

Props - Replicas - Costumes

VAULT 111 SUIT TUTORIAL

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This is a new vault 111 suit specific version of my tutorial for bodysuit customization.

Check out the video build log by SnarkyArts. First video: https://www.youtube.com/watch?v=OhoMhf8VuY4

Please note that this tutorial is not perfect. If you're missing something or would like to see something described in more detail, please let me know!

The tutorial covers the following topics:

- 1. Description of the pattern creation process
- 2. Cutting & preparation of the main suit pieces
- 3. Sewing the suit (difficult parts)
- 4. Preparation and application of the stripes, numbers, collar, trim
- 5. Attaching the silver applications

How to read this: The tutorial is supposed to be followed from start to end. However, you may want to know the general direction beforehand, so make sure to read it from start to end at least once BEFORE you start! (Also, this is not for beginners (sorry). Knowledge of some sewing and pattern making technique is presumed). The most relevant information is described in the captions.

Additional information, if necessary, will be posted into the comment section of the concerned picture, so please make sure to check it out if you're missing some information. If anything is still unclear, please post your question directly to the picture, I am following this album and I will do my best to answer every comment.

You will need the following materials:

- Blue interlock jersey (you can use single jersey but it's not the same) (2,5m / 2,8 yds)
- Blue stretchy mesh (soft tulle) (2m / 2,2 yds)
- Stretchy padding (15cm / 6")
- Gold fabric, preferably at least a little stretchy, something like vinyl covered fabric/fake leather (50cm / 1'8")
- Dark brown fake leather for the collar (at least 20cm / 8")
- I also use it to reinforce the gold parts. In this case you need 60cm / 2')
- 500m / 550yds blue thread (at least! better get some more)
- Some dark golden/light brown thread
- Round rubber cord for the seams (12m / 13yd)
- 6mm (1/4") rubber cord for the "cable" (50cm / 1'8")
- Silver application thingies (I got mine from Deadbeard props :))
- Water-soluble spray adhesive (optional but very, very helpful)

*Plase note that all quantities are for a female with 162 cm/5'4" and 65kg/143 lbs; assumed fabric width is 1,6m/1,8yd fabric. For a male, 180cm / 5'11" and 90kg / 198 lbs you will need around 3m / 3,3 yds of jersey and 2,5m / 2,8 yds of mesh. Expect to use more of the other materials as well.

THE FINAL FORM





PATTERN CREATION PROCESS

Start by finding a suitable starting point. I started with Yaya Han's bodysuit pattern and I can really recommend using it. There are patterns for female and male suits.

I used the version with legs and a zipper in the front (there are 4 versions: with or without legs and with the zipper in the front or back)



Sew your starting point. Use material that's similar to the one you intend to use for the actual suit, at least the stretchyness! Make all adjustments to this suit until it fits perfectly. If necessary, add darts or gores. Don't worry about the seamlines, they will be changed anyway.

This pic shows my "finished" bodysuit. I was too lazy to make both legs as I need only one anyway. I do strongly recommend sewing it completely!

Yaya's patterns include very good and detailed instructions. If you haven't ever sewn a bodysuit, I recommend sewing the starting point suit instead of buying one.

Mark the new seamlines on the finished suit. If possible, have somebody help you draw the lines while you're wearing the suit! If you're working alone, put the most important marks and directions while wearing the suit and draw the lines afterwards. If you do that, put the suit back on after drawing the lines and check if the lines are still correct!

To ensure symmetry you only use one side. But you can draw on both and decide afterwards which one to use.

When you're finished, put a number in every pattern piece and take pictures from every side! That will help you to put your suit back together ;-)

The female and male versions are a little different. Be sure to use the appropriate template picture (do not copy this pic - I marked male lines here but the suit in this album is female).



The most notable differences:

- The front center panels on the male suit are wider than the female ones.
- The male suit does not have the cross seam on the bodice side panels under the sleeves.
- The female suit has a round seam around the butt. Do not skip it. It makes a great looking ass.
- The butt seam on the female suit doesn't go up to the belt, it only reaches the round seam. The panel above is only one for both sides, just like the bodice back panel.

