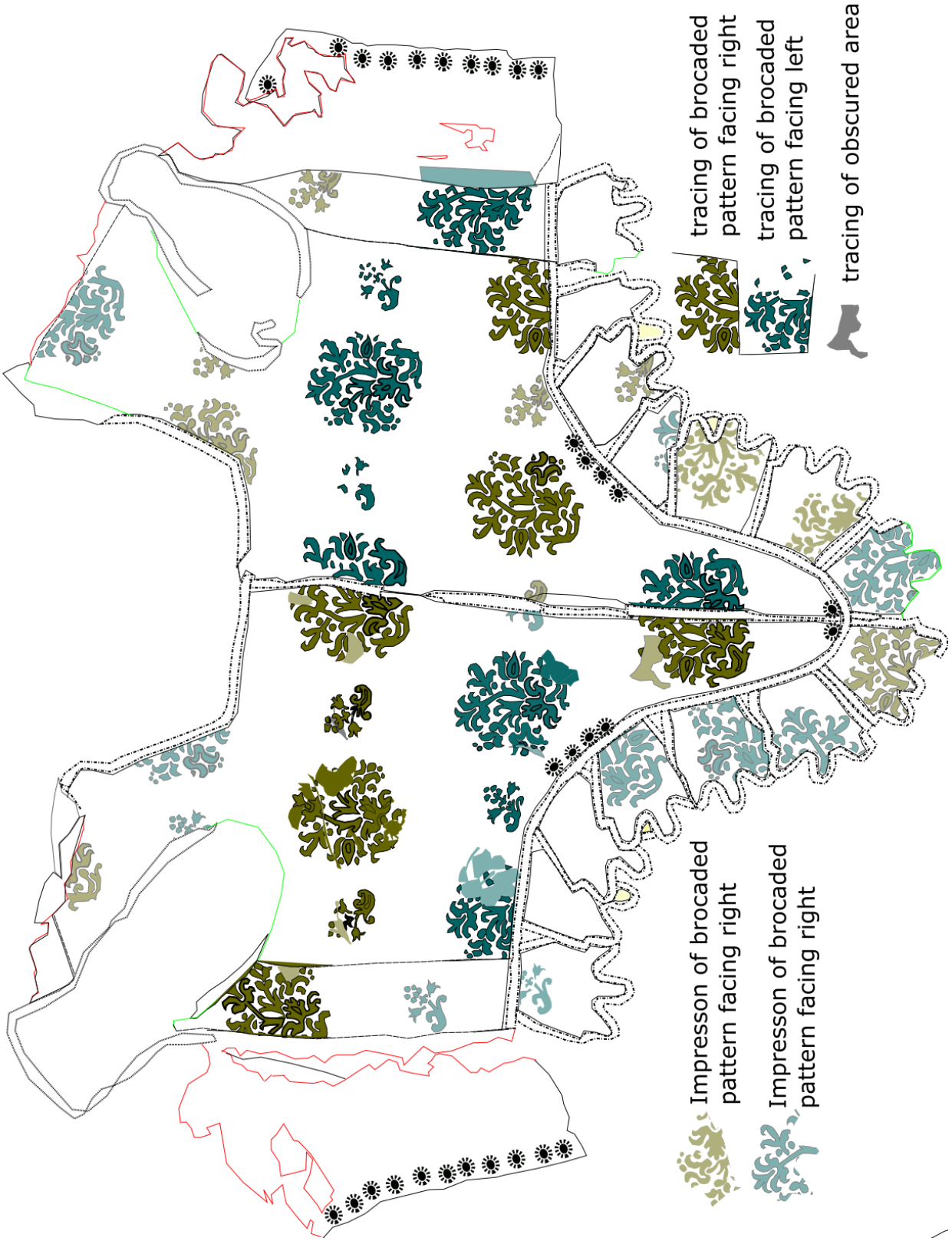
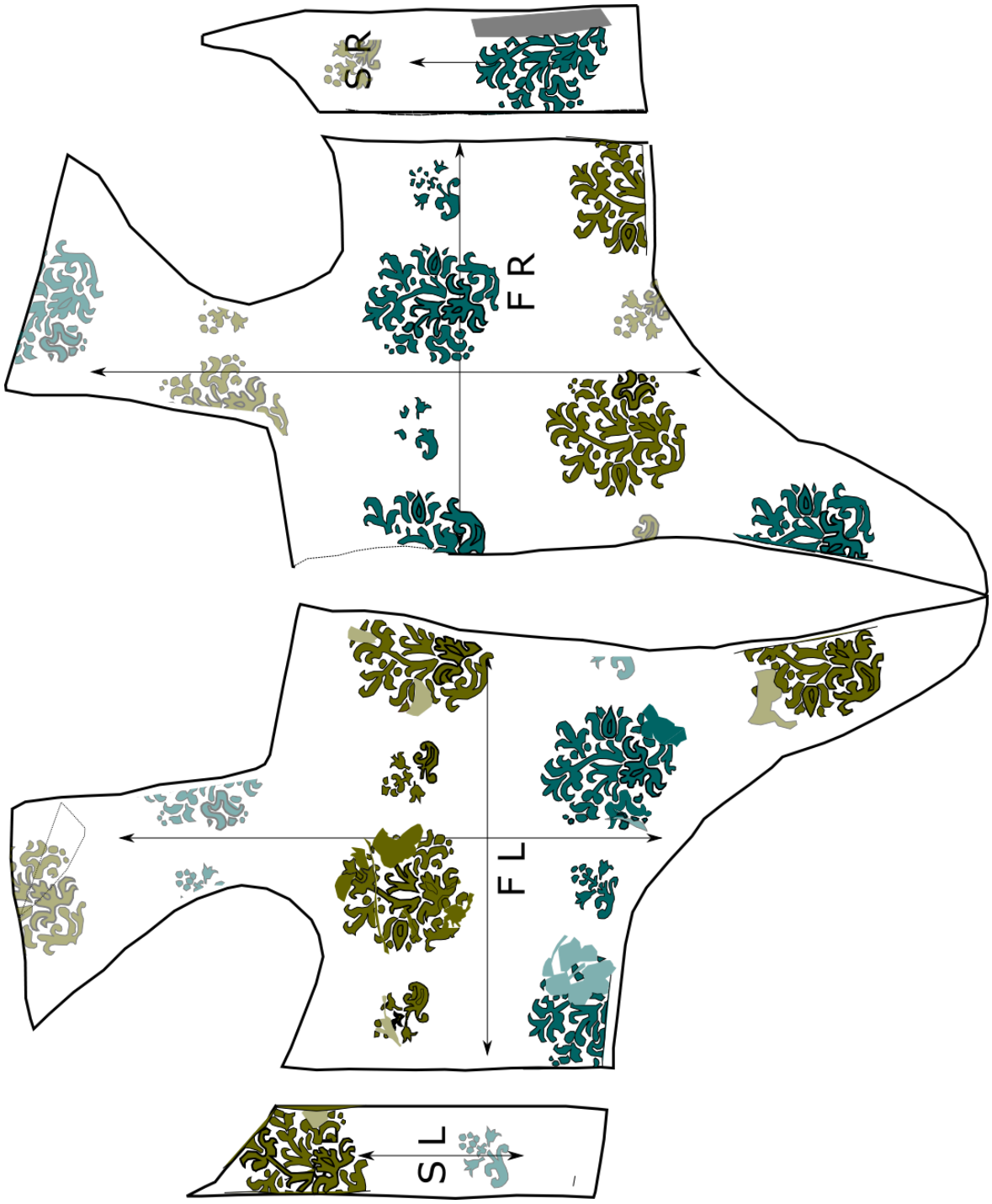
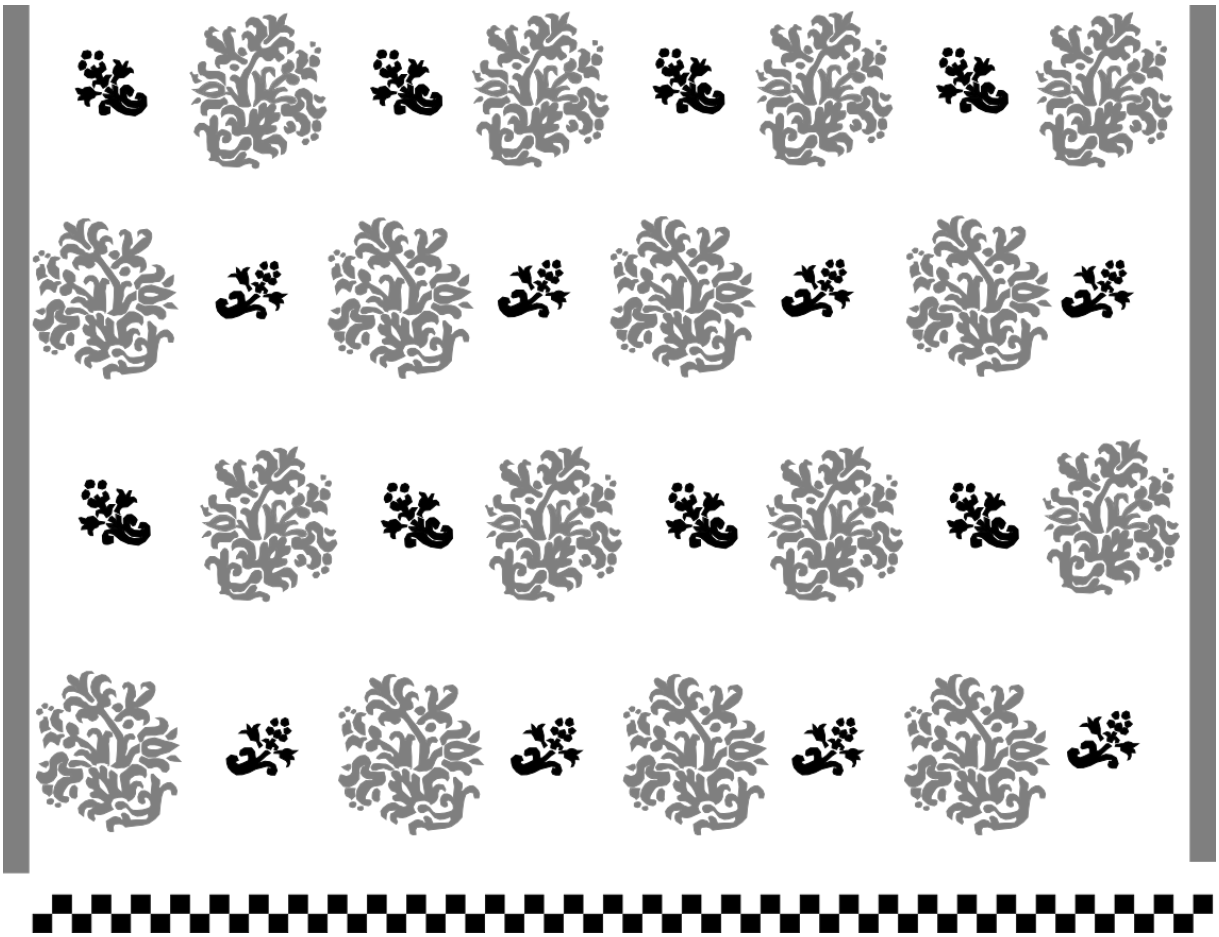


Figure III.5 Pattern pieces with brocaded pattern.



