

COSPLAYER'S ULTIMATE GUIDE TO EVA FOAM

BEVERLY DOWNEN

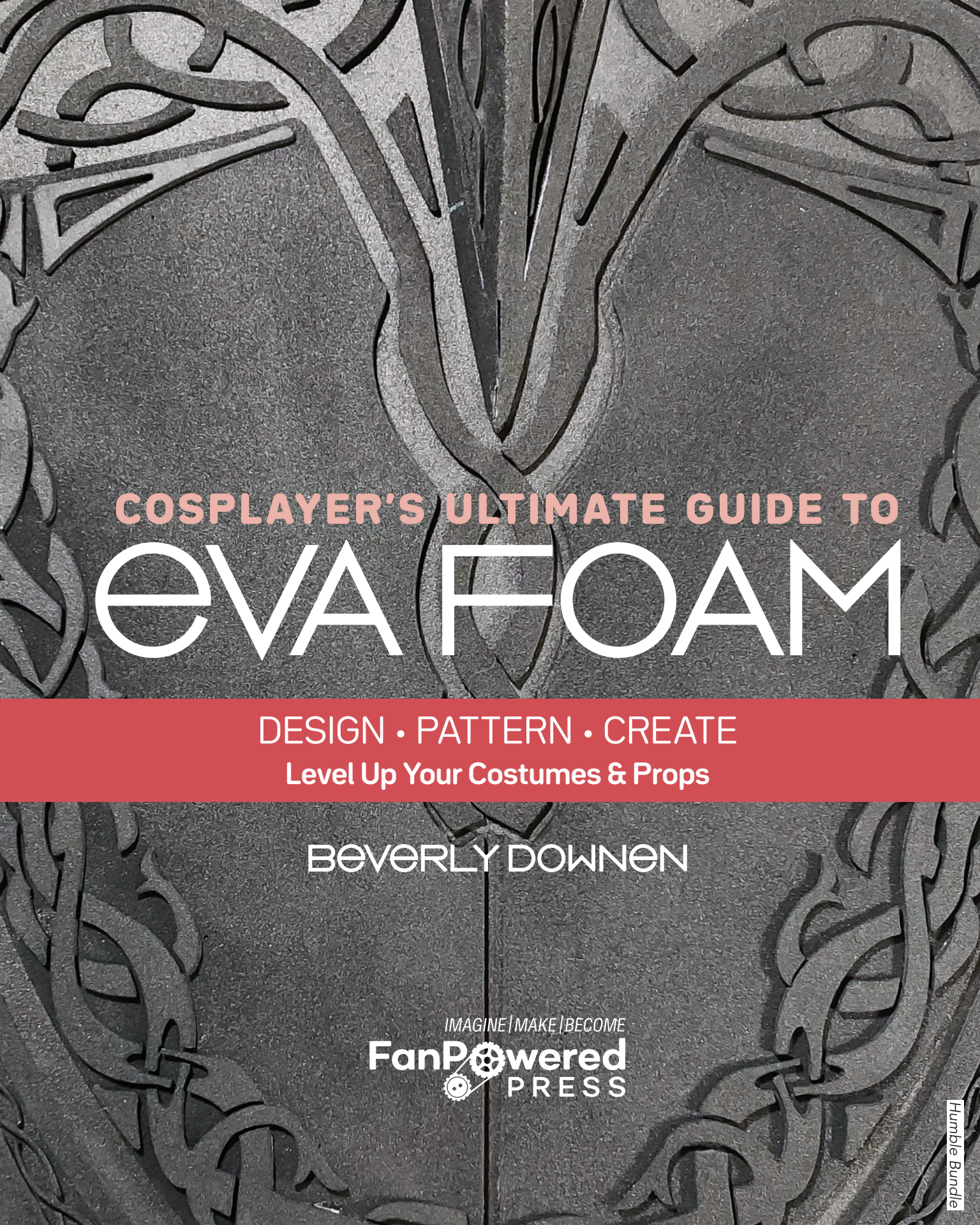
→ DESIGN

pattern ⇐

→ CREATE

LEVEL UP
Your Costumes
& Props





COSPLAYER'S ULTIMATE GUIDE TO eva FOAM

DESIGN • PATTERN • CREATE
Level Up Your Costumes & Props

BEVERLY DOWNEN

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Prop Maker: Downen Creative Studios
Prop: The Child Floating Pod from Star Wars' The Mandalorian

Photo by Downen Photography

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A Prop Maker: Sameer Bundela
Prop: Alucard shield from Castlevania
Photo by Sameer Bundela

B Cosplayer: Baldguycosplay
Costume: Lawbringer from For Honor
Photo by Downen Photography

C Cosplayer: Athel Artistry
Costume: Mysterio from Spider-Man: Far From Home
Photo by Christa J. Newman



A



B



C

INTRODUCTION

Hello, makers! Welcome to the starting line of leveling up your EVA foam costume and prop making skills!

Have you ever seen a costume or a prop in a movie that you've wanted to create, but you aren't sure where to start? Do you have experience building with EVA foam, but want to learn how to improve your techniques, patterning, and foamsmithing skills?

Every chapter of this book has been written for the eager maker who wants to learn how to use EVA foam like a pro, gather ideas for adding textures to their projects, and learn techniques and methods to create foam pieces that fit on a body without needing expensive tools, equipment, or materials.

This book will help you on your way to becoming a master of working with EVA foam and beyond, and it will give you tons of insider tips and techniques for making the best design and fabrication choices as you build your costumes and props. As you read through this book, you'll soon see that creating a good foundation for a well-designed, expertly constructed costume is well within reach of even the most novice of makers, and you won't need expensive equipment when using the techniques, methods, and materials suggested in these chapters.