A few tips for marking the vault suit:

- Mark exactly where the golden belt will be. The belt is approx. 6cm wide. Then draw a line 1cm above. This line above is the line where the upper and lower part of the suit connect! The belt will be completely on the pants part. It's easier that way, trust me.
- Also put marks where to put the loops for the cable and where the golden stripe will run around the neck.
- The front center panel (the quilted one in the middle) is NOT cut at the belt line. It remains whole.
- Mark exactly where the collar ends on top. The vault suit collar is shorter than nearly every other collar. Mine in this pic is too high and folded. It should be short and standing up.
- On the collar there is a little flap across the front (on the right side when wearing). It's best if you sew a small piece onto the starting point suit and mark it with the rest of the collar!
- Most pattern pieces will be cut out symmetrically, so you only have to mark to the center lines. The flap on the collar is the exception, this means you will have a right and a left front center piece.

You can either cut your suit up and transfer the pattern pieces to foil or paper OR you follow this tutorial (which I recommend):

http://www.instructables.com/id/How-to-Copy-a-Garment-that-Fits-Perfectly-Without-/?ALLSTEPS

Divide the pattern into top and pants part at the line you drew above the belt.

Do not copy the belt and the other stripes, they will be applied on top, we will make the pattern pieces later on the finished suit. But do put the marks on the pattern pieces where to position them.

If you cut, transfer the new pattern to tracing foil or paper. I prefer foil because it's clear and doesn't get torn as fast as paper. Lie the pieces down with the right side on the foil. Pay special attention that the seams are flat and the fabric is not stretched. Cut off seam allowances before transferring the pattern.



If you use the tape-method copying is good practice but optional .



This is my legs part, taped version.

To recap my preferred method:

- Make a well-fitting bodysuit, e.g. using Yaya Han's bodysuit pattern. Make sure it is made of fabric that stretches similarly to your vault suit fabric. Note that all mesh-covered parts will stretch a little less than jersey alone.
- Put it on.
- Draw the desired seamlines on the suit while wearing (ideally let somebody do it for you)
- Copy the individual pieces. You can so so by copying directly onto tracing paper/foil; by cutting up the initial bodysuit (and then copy to tracing paper); by using my preferred method described here: http://www.instructables. com/id/How-to-Copy-a-Garment-that-Fits-Perfectly-Without-/

For the blue I chose interlock jersey, because it's thicker and more robust than spandex, yet stretchy enough. But it will work with any 4-way stretch fabric.

The golden fabric looks and feels like a mix of lacquer and faux leather. This one is very thin, a little thicker would be better. Make sure the gold is not too yellow or it'll be too bright.

For structure I add a layer of mesh/soft stretch tulle.





PREPARING THE PIECES

Soooo now you have your perfectly fitting pattern done.

Note:

- The back piece is only cut out once, on the fold.
- The collar is cut out once (don't forget that "flap").
- Make the front center a few cm longer than the pattern piece and cut it out 4 times (2 for each side).
- The part with the side pleats is not cut out yet. It must be lengthened by 2*number of pleats*depth of pleats. Use a pleat depth >2,5cm (>1")
- The part with the arm pleats is NOT cut out yet! You simply cut a strip of fabric with length = 3 times the length of the pattern piece + a little extra; width= widest part of the pattern+sewing allowance+a little extra

Now cut out the rest (two times - one for each side).

Most pieces are covered with mesh. The following are NOT mesh covered:

- front center
- pleats on the arm
- pleats on the side of the thigh
- knee cap

Set them aside and proceed with the ones to be "meshed"



I use temporary/water soluble fabric spray adhesive (link below) to make the mesh stick to the jersey while sewing. You could also baste it together, but it's more work and will get distorted much easier. Srsly, use spray glue. I calculate one bottle of glue per suit and I keep a backup, just in case I need to re-do something.