Patterns as traced and simulated from the photograph.

Figure III.6 Reconstruction fabric pattern.



Reconstructed textile pattern based on the bodice: grey lines on sides are selvedges - width of the original textile is unknown. However, the selvedges do relate to the pattern this way.

IV X-radiography images

Figure IV.1 X-radiography Object Overview (stitched by hand)

Figure IV.2 X-radiography Object Overview (stitched by Photoshop)

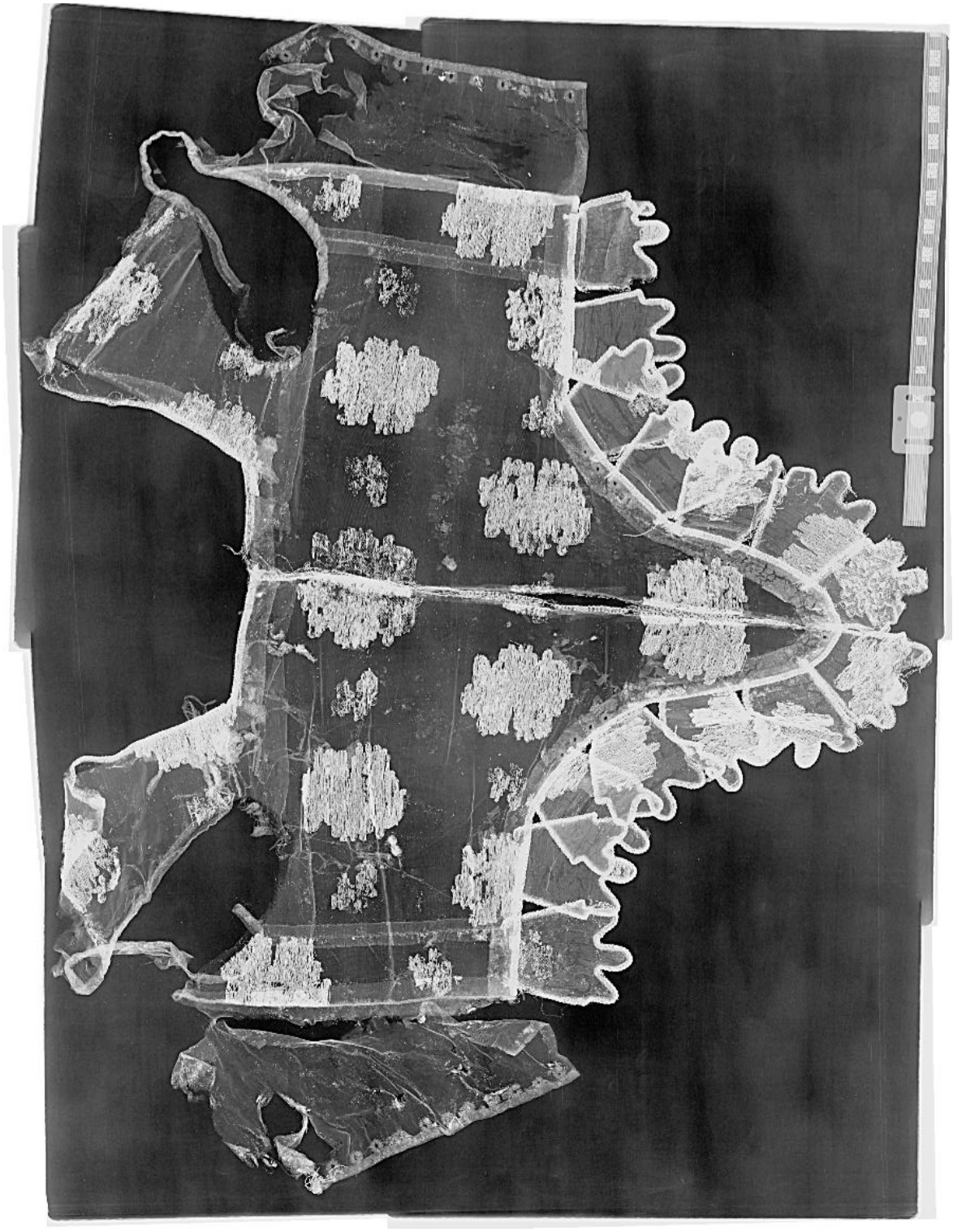
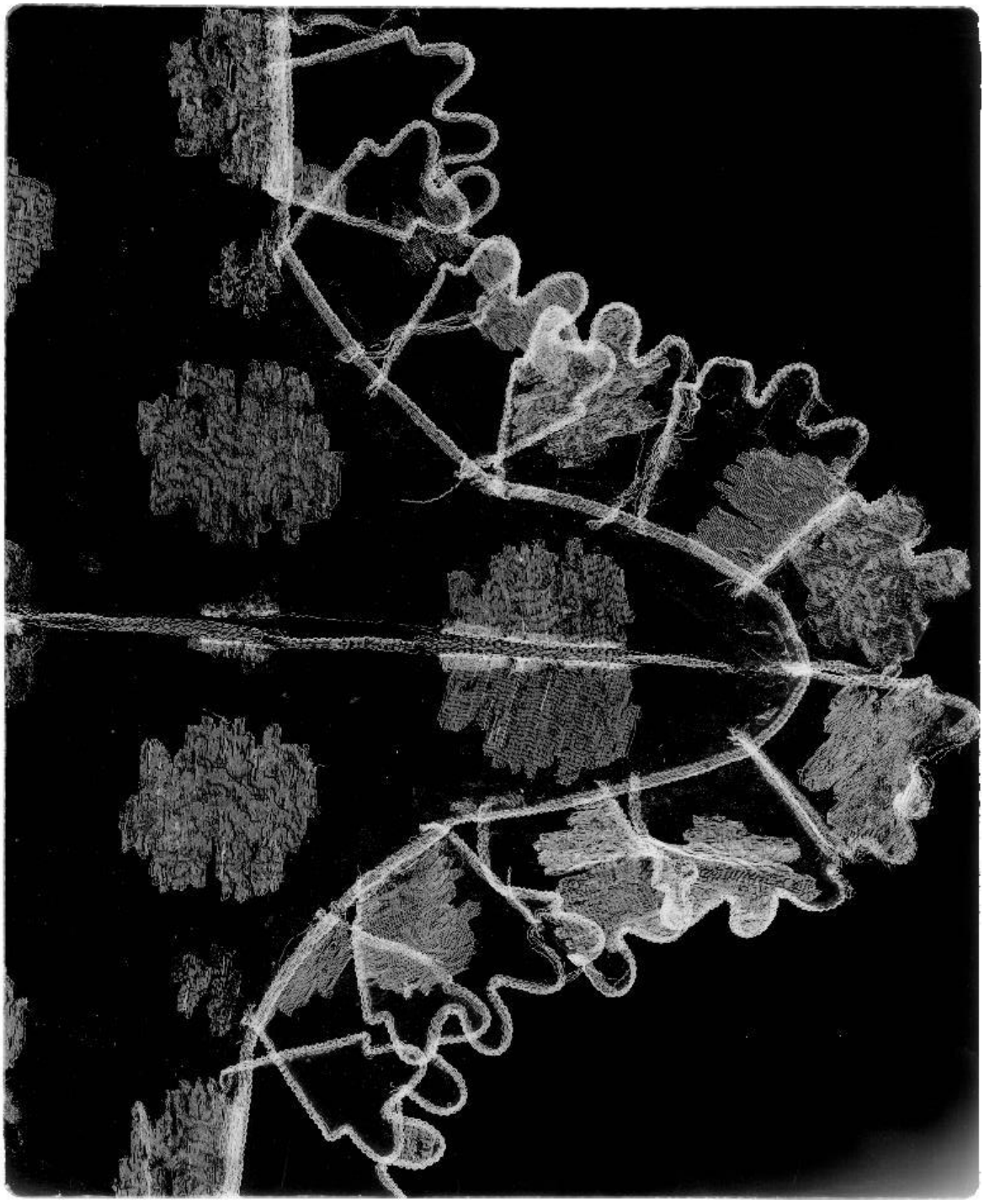
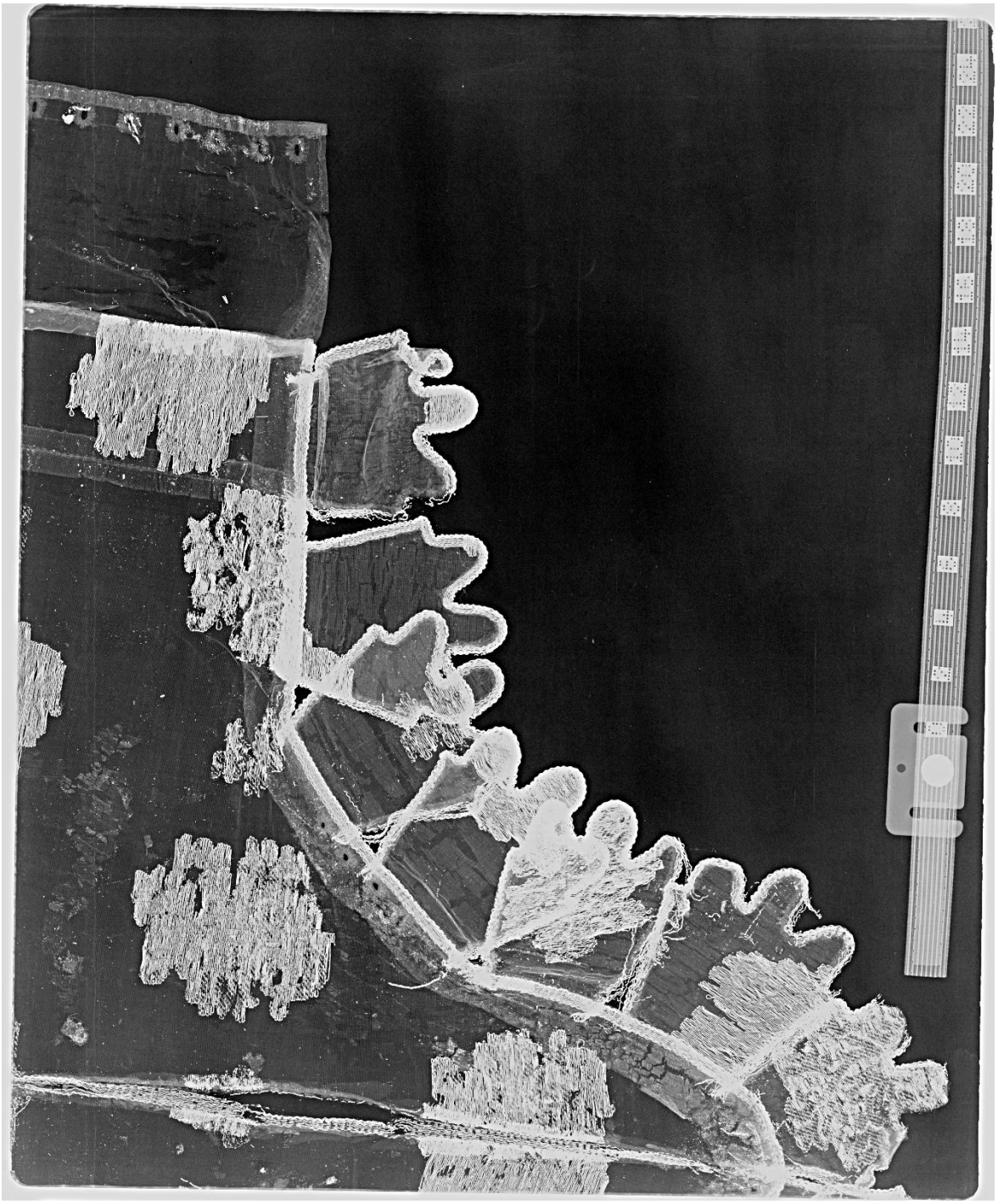