These pages are absolutely packed with updated resources and processes, tons of pro tips, illustrations, more charts than you thought you'd ever need, and clear step-by-step instructions for cutting, priming, and patterning so you can get started making that incredible costume you've always dreamed of creating yourself!

So ... let's get started!

Fun Fact

These materials and techniques are also used in professional costume and prop studios! Many of the props and costumes you see in films are created with EVA foam.

Cosplayer: Akakioga Cosplay
Costume: Nargacuga from Monster Hunter World

Photo by World of Gwendana



PART 1

BEFORE YOU DIVE IN



Cosplayer: Jen Schachter

Costume: Marie Antoinette

Jen's wig is made of EVA foam.

Photo by Norman Chan

A MILLION POSSIBILITIES WITH ONE MATERIAL

EVA foam is an incredible material for many reasons. It is a lightweight, inexpensive material that can be used by anyone with a sharp blade and glue. EVA foam can be shaped and formed to resemble a large variety of materials including fabric, leather, metal, wood, stone, bone, scales, feathers, flowers, and more, using techniques you'll learn in this book. You can make just about *any* kind of project with EVA foam—from larger-than-life armor sets to props like futuristic space guns, ancient shields, helmets, footwear, accessories, masks, hats, and, yes, even wigs!

Cosplayers frequently defy reality with creative solutions to re-create computer-generated and illustrated character designs. These kinds of builds can be challenging but aren't impossible with a little engineering and thoughtful design.

Cosplayer: Rawrbomb

Costume: Korg from Marvel Cinematic Universe

Rawrbomb crafted this costume using EVA foam.

Photo by Downen Photography



VARIETY

If you are more familiar with creating with fabric, the idea of using foam might be a little intimidating. Let's talk about the differences between fabric and EVA foam to get you started with this material.

One of the biggest differences between fabric and foam is variety. While EVA foam has far less variety than fabric, it has so much more potential in raw form. It is available as smooth or textured sheets in a selection of thicknesses, colors, and densities or as dowels, bevels, clay, and precut shapes. These varieties can all be mixed and matched, and all use the same glues and finishing techniques.

COMPOUND CURVES

EVA foam allows you to transform a flat sheet into rounded, tapered, and curved shapes with ease. Add a gentle flair to the end of a helmet with heat and a little manipulation, or add seams and darts to create a complex curved shape.

EVA foam can be stretched slightly but will lose its original shape. Unlike a shirt or pants, you most likely won't be able to pull your costume over your head, shoulders, or hips without a little planning.



Cosplayer: Carly of Carma Cosplay

Costume: Batman from DC Extended Universe

Carly of Carma Cosplay made her Batman cowl and chest emblem with EVA foam.

Photo by Downen Photography



Costume: Hippolyta from DC Extended Universe

This armor piece I created uses grommets as well as parachute buckles to fasten together in the back. These are hidden underneath a cape.

DITCH THE THREAD AND GRAB THE GLUE

Perhaps the biggest difference between fabric and EVA foam is assembly technique. Instead of sewing pieces together with thread, EVA foam is glued together or attached with straps or other fixture hardware. For more information, see Using Adhesives (page 73).



This pauldron design has two seams (*center*) that are visible when painted (*left*) but can be hidden underneath a detail (*right*).

SEAMS

Holster your seam ripper! EVA foam seams can be designed to be hidden under details or other layers. Seams that cannot be stealthily disguised can be filled and sanded with a variety of techniques and products for a smooth surface. For more information, see Minimizing Seams and Gaps (page 82).

LAYERING

One of the best aspects of making costumes and props with EVA foam is that it is an additive process. Like with fabrics, layering more EVA foam, embellishments, and trims can add awesome details and dimension to your projects.

Prop Maker: Downen Creative Studios
Prop: Hippolyta Shield from DC Extended Universe



There are many supplies and tools available to help you create cool costumes and props using EVA foam. Here are a few of the most common items you should have in your shop along with a handful of tools that, while not essential, may save you time and effort.

SAFETY EQUIPMENT

You'll need some standard safety equipment when working with EVA foam, adhesives, and paints. To find out exactly what you'll want to have on hand, skip ahead to Safety Precautions (page 25).

ADHESIVES

Hot Glue Gun and Glue Sticks

A must-have in any workshop, hot glue is great for making quick attachments and repairs, attaching straps, reinforcing seams, and attaching support structures inside props and costumes. Hot glue will attach EVA foam to many materials including EVA foam, PVC, cardboard, LED wires, hook-and-loop tape, and more. **A**

Contact Cement

A favorite among cosplayers, contact cement will create strong, flexible bonds between many dissimilar materials. **B**

Quick-Cure Adhesive, CA Glue, and Epoxy

You'll be reaching for quick-cure adhesive and cyanoacrylate, also known as CA glue, more often than you may think. Always have some on hand for adding details, seam repair, and other jobs when you need a fastz-setting adhesive. **C**

Tape and Spray Adhesive

Duct tape, masking tape, painter's tape, aluminum tape, Tear-Perfect Maker Tape, spray adhesives, and Cos Bond are all great to have on hand for duct tape body forms, pattern building, temporary bonds, and more. **D**

Clamps and clips are great to have for holding materials together to allow glue to dry. **E**

PATTERNING MATERIALS AND TOOLS

Sharpies, Liquid Chalk Pens, and Gel Markers

Use a marker in a contrasting color to trace your patterns onto EVA foam, label pattern pieces, and write build notes. Silver Sharpies, metallic gel pens, chrome pens, and chalk markers are great for darker EVA foam colors.