Cut out the mesh at least a little bigger than the jersey pieces. I have a lot of mesh, so I cut it much bigger - it's easier to apply this way. Watch out if your mesh has different sides (mine is a little lighter on one side). Check out which side fits best to your jersey and make sure you have the right side up.

The promised details:

I use PRYM Spray Adhesive for temporary glueing of fabrics http://www.amazon.com/PRYM-968060-Spray-adhesive-aerosol/dp/B007CWHKSO/





For glueing the pieces together cover the right side of the jersey in glue and cover it with mesh immediately.

Make sure you:

- apply the mesh evenly
- don't stretch any of the fabrics
- avoid wrinkles

I usually start on one side and carefully lay the mesh on the jersey. Apply pressure to it to make the fabrics stick together.

Cut off excess mesh.

Repeat with all other pieces (except the non-covered, of course).



Direct comparison of "meshed" vs. "non-meshed" jersey.

Next step: quilting the front center. If you haven't done already, cut the front center pieces from the stretchy padding. Cut it WITH seam allowance.

Thank you Elenya Frost for being my model (and making this build so much more fun)



Here you see the next 4 steps.

- glue the front center pieces on both sides of the padding (it's a sandwich! yay - now I'm hungry again)
- baste (or if you're lazy like me, carefully stitch, using a long zigzag) around the edges to prevent them from coming apart during quilting
- mark on the fabric where the (it's probably a good idea to do this while you draft the pattern...) golden stripe will go around the neck. The lines end in this area, underneath the stripe.
- 4. mark a million lines where your stitches will be. I use a regular triangle to mark them, using 1cm distance.

Then stitch using regular forward stitches. In my experience, short to medium length is fine.



After stitching, lay the pattern onto the piece again and cut to size, if necessary (but don't cut off the seam allowance!)



One last step until the front center piece is finished: cutting off the excess padding.

Rip the stitches around the top and cut off above the quilting. In the end, the cut should be underneath the golden stripe around the neck (I marked the lines here). Only cut the padding.

Done with the front center, yay!



Then draw another line right across the fabric, starting at the lower end of the sloped line and running right across the fabric, perpendicular to the sides (in the pic, that's the second line from the top).

From now on, we are only working below this line. Everything above stays untouched (that's where the golden belt will be).





Now we need to calculate where to put the markings for the pleats. We need the distance above, between and below the pleats (L1) and the length of fabric that goes into every pleat (L2).

For L1, measure the shorter side of the pattern BELOW the line you marked for the belt.

NOTE: I did not include it on this pattern piece, so I'm measuring the whole distance. You will have a line there and then about 4cm above (like shown in the pic before) which you do not measure here!

Then you take the length and divide it by number of pleats plus one. In other terms:

D1... measured length on the pattern

p... number of pleats

L1... distance between box pleats

D1 = 22 p = 4

L1 = D1/(p+1)

I measured a length on the pattern D1=22cm. My number of box pleats p is 4, that makes my L1 = 22/5 = 4.4 cm



To get the length of fabric going into each pleat, measure the distance from the lower edge of your pattern piece to the seam allowance below. Here, D2 = 28cm.

Divide that by 2 times the number of box pleats (they are essentially mirrored and doubled pleats).

D2... measured length on the fabric

- p... number of pleats
- L2... fabric going into each pleat

D2 = 28 p = 4 L2 = D2/(2*p)

In words:

I measured a length on the fabric D2=28cm. My number of box pleats p is 4, that makes my L2 = 28/8 = 3.5 cm

If you want to make more or less, make sure the number you get for L2 is >2,5 cm).

Now begin at the straight line you drew right below the belt and draw parallel lines with the following distances: start with L1 (!), then alternate 4 times between $2 \times L2$ and $1 \times L1$ as shown in the picture (here, the top L1 is cut off but it's there, I promise).





I marked the L2 parts with lines for clarification.

The upper one gets folded down, the lower one gets folded up and the horizontal lines should all meet.

The unmarked areas remain visible.