Figure IV.3 'Metal X-radiography'



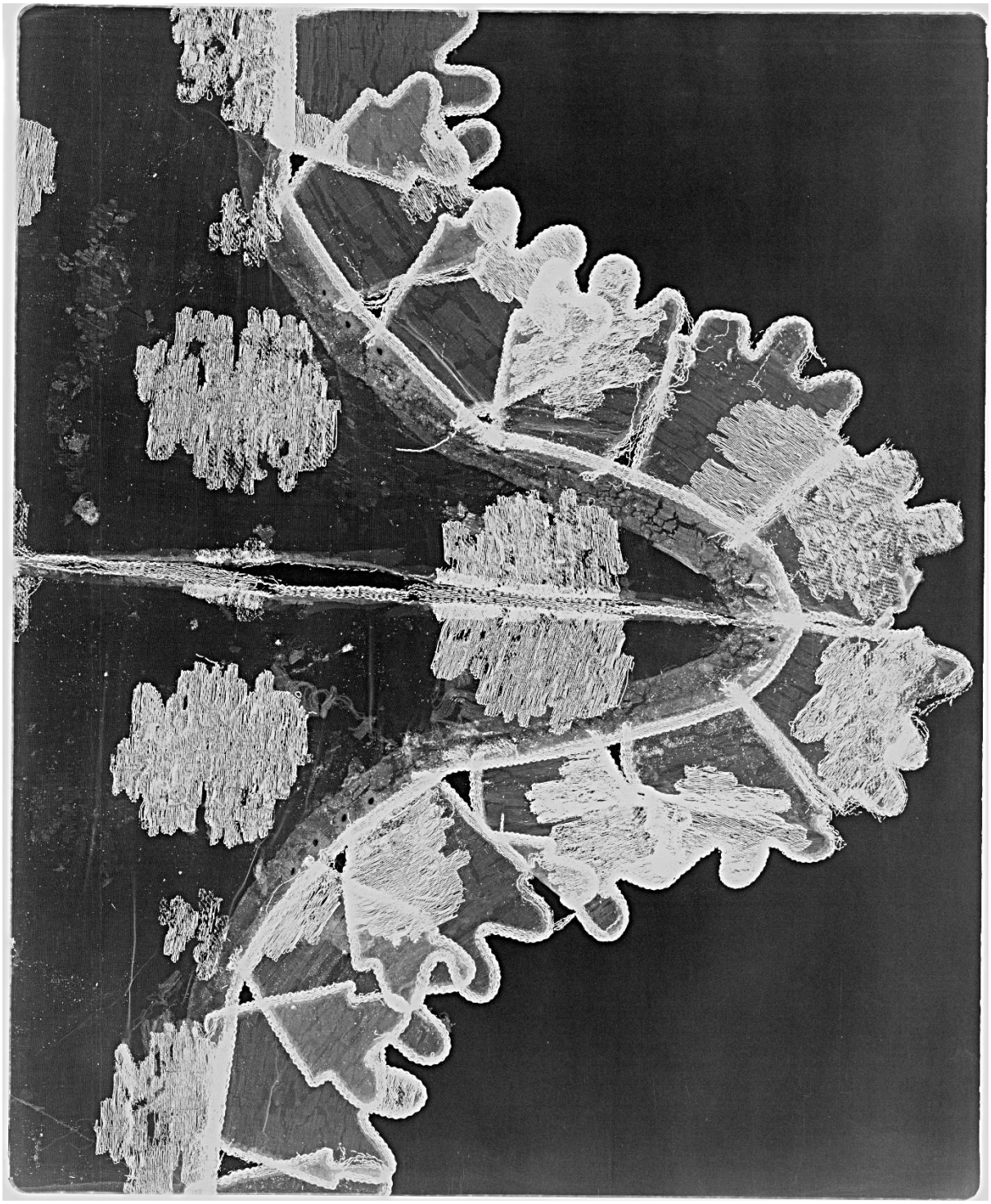
35 Kev, 1 minute exposure

Figure IV.4 Right bottom



10 Kev, 2,5 minute exposure

Figure IV.5 Center bottom



10 kv, 2,5 minute exposure

Figure IV.6 Left bottom

10 kv, 2,5 minute exposure

Figure IV.7 Left top

10 kv, 2,5 minute exposure

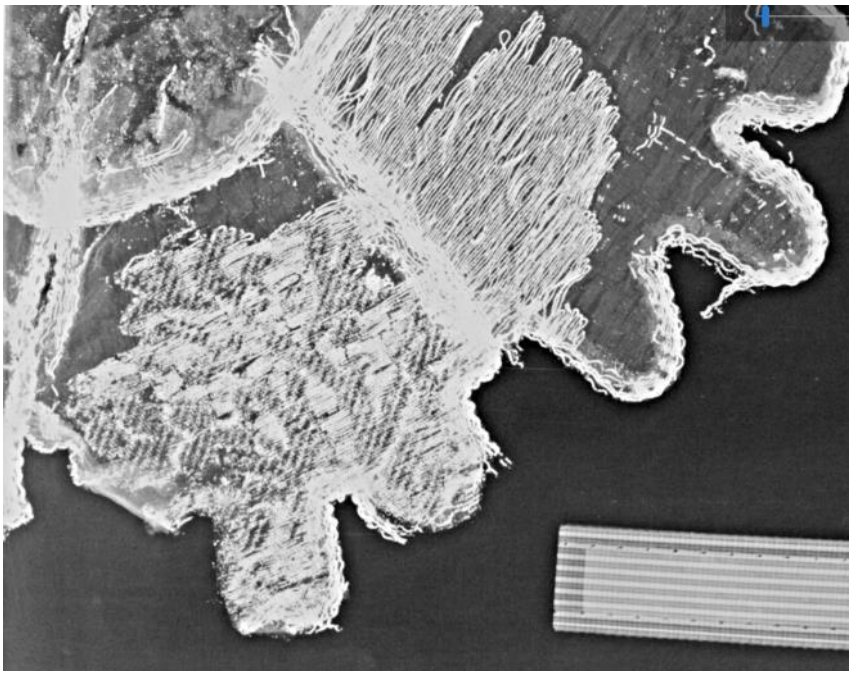
Figure IV.8 Middle top

10 kv, 2,5 minute exposure

Figure IV.9 Right top

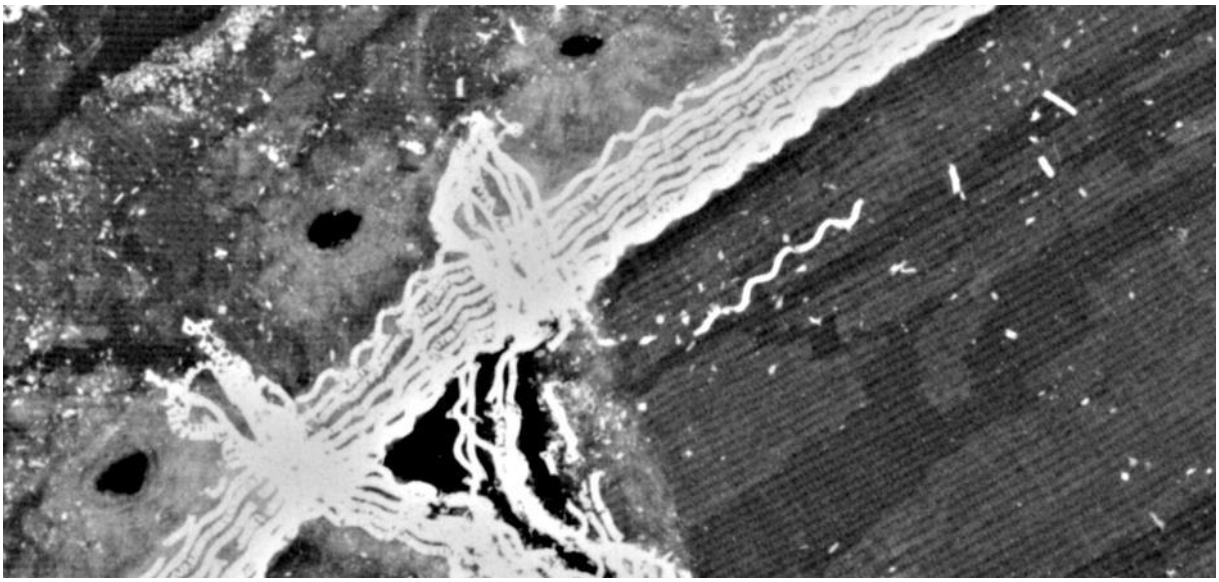
image 10 kv, 2,5 minute exposure

Figure IV.10 Detail flap 2L



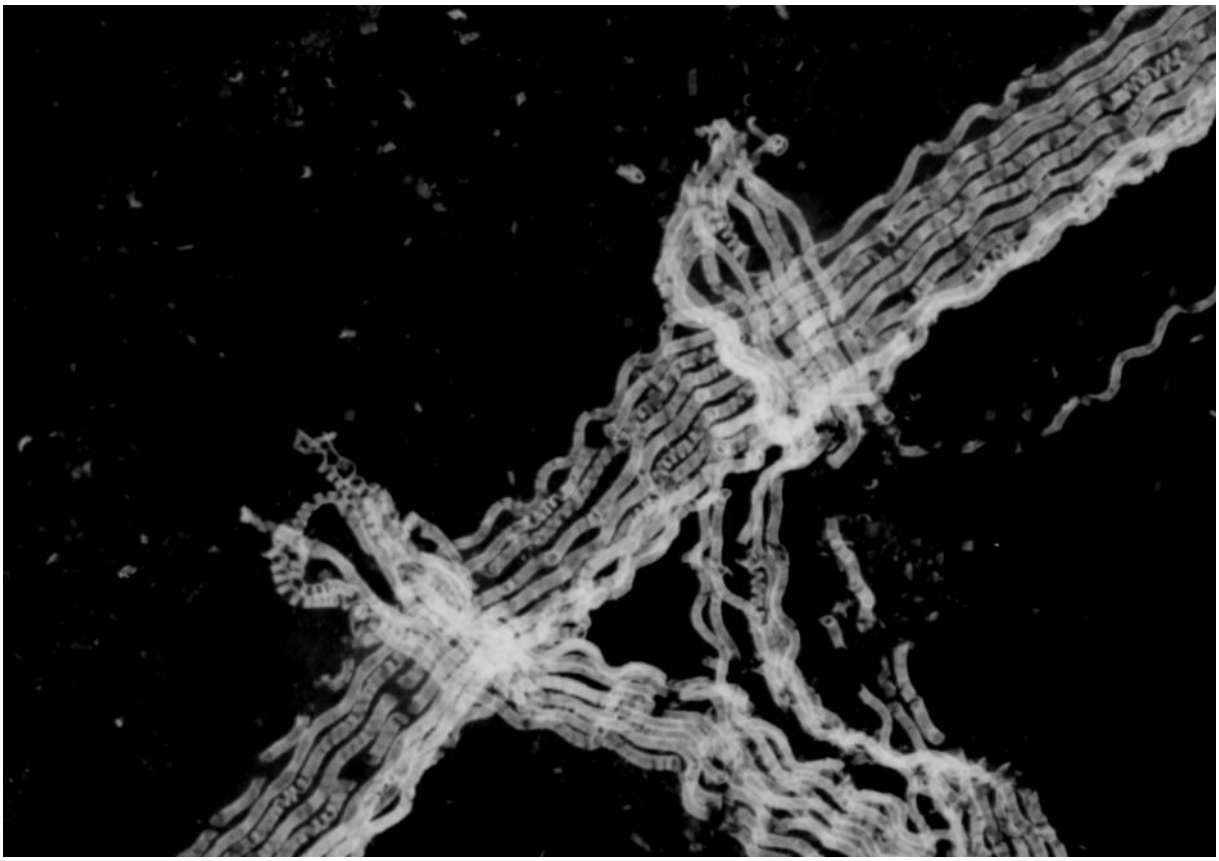
X-radiography detail of flap 1L 'Drawing in metal-thread section. flap 2 L shows 'healthy metal-thread weave

Figure IV.11 detail eyelets and re-enforcement flaps



Detail Eyelets and re-enforcement layers

Figure IV.12 Detail metalthread



Detail X-radiography 35 Kev Metal thread detail: it is visible that the threads are spirals, some of them coming apart

Figure IV.13 detail brocaded pattern

Detail of X-radiography Kev 35 metal thread detail of condition woven decoration

V. Derived Pattern

Figure V.1 Overview pattern parts.