Paper, Aluminum Foil, and Plastic Wrap

Use paper for patterning, creating mock-ups, making adjustments, and protecting your work surfaces. Use aluminum foil and plastic wrap for patterning, making adjustments, and creating shapes to form compound curves for hats, helmets, shoulder pieces, knees, horns, and more. There are two kinds of plastic wrap that are frequently used: standard plastic wrap and Glad Press'n Seal plastic wrap. **F**

Self-Healing Cutting Mat

A self-healing cutting mat that can cover your work surface will make it easier to cut EVA foam from large 24" × 60" (60cm × 1.5m) rolls. **G**

Pattern Notcher

Create registration marks on your patterns with ease! These tools are very useful for patterning and can speed up your workflow. **H-I**

1-2-3 Block

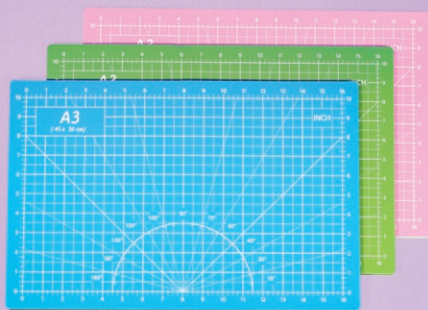
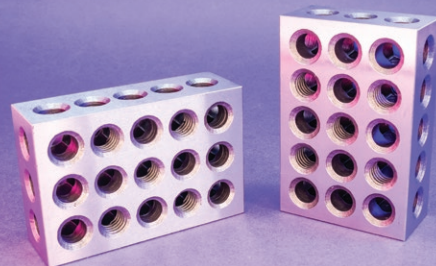
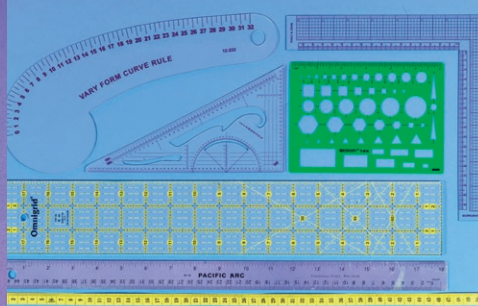
1-2-3 blocks are used by machinists and are made with hardened steel. The dimensions are 1" thick × 2" long × 3" wide, which is where they get their name. These are great for pattern weights and much, much more. **J**

Contour Gauge

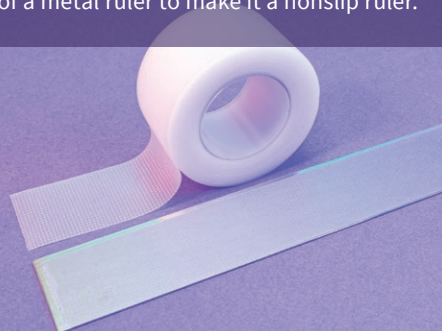
Use this tool to easily measure contours anywhere you need to add a layer to a curved surface. For example, these are incredibly helpful for adding crests to helmets. **K**

Rulers, Tape Measures, French Curves, and Foam Rulers

A metal ruler with a cork backing will keep your fingers safe and your ruler steady when you are cutting EVA foam. Sewing tape measures, clear acrylic rulers, French curves, and foam rulers are all useful for patterning and creating with EVA foam. **L**

Hot Glue Gun and Glue Sticks **A**Contact Cement **B**Quick-Cure Adhesive, CA Glue, and Epoxy **C**Tape and Spray Adhesive **D**Clamps and Clips **E**Paper, Aluminum Foil, and Plastic Wrap **F**Self-Healing Cutting Mat **G**Pattern Notcher **H****I**1-2-3 Block **J**Contour Gauge **K**Rulers, Tape Measures, French Curves, and Foam Rulers **L****PRO TIP** ➔

Add Tear-Perfect Maker Tape to the back of a metal ruler to make it a nonslip ruler.



CUTTING TOOLS

Blades, Knives, and Sharpening Stones

There are many kinds of knives and blades you can use to cut EVA foam. Have a variety on hand for large and small projects. You'll notice that your blades will become dull after a few cuts. Replace blades often, or use a sharpening stone for better, cleaner cuts. **A**

Scissors

Scissors are incredibly useful for cutting EVA foam. Keep an assortment for large and small projects. **B**

Circle-Cutting and Hole-Punching Tools

Need a perfect circle or a hole? There are several tools that are designed to make these shapes in a snap! **C**

SANDING TOOLS

Smooth edges and corners of EVA foam with sandpaper. Grits 180, 220, and 320 are typical grades to have around. You can attach sandpaper to paint sticks and popsicle sticks to create sanding tools. Some sandpaper rolls have an adhesive backing that can help the sandpaper adhere to many surfaces. Needle files can reach the smallest spaces and are great for adding some surface details onto EVA foam. **D**

MOLDING TOOLS

Silicone Molds

Use silicone molds with EVA foam clay, thermoplastics, hot glue, and resin to create absolutely amazing details. **E**

Wax Paper

Wax paper has a nonstick property that is perfect when working with EVA foam clay and thermoplastics. It is also a helpful barrier that can help prevent accidental bonds when pressing contact-cemented seams together.