Everything pinned down. NOW mark the outline of the pattern (but don't cut off the excess fabric just yet).

On the right piece you can see some markings about 1,5cm (1/2") inside the outlines.

That's where I stitch across the folds (crosswise, with a wide zigzag with 0 length).

This isn't mandatory but it makes the stitching around the folds much easier.





Now stitch around the folds and cut off excess fabric (don't forget to keep the seam allowance). Thigh pleats done! Next piece: making flat pleats on the sleeves. Unlike on my previous suits I opted for flat pleats that are stitched shut from the back side.

How to do it (imagine the pins are seams):

- 1. Top left: start on the lower end and fold your fabric right sides together. Stitch across the line, creating a loop. Ours is approx. 3,5 cm wide.
- 2. Top right: create another loop above the first. They should all have the same width so don't forget to measure (not shown in the pics)
- 3. Bottom right: stitch next to the edge of the first loop, holding it in place.
- 4. Bottom left: continue looping and stitching until the whole length is pleated.

If it's helpful, I can make a short video to show how the loops are created. If your fabric is not cooperative, it can be a good idea to iron every loop before stitching.



When everything is pleated and stitched, mark the pattern on the pleats, cut and neaten.

Before I start:

- Use pictures you took during the pattern making process to confirm which pieces go together
- Baste all difficult seams. Seriously, basting takes a lot less time than seam ripping (especially with elastics and mesh!)
- Start with the horizontal seams (front to back), then the vertical ones (neck to waist)
- I'm starting with the bodice, so that's what I'm showing first (you can just as well start with the pants, it doesn't matter)
- Use an elastic stitch, simple straight seams will rip! You don't need anything more fancy than a simple household sewing machine, just use a very narrow and short zigzag.



In the following pics I will show how Elenya Frost and I created the bulky seams. Bulking the seam is optional, but I would strongly recommend to make the folded seams for most seams (to be specific, all except for the inside of the sleeves, legs and crotch).

Enough talk, let's start by sewing the front center to the front side piece with a simple seam.

Make sure to leave at least 1 cm of seam allowance.





This is 4mm thick round elastic cord. You will need this a lot for bulking up the seams.



Now fold the seam, trapping the cord between seam allowance and one of the panels (here: the side panel).



Pin it, baste it and sew it.

I know most of you won't baste (I mostly didn't), but be careful you don't let it slip out of the fold.



Stitch the cord in place, creating the bulk. You may wanna practice before you sew everything in.

As this is the left side: I forgot to add the loops for the cable and had to rip parts of the seam later... What do we learn here? Always check where to put the loops first, mark them on the piece (!) and add them directly before you bulk the seam.



At some point you'll have to cut the bulky cord indside the seam (but only cut when you're sure you know where and how short).

This is a bulky seam that's about to meet another bulky seam at the bottom (see next pic for a bigger picture). That's next to impossible to sew with the cord inside, so you'll have to cut it.

My approach: Stitch across the cord at about 2 times the seam allowance, then pull it out real hard and cut as short as possible. It'll retreat back in to about half length.



Here is the T-shape formed by the crossing seams. Notice where the bulky seam joins the other one in the middle?



When closing the seams in the back, don't forget to add the loops for the cable on the left side!

Start by pinning the back panel to the left side panel (the horizontal line should already be stitched by then). Insert the loops and baste. Yes, baste it - the loops slide around a lot if you don't and the panels can move around (alternatively you can stitch, carefully rip holes in the seam, insert loops and stitch again over the loops). Then add the bulk to the seam.

The bodice is ready for the sleeves when all panels are connected. The shoulders are NOT closed by now.



Next step: attaching the lower parts of the sleeve.

Start by stitching together a few cm at the top. Stitch a little more than shown here, approx. 5cm (2") is fine.

Now attach the lower parts of the sleeve to the bodice. The upper edges must match.



Preparing the shoulder & pleated upper part of the sleeve. First attach the shoulder to the pleated panel. Add a loop for the cable on the left side.





Left shoulder & pleats. We did not bulk this seam



Start on one side and align the seams as shown in the pic.