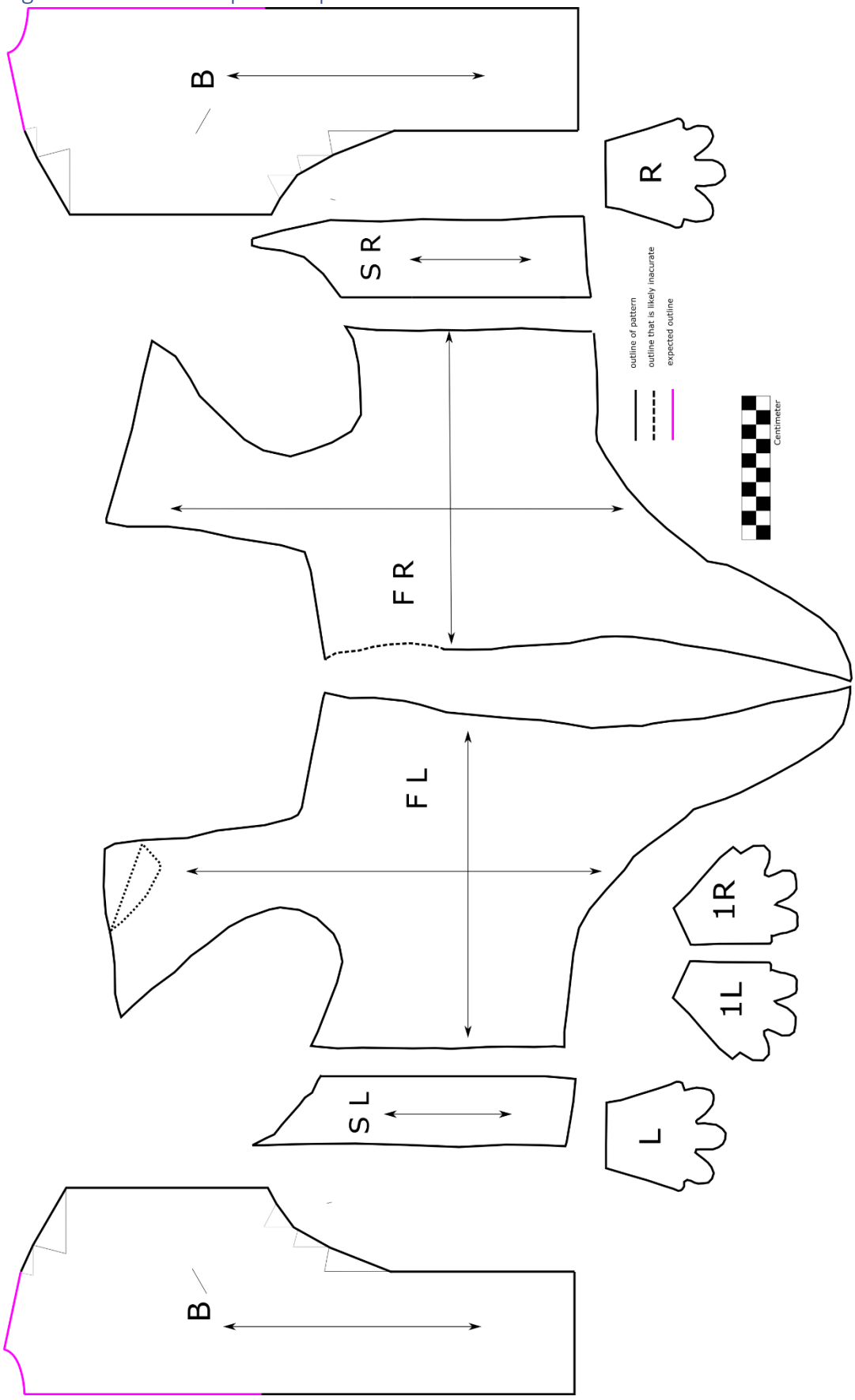


Figure V.2 Pattern FL Scale ½

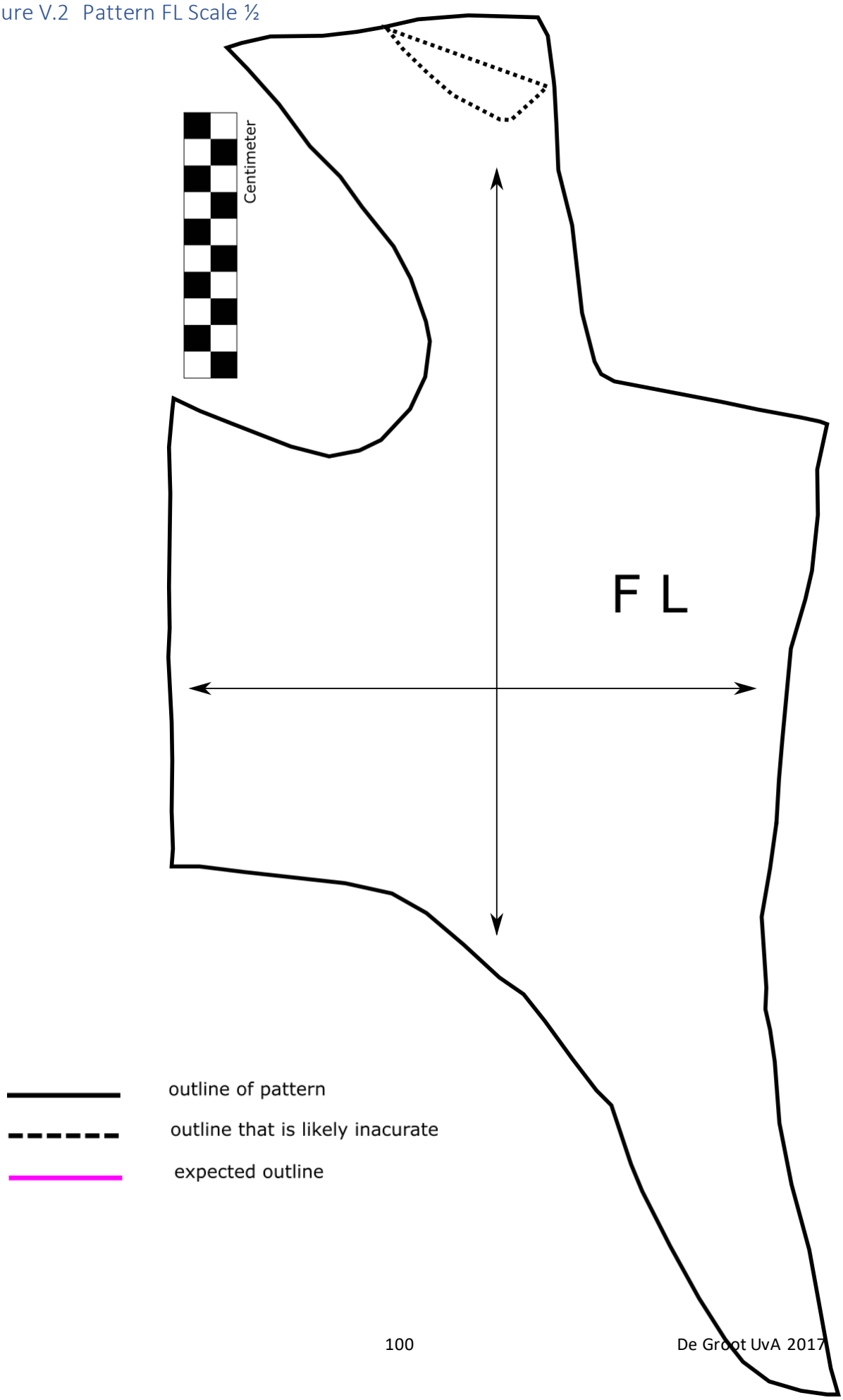


Figure V.3 Pattern F R Scale ½

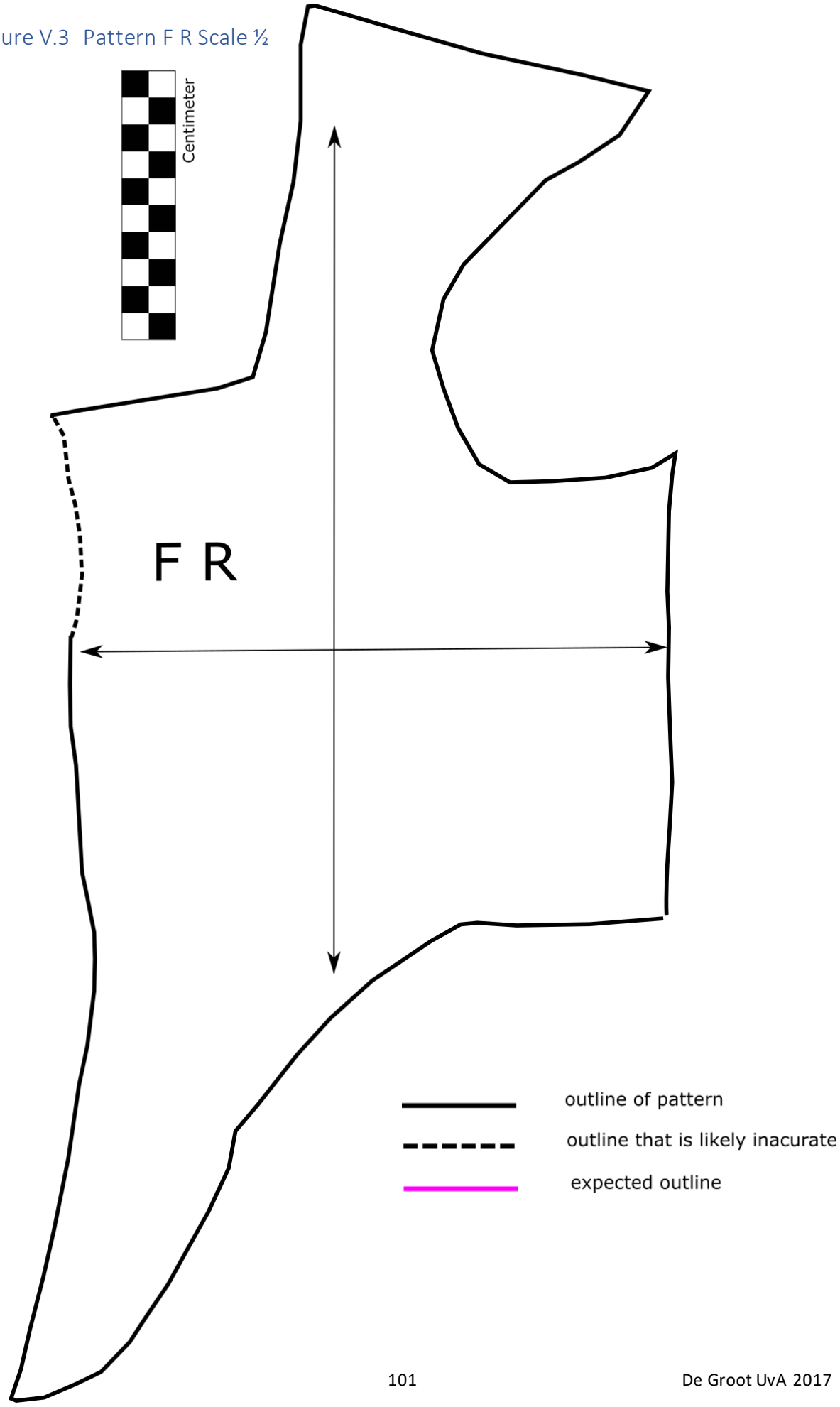


Figure V.4 Pattern SL, SR, 1L, 1R, L and R Scale ½

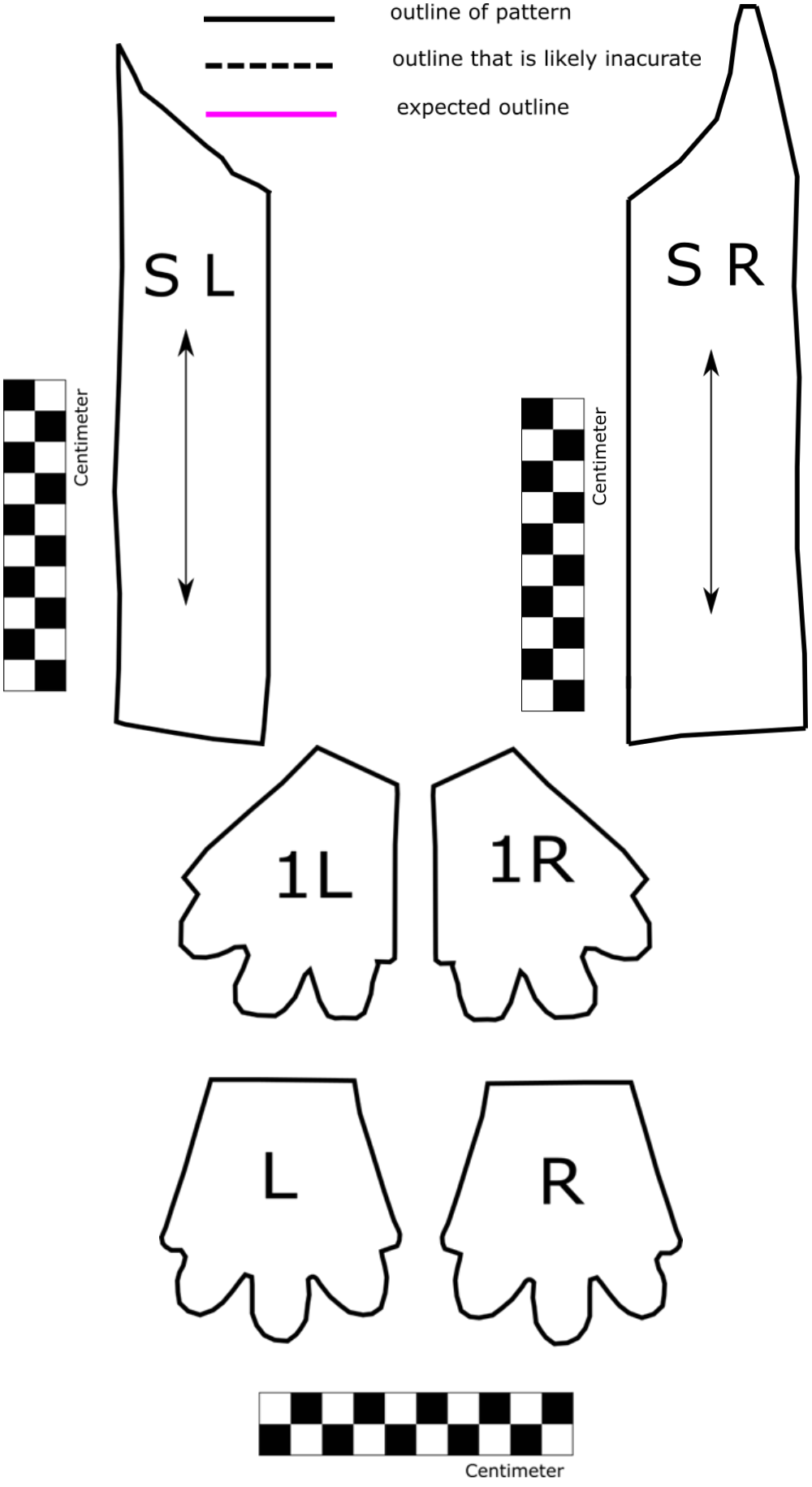
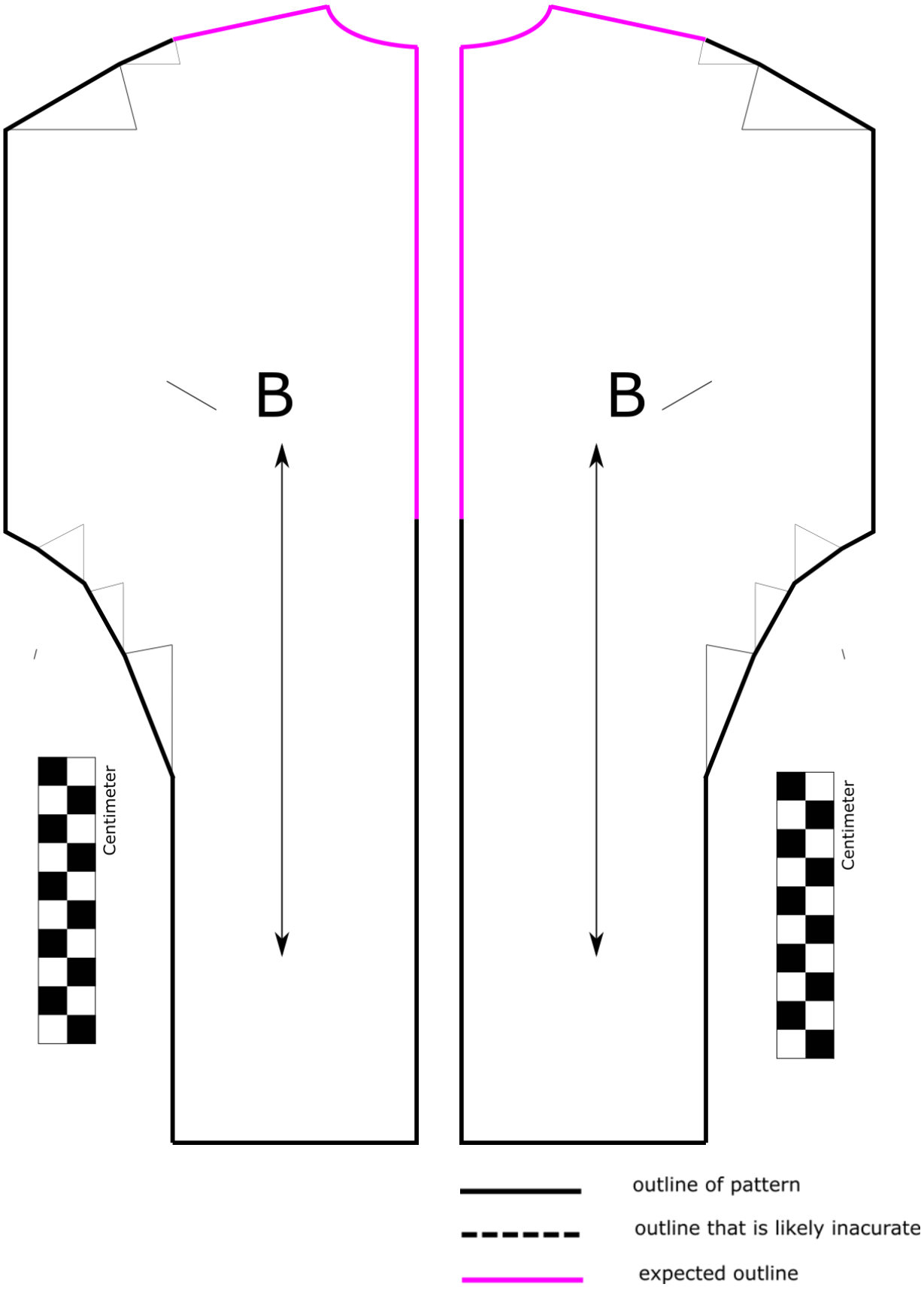


Figure V.5 Pattern B Scale ½



VI Paintings with similar bodices.

Content: Contemporary paintings painted in the Netherlands with similar bodices, were selected with the following criteria of similarities.[102]

a. No buttons in front but rather a mid-center seam decorated with a ribbon.
b. Floral motive in the tongues – 'leaves'.
c. Metal embroidery or damask weave in textile.

The paintings are listed according to the following structure:

Title or sitter on the painting and the year they lived. Attribution or painter. Date of creation. Location. Permalink. **Similarities (a, b, c)**

List of paintings

1. Portrait of Anna de Blocq (1593-1666) attributed to Jan Urbeijns de Salle. Dated 1624. Private collection. Permalink: https://rkd.nl/explore/images/177149 **Similarities b, c.**
2. Portrait of Auckje de Blocq attributed to Jan Urbeijns de Salle. Dated 1622. Private collection. Permalink https://rkd.nl/explore/images/173126 **Similarities b, c.**
3. Portrait of Pieter Gerritsz. Schaep (1570-1620), Margriete Pauli Hallincg (1570-1605) and Gerard Pietersz. Schaep (1599-1655). Salomon Mesdag. Dated 1623-32 Amsterdam, Museum Willet-Holthuysen. Permalink https://rkd.nl/explore/images/164288 **Similarities b, c.**