FORMING, SCULPTING, AND DETAILING TOOLS

Heat Gun

You'll definitely need a heat gun to work with EVA foam. Invest in a model with variable temperature settings, fan speed variations, and hands-free operation. For more information, see Heat Forming (page 47). **F**

Rotary Tool and Accessories

With a rotary tool, you can sculpt, smooth edges, add textures, and so much more! To learn more about how to use this versatile tool and the many convenient accessories that make these chores a breeze, jump ahead to Cutting and Sanding (page 39). **G**

Wood-Burning Tool

Wood-burning tools are fantastic for adding quick details to your projects. **H-I**

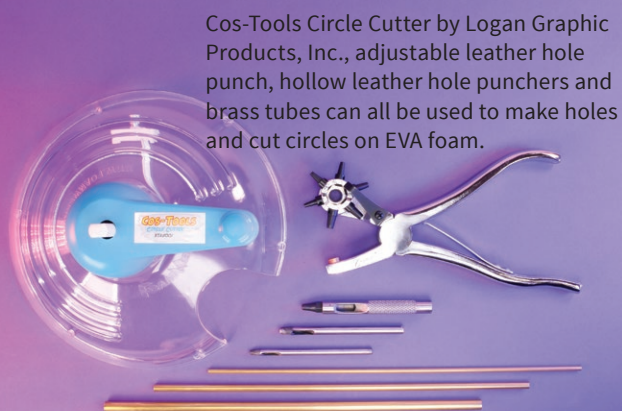
For examples of the possibilities, see Adding Textures and Details (page 53).



Blades, Knives, and Sharpening Stones **A**



Scissors **B**



Circle-Cutting and Hole-Punching Tools **C**



Sanding Tools **D**



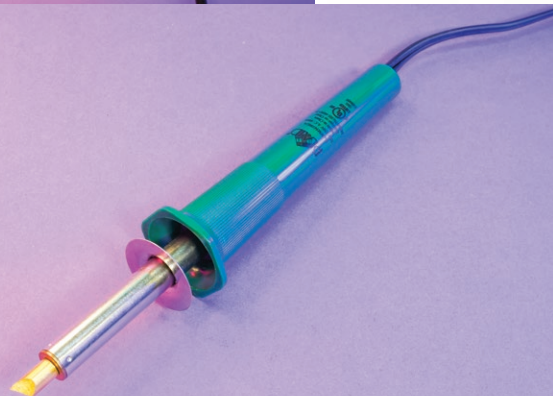
Silicone Molds **E**



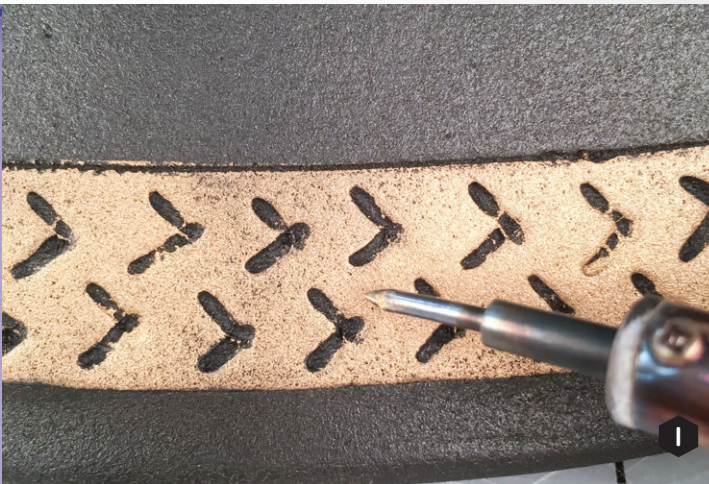
Heat Gun **F**



Rotary Tool and Accessories **G**



Wood-Burning Tool **H**



I

DIE-CUTTING EQUIPMENT

Die-cutting machines are incredibly useful for building amazing costumes. Use these machines to cut paper patterns or to cut and score EVA foam, thermoplastics, vinyl, balsa wood, fabric, styrene—you name it! **A**

BODY FORMS

Designing and building a costume that will be worn on your body is far easier with a body double! Dress forms, duct tape body forms, body molds, and 3D-printed body parts are invaluable for any costume project. For more information, see Body Forms (page 17). **B**

OTHER USEFUL SHOP TOOLS AND ACCESSORIES

Other shop tools are convenient but not essential to making amazing projects with EVA foam. These other tools can often have a hefty price tag and can require additional training, safety considerations, and a dedicated space in your workshop.

- Airbrush, Critter Spray Gun, and HVLP spray gun
- Belt sander and palm sander
- Band saw and scroll saw
- Drill press
- Laser cutter and vinyl cutter

Die-Cutting Equipment **A**



Body Forms **B**



PRO TIP

The Dremel Drill Press Rotary Tool Workstation Stand will convert your Dremel into a drill press and is great for small workshops with limited space!



Body forms are incredibly useful when making costumes for yourself or for others. Not only do they allow you to build and pattern directly on the form, but they help you see the costume pieces as they fit together. They can make alterations, like adding straps and hardware, very fast and easy. You can even cover a form with plastic wrap to sculpt with foam clay.

DRESS FORMS

Dress forms come in a large variety of sizes, styles, and price ranges. All of these styles are very helpful for every stage of the designing and building process.



Adjustable Dress Forms

These body forms are typically less costly than professional dress forms. Adjustable forms are usually fairly lightweight and can be altered with adjustment dials. These adjustments are somewhat limited due to the structure of these forms, making it difficult to match your measurements perfectly. Because of the material used to create the form, these are usually harder to pin and drape.



Professional Dress Forms

Professional dress forms allow you to drape, pin, and design directly on the form and can be modified with additional padding to match your measurements. There are usually a variety of options for female, male, teen, and even child sizes. These usually have a much higher price tag than adjustable forms but offer durability and far more accurate proportions. Most have collapsible shoulders that can easily be removed. You can even find bifurcated dress forms with legs.



DIY Dress Forms

A quick search online for DIY dress forms will reveal a number of ways to create your own, but if you want to save yourself a headache, BootstrapFashion has developed several customizable body form patterns that are easy to follow and available for download. These unique patterns are designed to be customized to your specific body shape. Follow their detailed instructions to create your own customized body form that matches your own measurements using their unique and easy to follow pattern. This is an inexpensive method but requires machine sewing.