One side stitched once



Add bulk to the seam. This is why you shouldn't close the lower seam completely at first.



Stitch and bulk the other seam on the sleeve. Now you can close the seam on the lower side of the sleeve.

The top is ready! Well, kinda. Looks like a pretty cool jacket, right?



PHASE 3



Next part: pants!

Let's start by preparing the knees: On the inside, add a piece of padding exactly the size of the knee cap pattern piece. Cover with a piece of jersey (this one with seam allowance so it's slightly bigger and covers the padding completely.

I use the temporary spray glue to keep everything in place. Set aside so the spray glue can dry out completely.



Ok, now for the actual pants part. This is different for the male and female suit.

Female suit:

Start by stitching the butt seam, i.e. connect the bottom back center pieces (my number 14) together. Leave approx. 10cm (4") of the seam open at the crotch (I didn't do it and had to rip).

Then stitch the top center piece (my number13) to the connected bottom panels. Do not bulk that seam up just yet!

Male Suit:

Skip this step. You can sew the legs separately and connect them in the end.

- 1. Stitch the upper and lower side panels together
- 2. Attach them to the back in one long seam.
- 3. bulk up the upper seam from the waist to where the vertical seam meets the round seam. Cut off the bulk cord inside the seam allowance
- 4. Bulk up the whole round seam around the butt (from knee to knee)
- 5. Add the front. The front center is looking weird, because that's where the front center piece of the bodice will connect. Don't let that bother you.
- 6. Bulk up the seam between the side and the front.



Back to the knee part. Stitch the knee cap shape:

- 1. around the padding, only on the jersey
- 2. through the padding, a little bit inside the first seam

FRONT

BACK





All the leg parts before inserting the knee.

Notice that I have already stitched the lower leg parts. The middle seam in the front (between my parts 16 and 19) needs to be bulky, for the one on the side (between 16 and 17) it's optional. I didn't because it's more comfortable non-bulky.

Make sure the center of the knee cap aligns with the front seam on the thigh and shin parts.



Completed joins.



Both parts of the suit

PHASE 4



Now add the zipper. Make sure the front panels align. Have I told you to baste yet?

Mark the top of the zipper (upper edge of the gold stripe around the neck) and the bottom (top edge of the narrow golden stripe in the front of the belt).

Attach the zipper.



There are several ways to insert the zipper. I chose an unconventional way where the quilted front panels stay straight and the zipper strap folds. Since the golden stripes will cover it up (ust make sure to sew through the zipper belt when attaching them), it doesn't matter.

It just occurred to me that you could just sew the zipper on top, not folding anything. It'll be covered by the golden stripe anyway... damn. Why didn't I think of that earlier??

Trying it on after basting the sides and back of top and bottom together.

- 1. Put on both parts separately
- 2. Mark where they go together
- 3. Baste
- 4. Try it on again (pics below) and adjust if necessary
- 5. Stitch
- 6. Fold the seam and stitch again (no bulk)

The rounded part in the front is next.





After basting do not yet sew together top & bottom. While trying it on, mark the belt on the suit (I didn't take a pic with the complete marking, just the beginning - but I this won't be a problem for you).



There are 3 parts of the belt:

- 1. The strip across the front panels. The end of the zipper should be underneath it. Start with marking that part (not shown in the pic)
- 2. The wide belt part. It aligns with the front srip and runs from the front side panels around the lower back (not across the front center panel). I made it 6cm wide.
- The narrow belt on top. It will be 2,5 cm wide. Since I use slightly stretchy material I will just use a straight strip as narrow belt, it will be able to adjust to the curve better than the wide part.

ATTENTION!

Since I did not add enough fabric on top of the pants I had to first sew together top and bottom of the suit and add the belt & other stuff afterwards.

If you were smarter than me and followed my advice to add enough fabric at the top of the pants, you will be able to sew the golden stripes onto the pants before sewing top & bottom together. Which is like 10000 times more comfortable and less prone to mistakes. So if you were smart, you will NOT sew top & bottom together after basting.