4. Portrait of Catharina van Heemskerck (1588-1670) Circle around Joachim Wteweal. Dated 1626. Private Collection. Permalink https://rkd.nl/explore/images/56185 **Similarities a, b, c.**
5. Portrait of Anna van Swieten (1603-1659) Paulus Moreelse. Dated 1625-1649. Private Collection. Permalink https://rkd.nl/explore/images/124962 **Similarities a, b, c.**
6. Portrait of a woman. Wibrand de Geest. Dated 1630. Private collection Permalink https://rkd.nl/explore/images/128318 **Similarities b, c.**
7. Portrait of Johanna van Heyst (1599-) attributed to Michiel van Miervelt. Dated 1627. Brussels, Koninklijke Musea voor Schone Kunsten. Permalink https://rkd.nl/explore/images/123362 **Similarities a, b, c.**

[102] The objects were found in the RKD database, RKDimages https://rkd.nl/nl/explore/images and RKDportraits https://rkd.nl/nl/explore/portraits

8. Portrait of Catherina Both van der Eem (1589-1666) Pieter Soutman. Dated 1619-29. Paris, Musée du louvre. Permalink https://rkd.nl/explore/images/218787 **Similarities a, b, c.**
9. Portrait of Clara van Hulten (1600-1671) Anonymous. Dated 1625. Antiquair villars. Permalink https://rkd.nl/explore/images/170151 **Similarities b, c.**
10. Portrait of Catharina van Voorst (1695-1650) Paulus Moreelse. Dated 1628. Minneapolis, Minneapolis institute of arts. https://rkd.nl/explore/images/166159 **Similarities a,b,c**
11. Portrait of Hillegonda van Baersdorp (1594-1661) Christoffel Lubieniecki. Dated 1600-24. Private Collection. Permalink https://rkd.nl/explore/images/127578 **Similarities a,b,c.**