A. DIY Dress Form B. DIY Leg Form

Patterns by BootstrapFashion

Photos by Mylinego, Inc

DUCT TAPE BODY FORMS

Duct tape body forms are an inexpensive and easy way to make a custom form of your body. These can be entire torsos or just a body part, like a head, arm, or foot. In addition to being an inexpensive body molding technique, you can pattern directly on a duct tape body form. To build your own, follow the tutorial Duct Tape Body Form (page 229).



3D-PRINTED BODY FORMS

3D-printed body forms are another option that can provide an accurate version of your entire body. Printing an entire body form can take quite a lot of filament and time, but the results speak for themselves: 3D-printed body forms are your exact specifications. Even printing just your head can help tremendously when creating headpieces, helmets, and masks and can even help with wig styling. 3D body scanning, also known as photogrammetry, can be performed on a full body or a body part. The scans generated from these devices can be used as a digital reference or for 3D printing miniature and full-size models of your body. Currently, there are a few options to choose from, ranging in price, detail quality, and convenience. To get a high-quality full-body scan without needing additional equipment or software, you'll want to search for a 3D-scanning booth service in your area that provides full-body scanning for 3D printing. Many fitness centers are adding full-body scanning services for members. Be sure to ask if you can use the file for 3D printing.



Cosplayer: Ridd1e

Costume: Edward (Edwina) Scissorhands, inspired by the Edward Scissorhands Bishoujo Statue

This 3D-printed body form of Ridd1e helped her design her Edward (Edwina) Scissorhands costume.

Photo by Ridd1e

MANNEQUINS

Mannequins are very useful for display and make for great work-in-progress photos! You can even make a thermoplastic shell layer on these forms to create torso pieces. Patterning directly on a mannequin is not recommended unless the dimensions are similar to your own.

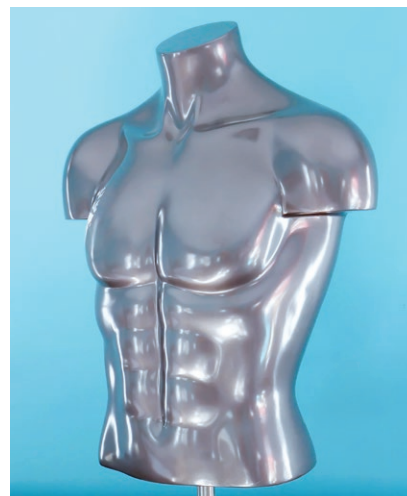


Photo by Kelly Osborne

LIFE CASTS

Life casts are exact copies of a body part and are usually made of plaster or expandable foam. The process is quite involved and requires a few helpful, knowledgeable assistants to accurately and safely make a successful cast. These forms are very durable, and plaster casts can be subjected to heat without melting or warping. You can sculpt directly on these casts for perfectly fitted accessories and costumes.



Model: AnastasiaPDX

HEAD FORMS

A good head form is an invaluable tool in your workshop. Making head pieces and helmets that are comfortable is possible with a little planning and careful patterning.

3D-Printed Heads

If you are lucky and live near a scanning facility or have a friend that has a scanner, you can get your head (and body) scanned and make a 3D-printed replica. These are great for precisely patterning form-fitting pieces like face masks.



Wig Heads

Wig heads are a really great accessory to have in your cosplay tool collection for designing head-pieces, helmets, and, of course, for wig styling.



DIY EVA Foam Heads

The next best thing to your own 3D-printed head is a patterned foam head that includes anatomy like ears, eyes, nose, and chin. A very popular pattern is available from Punished Props Academy and is a wonderful patterning tool to own. One big advantage of an EVA foam head form is that you can use pins to hold pieces in place, which is not something easily done with 3D-printed heads made from hardened filament. Reinforce the inside of an EVA foam head with something sturdy like expanding foam, scrap fabric, or anything that will help it keep its shape while you are piling on the designs.

PRO TIP

The standard head circumference is approximately 55cm (21¾") for an adult female and 57cm (22½") for an adult male.



I made my EVA foam head using the Punished Props Academy Head Form/Helmet Stand pattern.

Styrofoam Heads

Styrofoam head forms are generally much smaller than adult heads and are more useful for display than patterning.



PART 2

EVA FOAM BASICS



Cosplayer: Downen Creative Studios

Costume: Hela from Thor: Ragnarok

Photo by Downen Photography

EVA (ethylene-vinyl acetate) foam is a closed-cell material that is composed of an elastomeric polymer. It's a favorite material for cosplayers and prop makers because it is lightweight, flexible, tear-resistant, waterproof, incredibly easy to work with, affordable, and easy to find.

Cosplayers love using EVA foam for all kinds of projects like armor, helmets, shields, swords, chain maille, scales, feathers, space guns, masks, and even hair and wigs! The versatility and endless possibilities of this unique material allow for the most creative applications. There is no limit to what you can create with EVA foam!

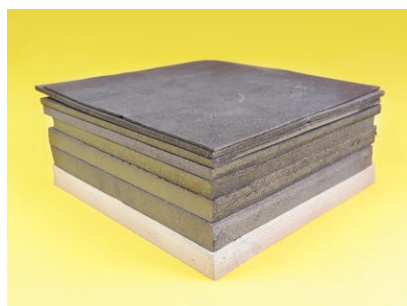


10 Reasons EVA Foam Is Loved by Makers Around the World

1. Affordable and easily accessible
2. Comparatively easy to work with
3. Flexible
4. Lightweight yet durable
5. Available in several color options
6. Available in a multitude of thickness and density options
7. Able to be heat formed into compound curves
8. Easily cut, sanded, and glued
9. Available in many preformed shapes and sizes
10. Able to be painted and textured to look like plastic, wood, bone, leather, metal, and more!