You will

- 1. mark the belt parts
- 2. Rip the basting (that hurts right?)
- 3. Copy the marked pattern off the fabric
- 4. Prepare the belt parts
- 5. Sew on the belt parts
- 6. Baste again (ugh)
- 7. Sew top & bottom together just above the golden stripe.



Now we do something similar for the collar:

Start by marking the lower edge of the golden stripe (as in the pic).



Put masking tape on the collar and copy the lower edge you marked on the fabric. Draw another line to mark the upper edge of the stripe. We also need a third line ~3cm above for the pattern of the faux leather collar.

In this step you can correct the collar shape and height (I did) by cutting away any excess fabric around the collar. Just don't forget the seam allowance.



These are my two pattern pieces right off the fabric, before cutting. The lower for the gold stripe and the upper for the faux leather.

Quick Tip: when cutting the faux leather, double the seam allowance for the lower edge. This way you can be sure to have the lower seam hidden underneath the gold stripe.



This step is only necessary if you didn't put it in the original pattern: add a rectangle on the front of the right side. Make it a little longer than mine - I replaced that one with a longer one afterwards...

PHASE 5



Apply the faux leather to the collar like this:

- 1. pin right sides together
- 2. stitch near the edge
- 3. fold faux leather over to the inside
- 4. stitch again near the upper edge
- 5. stitch along the lower edge of the faux leather. Make sure the lower seam is low enough to be covered by the golden stripe afterwards.



When applying the gold around the neck, add stitches left & right of the real seams.



This is what you would wanna have: the stripe around the neck, next to the zipper and the small strip across the front center panels is one piece.

One day I will do it the way it should be. For now I'll just admit I'm lazy and that I chose to make them separate. A friend of mine always says: if somebody's looking THAT closely, they're already almost stealing...;)



Prepare the golden stripes by cutting the wide and narrow belt, front strips and the one around the neck out of faux leather and cover it with the gold. You can skip the faux leather if your gold fabric is strong enough.

Top: First stitch together the two belt parts. I used the most beloved spray adhesive to hold everything in ... See More



Everything attached.



If you haven't done already, now's the time for hemming those sleeves. On the finished suit they're covered with leather trims, I don't sew them on though because I find it uncomfortable. It's easier to just switch to other versions (e.g. from the leather armor) than wear the leather armor gauntlet over the trim.

I make the trim from faux leather covered craft foam (or 2mm EVA foam). If you want I can show you how I make them.

On the top left: you see the pieces needed for the trim on the hem of the legs (per side):

2x blue fabric rectangle (~5cm wide, the length is the circumference + seam allowance)

faux leather strip (~2cm wide, same length as the blue one)

elastic "bulking cord"

Method:

- 1. Stitch the blue rectangles together
- 2. Fold the seam over and stitch again
- Fold the faux leather, insert the bulking cord and stitch (or use spray glue like me)
- Open up the two blue rectangles and put the faux leather bulk on the inside of one rectancle (round side away from the seam (top right)
- 5. Fold the other blue over and place the fold next to the bulky round (bottom left)
- 6. Stitch

On the bottom right is a cross section to show how the different parts go together.





Now measure the length of the lower leg and shorten if necessary. Pin & stitch it to the folded hem. That's it

Now for the communicator/monitor/buckles stuff!

Make them out of something sturdy, like sintra, worbla, resin,... I got mine from a not only incredibly talented but also very, very nice guy named Deadbeard props who cast them in resin for me (they come unpainted in light grey). I loved his so much that I decided not to make them myself.

If you ask nicely, I'm pretty sure he can help you, too!





When attaching stuff to clothing, velcro is your friend. Quick tip: always put the fluff-part on the fabric.

I use self-adhesive velcro (but I sew the fabric side it onto the suit).



Sew the velcro into the suit at the appriopriate locations. When placing them across a seam, put the velcro next to the seam, not over it.



The one on the belt.

COMPLETED SUIT