12. Portrait of Maria van de Loo. Anonymous. Dated 1600-24. Location unknown. Permalink https://rkd.nl/explore/images/135485 **Similarities a, b, c.**
13. Portrait of an unknown woman. Pieter Soutman. Dated 1625-28. Saint Louis, Saint louis Art Museum. Permalink https://rkd.nl/explore/images/258405 **Similarities b, c.**
14. Portrait of a woman, circle of Nicolaes Eliasz. Pickenoy. Date 1603-1656. Location unknown. Permalink https://rkd.nl/explore/images/282906 **Similarities b, c.**
15. Portrait of Johanna Martens (1599-1639) Possibly Cornelis Jonson van Ceulen. Dated ca. 1650. Centraal Museum Utrecht. Permalink https://rkd.nl/explore/images/41424 **Similarities a, b, c.**
16. Portrait of Maria van Beveren (1585-?) Jan van Ravenstein. Dated 1613. Dordrecht, Dordrechts museum. Permalink https://rkd.nl/explore/images/39330. **Similarities a, b, c.**
17. Portrait of Maria de Bye (1597-1622) Michiel van Mierevelt. Dated 1620. Amsterdam Deutzenhofje. Permalink https://rkd.nl/explore/images/38928 **Similarities a, b, c.**
18. Portrait of a young woman with a leafy branch in her hand. Anthony van Dyck. Dated 1618-1620. El Paso The El Paso Museum of art. Permalink https://rkd.nl/explore/images/63392 **Similarities a, b, c.**
19. Portrait of a woman with fan in her right hand. Attributed to Nicolaes Eliasz. Pickenoy. Dated 1600-1624. Location unknown. Permalink https://rkd.nl/explore/images/61045 **Similarities a, c.**