SIZE AND THICKNESS

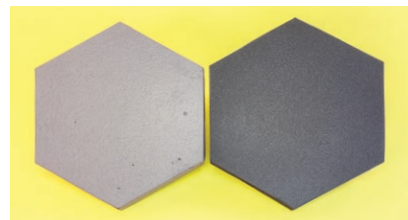
Sheets of EVA foam are available in a variety of sizes and thicknesses ranging from 1mm (0.04") to over 50mm (1.97"). The thinnest sheets of foam can be transformed into delicate designs, flower petals, hair, and the smallest details. Thicker foam can be used for pieces that require strength and structure, like armor, shields, helmets, and props.



DENSITY

High-Density Foam

Higher-density EVA foam will have a smooth surface on both sides. This type of EVA foam has fewer flaws; will be easier to sand, paint, heat form, and heat seal; and has a much smoother surface for painting. It is generally available in black, white, gray, and even red!



Low-density foam is prone to large, visible surface flaws (*left*). High-density foam will have a much smoother surface and is easier to work with (*right*).

SAVE TIME AND PAINT

Starting a project using a lighter or darker EVA foam will make a big difference when it's time to prime and paint. You'll need a lot of paint to transform black EVA foam into a brighter color. Save time and materials by considering the final colors of your project and selecting your EVA foam colors accordingly. For example, if your final look will be a medium to dark color, build with black EVA foam and use a dark primer and a dark base coat before painting. Similarly, if your final look will be a light to medium color or will have a pearly metallic effect, build using white or gray EVA foam and use a light primer and a light base coat before painting.

Low-Density Foam

Lower-density foam is usually less expensive and great to use for support structures and mock-ups, but it can be used for entire builds. You can find sheets and rolls at your local hardware store in the floor mat section. These types of foam are usually smooth on one side and textured on the other. Designed for industrial use, the surface of this foam is more likely to have numerous production flaws.

PRO TIP

- Use high-density foam for projects that need a smooth surface, such as armor.
- Use low-density foam for quick projects that will be covered by layers or as structural support.



CRAFT FOAM

Craft foam is a type of low-density EVA foam that can be found in most arts and craft supply shops in multiple colors and various forms: small sheets, prefabricated shapes, rolls, and even with adhesive backing. Craft foam is great to have on hand for mock-ups and details, and it is usually inexpensive.



PRETEXTURED SHEETS

Some high-density EVA foam sheets are produced with a textured surface, ready to cut and use in your projects. These are perfect for adding accent details or for adding interest to large areas of your costumes and props.



These pretextured EVA foam sheets designed by Yaya Han for JOANN Fabric and Craft are perfect for any costume or prop.

SEMITRANSLUCENT FOAM

Create diffuse lighting effects with semitranslucent foam sheets such as Plastazote. Perfect for diffusing LEDs and light accents in your costumes and props, this unique type of EVA foam can be cut, heat formed, glued, sanded, and airbrushed.



Semitranslucent foam in daylight (top); the same foam illuminated with LED lights (bottom)

Cosplayer: Athel Artistry
Costume: Mysterio from *Spider-Man: Far From Home*

Athel Artistry used colored LEDs and Plastazote to add sophisticated illuminated effects on her Mysterio costume.

Photo by Christa J. Newman



EVA-70

EVA-70 is a very dense variation of 2mm EVA foam available at TNT Cosplay Supply. This foam is perfect for providing strength for thin projects requiring structure like holsters, pouches, vambraces, collars, tiaras, crowns, and prop details. It cuts beautifully with a die cutter and can even be sewn with a sewing machine to add rigidity and structure to your fabric projects. For more information, see Other Uses for Foam in Costumes and Props (page 127).



ADHESIVE-BACKED FOAM

Adhesive-backed foam is *amazing* for certain applications that don't need to be heat formed. You can find high-density sheets in a variety of thicknesses at TNT Cosplay Supply and smaller, low-density 2mm sheets at your local craft store. Use these foams for creating prototypes, creating detail mock-ups, and anchoring layers in place. Some adhesive-backed foam will form a permanent bond after 24 hours, giving you time to reposition detail layers if needed. Use a bit of quick-cure adhesive to help with adhesion.

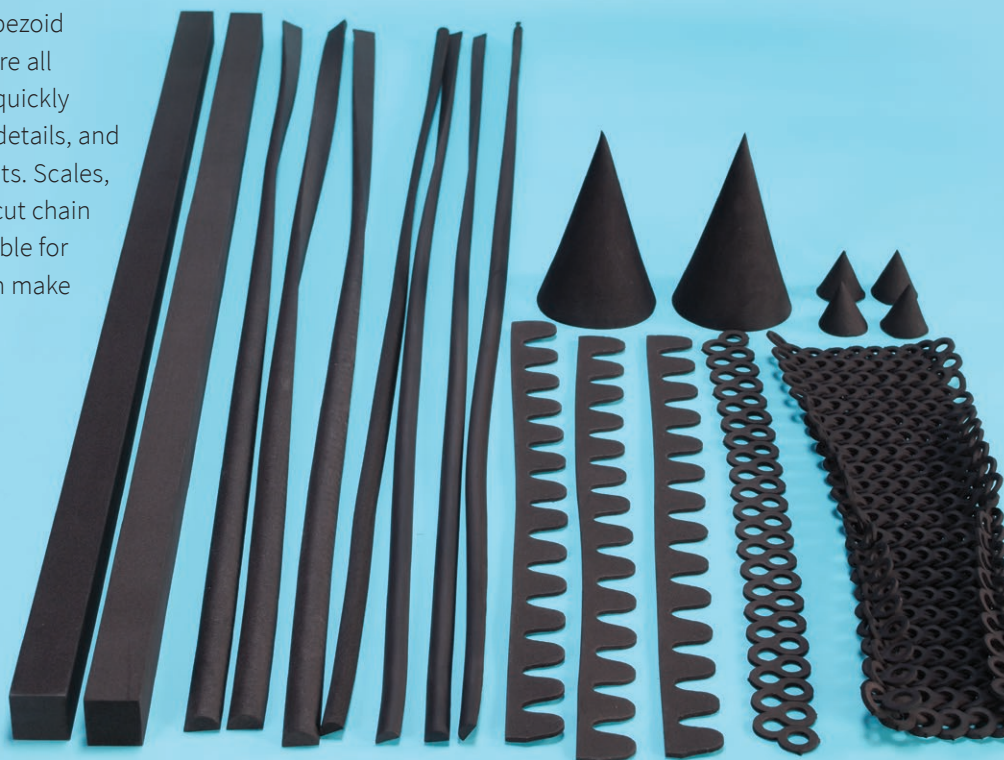


PRO TIP

The additional layer of glue that is adhered to adhesive-backed foam will make it challenging to heat form these sheets into compound shapes.

PRECUT FOAM SHAPES

Rounded bevels, trapezoid bevels, and dowels are all incredibly useful for quickly creating clean lines, details, and edges on your projects. Scales, cones, and even precut chain maille are also available for quick details that can make any project pop.



FOAM CLAY

Foam clay is an amazing material that is extremely easy to sculpt. Create lightweight, organic shapes that can be glued, sanded, and painted with the same materials and methods used with EVA foam sheets. You can even use foam clay to fill holes and gaps and in silicone press molds to create cool shapes and details!

Foam clay is water-based EVA foam that adheres very well to EVA foam without additional glue if applied directly on the foam while still wet. Apply straight from the container to a silicone mold, or layer on EVA foam with a small amount of water to help with adhesion and extend working time. Use your hands or carving and sculpting tools to shape and add detail until the clay starts to become harder to work with. Allow to fully dry (about 24–48 hours, longer for thicker layers) and continue sanding, carving, sealing, and painting as you wish. Attach dried foam clay to EVA foam with contact cement, quick-cure adhesive, or CA glue.



This silicone mold, designed by Evil Ted Smith for Michaels stores, is perfect for EVA foam clay shapes.



Apply water to the foam clay and the EVA foam for better adhesion, as I did when making this Eagle Axe designed by Mathew Grigsby.



Use sculpting tools to add detail to foam clay while it is still wet.

PRO TIPS →

- Speed up production when using silicone molds by placing the mold and clay in the freezer for 30 minutes. Carefully remove the frozen foam clay from the mold and set aside to fully dry.
- Use wax paper between foam clay and other surfaces to avoid unwanted adhesion.
- Foam clay is water based and will shrink slightly when fully cured.

In sheet form, EVA foam is generally considered nontoxic and can be used without gloves or a mask. You can find EVA foam in many items that you use every day: gym floor mats, flip-flops, equipment padding, footwear, and craft supplies. Applying heat, glue, and paint to your projects requires some extra steps to ensure your safety and the safety of others.

Safety First!

Always take the time to thoroughly read product directions and follow all recommended safety precautions for materials and tools.

Safety First!

Throughout this book, you'll see several graphics that are designed to provide a quick visual reminder of the safety precautions that are needed for a particular section, material, or process. Be sure to always follow manufacturer's recommendations on the use of all tools and products you use to create your projects.



The respirator icon indicates that the products, tools, or techniques used in the section could produce harmful vapors. Always follow the manufacturer's recommendations for all equipment and products that generate aerosols or vapors.



Safety glasses should be worn whenever there is a risk of eye injury. This icon is a reminder of these safety precautions and will be seen in sections covering products and techniques that could potentially cause an eye injury.



The gloves icon will be seen in sections that cover products and techniques that call for using potentially harmful substances including glues.

SAFETY EQUIPMENT

If you don't already own the following items, put them on your must-have list! You will need all of these to work safely with EVA foam and the materials most commonly used to create amazing costumes and props; but don't worry, they are all very easy to find at your local hardware store if you don't already have them in your home.

Respirators

Cartridge respirators provide protection from potentially harmful vapors and are an absolute must when using a heat gun on EVA foam, applying certain glues, or spraying paint. Cartridges should be replaced often, so it's a good idea to get a backup cartridge set and label each cartridge with the date the package was opened.



It's Not Just Your Lungs

Remember that your pets and family members can also be exposed to fumes and dust, so always use caution and work responsibly.



Dust Protection



Anytime you sand EVA foam by hand or with a power tool, you'll need a dust mask and safety glasses to keep dust particles out of your eyes and lungs. These super-tiny EVA foam particles can and will get everywhere! Gloves, a shop apron, and long-sleeved shirts are also friendly recommendations for working with messy materials.

PRO TIP

Have a vacuum handy for cleaning up EVA foam dust from your work surface and your clothing!

Gloves



Always have nitrile gloves on hand to protect your hands from glue and paint. When using power tools, use work gloves to protect your skin from equipment such as belt sanders and the like.

Safety Glasses



Protect those peepers any time you are working with any material that has a vapor (glue, spray paint, airbrushing paint), or if you are doing anything that generates dust or debris. You don't want to damage or lose an eye!

HEAT GUN SAFETY

Heat gun nozzles become incredibly hot and take a long time to cool down. Be aware of your heat gun at all times, and be sure to follow all manufacturer safety precautions and directions for this tool. Heating EVA foam with a heat gun can damage work surfaces, so be mindful of the layers underneath the foam. You don't want to mistakenly damage your cutting mat, carpet, or dining table! Use a pizza stone or a concrete floor as a base when you heat up large pieces of EVA foam.

Safety First!