20. Portrait of Geertrui van Engelstede (1584-1643). Attributed to Jan Urbeijns de Salle. Dated 1630. Leiden Hoogheemraadschap van rijnland, Rijnalndshuis. Permalink https://rkd.nl/explore/images/61176 **Similarities a, c.**
21. Portrait of Maria van Roubergen (1600-1662) Attributed to Salomon Mesdach. Dated 1626. Middelburg, Zeeuws Museum. Permalink https://rkd.nl/explore/images/126927 **Similarities a, c.**
22. Portrait of Maria Graswinckel (1600-1665) Anonymous. Dated 1637. Private collection. Permalink https://rkd.nl/explore/images/124491 **Similarities a, c.**
23. Portrait of a seated young woman. Anthony van Dyck. Dated 1618-1620. Unknown location. Permalink https://rkd.nl/explore/images/234152 **Similarities a, c.**
24. Portrait of a woman. Nicolaes Eliasz. Pickenoy. Dated 1619. Unknown location Permalink https://rkd.nl/explore/images/246418 **Similarities a, c.**
25. Portrait of a woman. Cornelis van der Voort. Dated 1619. Location unknown. https://rkd.nl/explore/images/196814 **Simalarities a, c.**
26. Portrait of Geertruid Overlander (1608-1634) Attributed to Nicolaes Eliasz. Pickenoy. Dated 1633. Amsterdam. Nederlands scheepsvaart museum. Permalink https://rkd.nl/explore/images/27973 **Similarities a, c.**
27. Portrait of Susanna van Someren (1609-…) Jacques Waben. Dated 1629. Hoorn Westfries Museum. Permalink https://rkd.nl/explore/images/13945 **similarities b, c.**
28. Portret van Janneken Hooft (1582-1642) Anoniem. Dated 1615-1624 Dated based on costume. Location unknown. Permalink https://rkd.nl/explore/images/213237 **Similarities a, b, c.**
29. Portrait of Jeanne de Planque (1591-1663) Pieter Dubordieu. Dated 1635. Philadelphia Philidelphia museum of art. Permalink https://rkd.nl/explore/images/180776 **Similarities b,c.**
30. Portrait of Eva Ment (1606-1958) Jacques Waben. Dated 1631. Location unknown. Permalink https://rkd.nl/explore/images/9251 **Similarities a, b, c.**
31. Portrait of Eva Ment (1606-1658) (after) Jacques Waben. Dated 1631 or later. Hoorn Westfries museum. Permalink https://rkd.nl/explore/images/13966 **Similarities a, b, c.**
32. Portrait of Grietje Adriaensdr Grootes (1588-1622) attributed to Jacob Waben. Dated 1622. Westfries museum. Permanent link. http://beeldbank.cultureelerfgoed.nl/alle-

afbeeldingen/detail/606ec69c-de48-11e6-836d-d89d6717b464/media/bebfaa80-6fed-4bf2-5c54-e08203d16044 **Similarities b, c.**

33. Portrait of Geertruid van Engelstede (1584-1643). Attributed to Jan Urbeijns de Salle. dated 1621. Enschede, Rijksmuseum Twente. Permalink https://rkd.nl/explore/images/13640 **Similarities a, b, c.**
34. Paulus van Beresteyn (1588-36) and his wife Caterina Both van der Eem with their six children and two servants. Pieter Soutman. Dated 1630-31. Paris Musee de louvre. Link http://cartelfr.louvre.fr/cartelfr/visite?srv=car_not_frame&idNotice=10365&langue=fr **similarities a, b, c.**

VII Checklist - 'Steps to understanding'

How to approach making a replica as developed and followed by the author- For Photography/X-radiography development and techniques see another appendix.

Step 1. Determine the different costume pattern pieces and name them for reference in the rest of the process.

Technique: It might be helpful to draw a loose schematic representation of the object, with the names with the different pieces. Example of names: F L (Front Left)

Step 2. Determine different layers present in the costume.

What function do they have? Ex. lining, fringes, finishing edges, support

- Are they cut into shape (do they have individual pattern pieces, or are they just cut to size like bias cut edges, ribbons, etc.)

Technique: Visual examination, inspection of photographs and X-radiography Images.

Step 3. Determine shape of pattern pieces:

What is the straight of grain?

- Are pieces on left and right the same?

Technique: Visual examination, identifying possible self-edges. Visual examination photographs and X-radiography images. Determination of pattern pieces' trough determining straight of grain digitally: image manipulation. Drawing pattern pieces from photography and X-radiography and layer or flip them to see if they are the same. Always consider inconsistencies due to limitations of photography, folds and damage.

Step 4. What are the construction/tailor techniques present?

What is made by thread? Seams, eyelets, etc.

- Which kind of stitches are present?

Technique: Visual examination, examination of photographs and X Ray images. Especially X-radiograph's help you follow the thread through different layers. Map different stitches and techniques on drawing.

Step 5. Determine what is missing

Rather than a last step this is a step that is taken throughout, and it is interpretive.

where are needle holes, folds and loose parts?

- How do these anomalies influence the object, condition and understanding?

Product:

Elaborate identification of object (step 1-2), visual indication of different pattern pieces and tailoring techniques. Clear indication of different missing parts and anomalies. A preliminary interpretation of the role of the damage and in the condition of the object, that will determine the focus of the further research.

VIII Collecting data without touching: Photography, X-radiographs

It is vital to determine what kind of object you are dealing with, a flat-lying object where only few areas overlap such as the Texel bodice have different problems and solutions. This method focuses on flat lying costumes.

VIII.1 Photography

1. Since the object is a flat-lying costume, there are two sides to consider, the front and the back. Ideally the object can be flipped between two plates of for instance foam board to make sure that the object stays in the same orientation when photographed from the front and/or the back. With taking photographs a few things are vital: considering the object as a flat object means that to see the object in the right perspective the camera has to be parallel to the object/the surface that the object is placed on. This is best done with an arm that allows the camera on a 'tripod-head' to be adjusted per millimeter to get the exact parallel shape. To check this a grid checkerboard grid can be placed to see if the lines and intersections are indeed parallel /90 degrees.
2. It is very important to be able to see all the details needed for visual inspection of photography instead of 'the real thing'. Details such as grain, sewing threads, should be captured in as much detail as possible. When it is not possible to get a clear image of these details when photographing the object as a whole separate overlapping photographs can be taken, and later stitched together. Always take a photograph of the object for reference.
3. Be sure to save keep the original files in Tiff or raw, though these files are very large, it is more work and more danger to the object when originals are not kept: consider that the object is harmed every time when handled for photography. Also make sure that the object is as straight as possible when photographed: everything that is adjusted/ turned after photography digitally will result in some kind of loss of the image.
4. Scales, checkerboards and color checkers can make sure the quality of the images and the information given is sufficient. However, when not adjusting

lighting, focus, positioning etc, it is fine to take a second picture without these attributes, because the information you need is the same in the other image.

VIII.2 X-radiography

One of the advantages of x-radiography is that you record a direct impression of the object. For that reason, the registration is 1:1. The process of X-radiography is different than that of digital photography: it's, depending on the machine available- a very physical process. The film has to be put under the object to absorb the X-rays are 'fired' on the object. For the object of this project 6 separate films and images were made to have enough overlap for stitching afterwards. Unlike photography the taking of x-radiography images are done with or by an expert on the technique. It is very important to realize what information is relevant and obtainable for your particular object. Exposure, voltage and adjustment all work together to create the most relevant/readable object. However, below are some tips when carrying out x-radiography or evaluating whether or not it is relevant as substitute of the object.

1. Make sure that the whole object is imaged, to identify, compare and measure pattern pieces it is very important to indeed have all the different pattern pieces and not just one sample image.
2. For the sake of pattern extraction replica making and construction identification it is very important to be able to identify straight of grain, different layers and stiches present.
3. When dealing with metal thread in the weave of the textiles it is very important to consider these are much heavier than the other materials present. For this reason, they will show up very bright, while other layers below them will be invisible. To see the metal threads separately you might want to have a different voltage than for the fabric.
4. Take photographs of the object when the image is made: since the film is put under the object the object can move a little bit, resulting in slightly different results in the X-radiographs. Similarly folds and anomalies are important to capture in photography to compare the X-radiographs to the actual object to see what are anomalies only

seen in X-radiographs and which can be easily explained by looking at the object (holes, folds, etc)

IX Digital manipulation of images to gain information about pattern pieces.

When considering using images rather than the physical object to obtain patterns and other information it is very important to realize that both knowledge of the behavior and ground rules of textile and computers are very important. Pixel based programs such as Photoshop and The GIMP (open-source/free version of Photoshop) and Vector/drawing programs such as Illustrator and Inkscape (open-source version of illustrator) can be used to work with these images. The main difference between pixel based and vector based programs is that the pixel based programs allow manipulations of the pixels that are found in these digital images. The vector-based programs on the other hand are more concerned with shapes, they allow you to draw lines which then can be infinitely enlarged without getting blurry. Both programs have specific possibilities and impossibilities that can be worked around by combining the two. For the understanding and drawing of objects and pattern pieces Illustrator or Inkscape is best.

Products

- Overview drawing of different pattern pieces and tailoring techniques, layers (photography)

1. Based on the photos, either front or back the basic outlines of the photo can be traced from the photo. Method: Open the photograph as the first layer and trace the lines present. Make a distinction between outer lines for the shape and for instance edges of ribbons, eye-lets. Also the names of pattern pieces can be included.
2. Front and back photography may show different damages and layers, these can be indicated in the drawing.
3. When illustrative use images to indicate damages, or special features such as self-edge.

Method: Inkscape line drawing. Documents are exported in the PNG format, a lossless format that allows an alpha, see through channel to exist. These images can also be saved in pdf format.

- Comparing, measuring pattern pieces

1. As indicated before X-radiography images are a 1:1 representation of the object. Additionally, layer build-up and seam allowances are visible, and can be identified. Similarly overlapping pattern pieces that are only partly visible on the photographs can be identified on X-radiography images. This makes it especially useful for measuring and comparing pattern pieces. In a vector based program pattern pieces are traced, preferably saved all in a different layer. Names of layers are added in the image. To compare the different pattern pieces the pattern pieces are put in the same direction (turned when in a different orientation or flipped when relating left-right) and layered. In this way, it becomes possible to see similarities and differences. It is important to notice that we here still work with an object that is not entirely flat: curves and folds might distort the image. Also, it is important that since the object is one-of-a-kind, minor differences can be due to the fact that the object is handmade rather than that different patterns are used. Similarly, it is not a rule that left and right pattern pieces are indeed the same but mirrored: Each human being is non-symmetrical and for that reason costumes are often not symmetrical as well.
2. For measuring pattern pieces, programs such as Inkscape allow measurements to be made with a measuring tool. Here you can measure between two points (with a straight line) in cm, mm, inch etc. However, it is important to realize that these measurements do not always 'make sense' before the determination of the modern measurements local measurements were used.

IX. 1 Creating a 'Straight of grain' image

In tailoring and garment making the straight lines, also called straight of grain are vital to keep in mind. Textile especially when it is woven in a plain weave will not stretched when pulled in the length of the width of the fabric but it will stretch diagonally. Bias cut garments and textiles behave very different than non-bias-cut fabric. In general, the straight of grain is found in the longest length of the pattern piece. A pattern is always created on the basis of straight of grain which is the vertical axis of the pattern. When straightening the natural grid of the warp and weft a reliable pattern can be made. This can be done digitally. What is vital is that the straight of grain is visible digitally, something that is often the case with a plain weave but is much more difficult to find in satin of damask.

1. For various reasons on photographs the straight of grain is not necessarily straight when comparing it to a grid. In image manipulation programs such as Inkscape it is possible to

create a grid, to which you can relate the image. The best result is gained when just the particular pattern piece is adjusted to this grid. In the case of the flat-lying flaps of the Texel bodice this would be enough to determine the orientation of the pattern to the textile. However, when dealing with more complex and distorted fabrics such as the front panels more steps are required. The image then is cut in separate parts that have the same straight of grain, each of these separate pieces are adjusted to fit in the new grid, while carefully matching the overlapping areas in the weave.

2. Drawing the new outline of the pattern piece and adjusting where necessary. Although it is possible to straighten the image sections that show the straight of grain of the fabric some areas might still be difficult to interpret due to distortion. A good way to complete these area is trough comparing it to the mirroring pattern piece, for instance in the case of the Texel bodice the neckline area was very hard to interpret because F L is folded over F R, since F L for that reason can be fully seen the pattern piece was mirrored and the F R adjusted according to the image.
3. In the case of overlapping pieces to create a reliable pattern use can be made of the x-radiography images that do show the complete shape of the different overlapping parts.

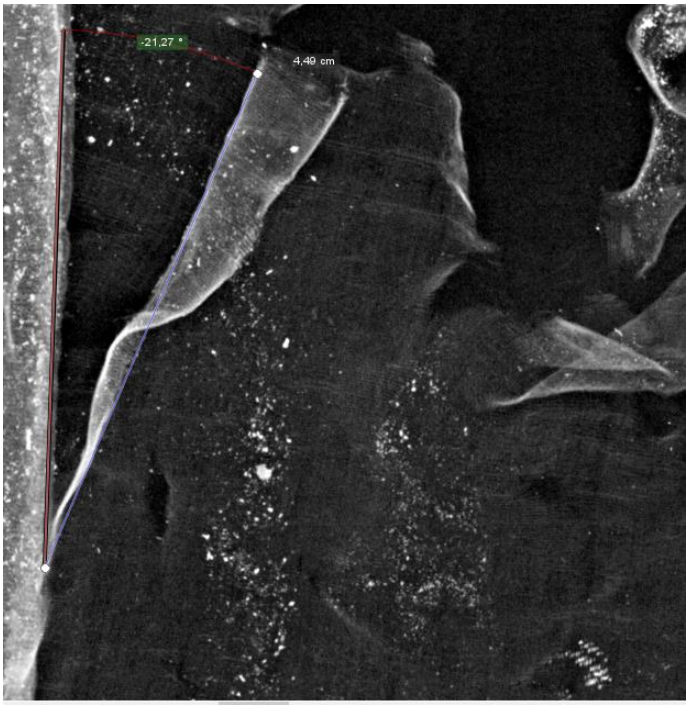
XI.2 Reconstructing a pattern- using straight of grain

The back panels of the Texel bodice are very damaged and the shoulder pieces entirely missing. The fabric is very distorted which makes it really hard to read. Unfortunately, because the fabric is a damask weave using the photograph based method for straightening a pattern piece as previously discussed is out of the question. Since either back panels have extensive but different damage a reconstruction of the pattern piece was created based on the evidence that was still retrievable from either side. This method was also based on the rule of the straight of grain, however, instead of using the straight of grain found in photographs the straight of grain in x-radiographs was found. The following steps were followed:

1. Measure what is available: the side seams, shoulder seams etc. For the Texel bodice these and the left over piping was measured, since that indicates the original length of the armhole. Similarly the size of the the back piece such as the waist width was measured
2. Determine the straight of grain:
3. Damask and satin are very difficult when it comes to determining the straight of grain. When the handling and manipulating an object it is not possible, every method

that is that ís available to us, no matter how small, is very important e.g. finding the straight of grain in a x-radiograph. In the Texel x-radiographs it first seamed that the x-radiography was not very useful, however, it turned out that the straight of grain of the damask was visible when viewed on the highest resolution. It was clear that the outside seam of the back panel which features the eyelets was straight of grain.

4. Determine where the straight of grain changes. The first 12,8 cm the straight of grain of the Texel bodice was followed by the seams on either sides, determining that the bottom of the back panel was close to a rectangle. However, after this first 12,8 cm, this started to change: the straight of grain went around the corner.
5. Measuring the angle of straight of grain in Inkscape. Inkscape has a tool that both allows you to measure straight lines as well as angles. To identify the shape of the bodice the angle of the straight of grain that was 'added' was measured, depending on the regularity of the add in measurements from 4,5 to 1,2 cm. one of the arms follows the straight of grain in the fabric while the other follows the edge of the fabric.



FigureXI.11.1 Example of 'added' grain and the angle that is identified

6. This measurement can be translated to a triangle, where one side follows the straight of grain and the other shows the angle added. In the case of the Texel bodice this triangle could be placed 'on top' of the already know triangle, showing the bend in the pattern.

7. The following triangle or angle is identified: starting with the end point of the triangle on the side where the fabric is added, following the same steps. This triangle can be added to the pattern by placing it like it measured: with one side following the determined straight of grain, the other indicating the added allowance, see image as example.
8. Compare what you have found with similar patterns from comparable objects. For instance garments from the same era and silhouette can identified whether the shape you find is common or not. Similarly test what you find: does the reconstructed pattern piece fit with the object, does it give it a better shape, or rather does it cause strain? To find out experiment! Make a half or real size test garment that helps identify whether your prognoses is accurate or not.

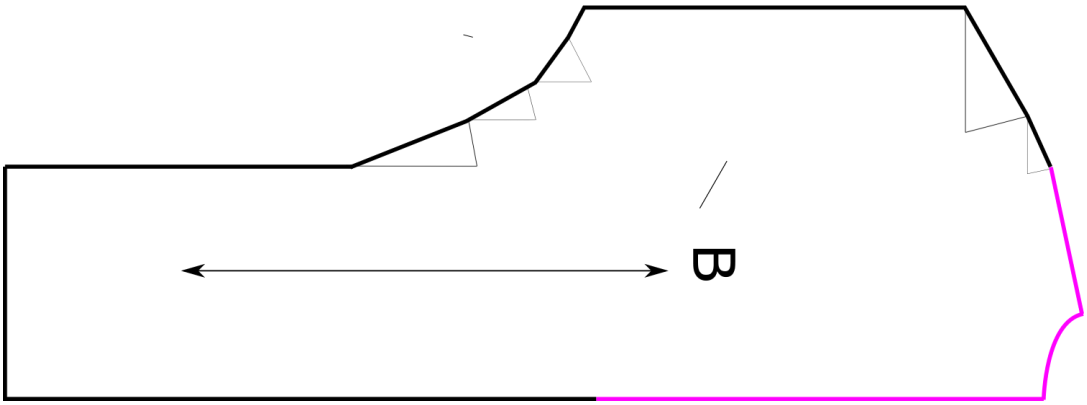


Figure XI.2.1 triangles used for the reconstruction of the back panel

X. Construction and attachment as seen in paintings

When looking at the painting of Aletta Hanemans painted by Frans Hals in 1925 we see a similar design too the bodice, in that sense that it too has a metal thread decorated bodice with separate 'flaps' bottom of the bodice. Here we see a different use of the eyelets in the front of the bodice, the golden chain is attached to this front. It is clear in the painting similar to the Soutman bodice that the skirt does not necessarily fully support the bodice: a shade is seen in between the bodice and the skirt, yet the bodice stays firm. This suggests that the bodice was a very inflexible object. The particular bodice that Aletta Hanemans is wearing is a wedding bodice or 'Bruidsborst'. This was a golden decorated bodice with in the decoration several references to marriage. Although the Texel bodice is clearly less richly decorated the overall view is similar. Here again the bodice is worn with a ruff, leaving it unclear how the neckline was.

The painting of Grietje Adriaansdr Grotes is quite dark and the construction of her dress is only seen when finished with a gold braid, however, this painting does show something quite interesting aside from golden trims, Grietje has golden tags on the ribbons that connect her *vlieger* to her bodice, and in this way, we find a clue how the bodices and *vliegers* were attached.

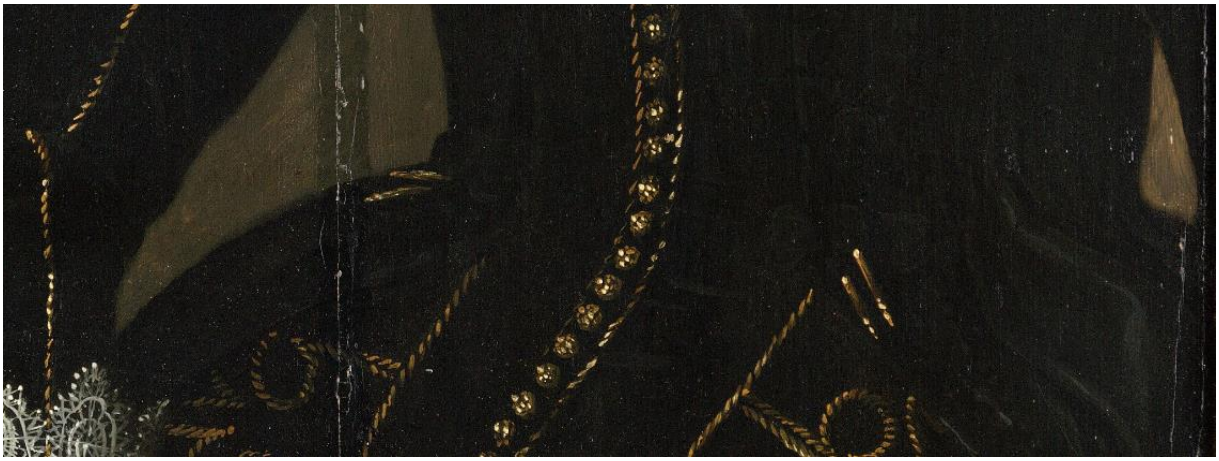


Figure X.1 Detail of Portrait of Grietje Adriaensdr Grootes (1588-1622) attributed to Jacob Waben. Dated 1622. Westfries museum. Dimension unknown.
http://beeldbank.cultureelerfgoed.nl/alleafbeeldingen/detail/606ec69c-de48-11e6-836d-d89d6717b464/media/bebfaa80-6fed-4bf2-5c54-e08203d16044