Kitchen items used with EVA foam, paint, and other nonfood materials should be considered workshop equipment and shouldn't be used to prepare food.

PRO TIP

Heat guns with an integrated stand are great for keeping the hot tip away from surfaces.



Hydrogen Bromide



When heated, EVA foam cells close, releasing hydrogen bromide, which is a skin irritant in dust form and corrosive in gas form. Be sure to have adequate ventilation when heating EVA foam, such as an open window and a fan, and use a cartridge respirator.

WOOD-BURNING TOOL PRECAUTIONS

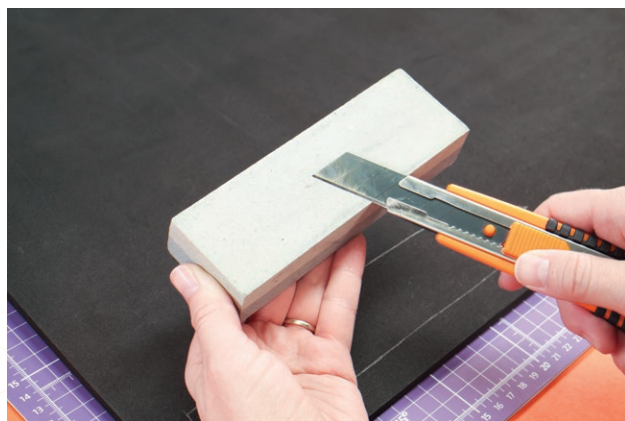


Wood-burning tools are perfect for creating awesome textures on EVA foam, but the process can create toxic fumes. Be sure to have plenty of ventilation, and wear a respirator and safety glasses!



CUTTING SAFETY

A dull blade is your worst enemy! Keeping blades sharp with a sharpening stone or replacing blades often can keep your EVA foam edges clean and your fingers intact. Be sure to dispose of dull blades properly.



ADHESIVE PRECAUTIONS



The best glues for EVA foam are contact cement and quick-cure adhesives, which can be toxic. It is very important to follow all manufacturer safety guidelines when using any adhesive. Use cartridge respirators designed for organic solvents and always have proper ventilation.

PAINT PRECAUTIONS



Generally, any kind of paint in aerosol form requires a lot of ventilation, eye protection, and a respirator designed for organic solvents. This includes airbrushing.

PRO TIP

If you have the space and proper ventilation, a spray booth is an excellent option for using aerosol sprays inside.



6

USING EVA FOAM WITH THERMOPLASTICS

WHAT ARE THERMOPLASTICS?

Thermoplastics are plastic materials that are rigid at room temperature but become soft and very pliable when exposed to heat. They are nontoxic, self-adhesive, and very easy to work with. Add fine details, structure, and durability to your foam projects with a wide range of brands and techniques!



From top to bottom: Worbla's Black Art, Worbla's Finest Art, Worbla's Pearly Art, TerraFlex, MTP, Wonderflex Pro, Thibra, Worbla's TranspArt, Worbla's KobraCast Art, Thibra Tex (smooth side), Thibra Tex (mesh side), Worbla's Mesh Art (smooth side), and Worbla's Mesh Art (mesh side)

All thermoplastics have different characteristics that make each one unique and useful for a wide variety of projects.



Cosplayer: Downen Creative Studios

Costume: Athena, original design

Photo by Downen Photography

This chestpiece was created completely with Thibra, a brand of thermoplastic. A sheet was formed over a mannequin bust for the chest, and the details were created with blended scraps. All of these details were attached with a small amount of heat. No glue was used!

Tools You'll Need to Work with Most Thermoplastics

- Heavy-duty scissors, tin snips, or medical scissors
- Heat gun
- Heat-safe work surface
- Silicone mat, wax paper, or other nonstick surface
- Cool water (for cooling fingers)
- Silicone molds (for making pressed details)

Are Thermoplastics Convention-Safe?

Thermoplastics are capable of creating very realistic props with sharp edges and points, and conventions are understandably cautious about allowing these items into event spaces. Convention staff are more likely to approve your props if they have a soft outer surface like foam or are obviously not real weapons by design.

HEAT-ACTIVATED AND SELF-ADHESIVE THERMOPLASTICS

Most thermoplastics contain their own adhesive that activates when heated above a specific temperature, which varies with each brand of thermoplastic. While in a warmed state, they become very soft and pliable, like fruit leather or beeswax. When cooled, they retain their new shape and become rigid again. Reheat and combine scraps to use every bit of these precious, and generally more expensive, materials! For activation temperatures and other properties of many common thermoplastics, see the thermoplastics charts in *Choosing Your Thermoplastic* (page 30).

PRO TIPS →

- Most thermoplastics have a shiny side that has more adhesive. Make sure the shiny side is facing towards your project for the best adhesion.
- Use a hair dryer or hot water with low-temp-activated thermoplastics like Thibra.
- Don't leave low-temp thermoplastics in a very hot car or in direct sunlight for an extended period of time because they can heat activate again and warp or melt altogether.
- Instantly cool thermoplastics with ice water or cold packs.
- Use sharp scissors or medical scissors to cut thermoplastics.
- Warm up thermoplastics to make trimming much easier.

EASILY CREATE QUICK AND INTRICATE DETAILS

Thermoplastics like MTP, Thibra, Wonderflex Pro, Worbla's Deco Art, Worbla's Crystal Art, and InstaMorph are perfect for adding quick, smooth, intricate details to your costumes. You can shape these thermoplastics into anything you want or press them into a silicone mold to create amazing details that can be attached directly to EVA foam. You can also cut strips of thermoplastic sheets to create woven details and add edging to projects with ease!



These feathers were created by pressing Thibra into a silicone mold.



Weave thermoplastic strips together to create awesome, durable designs like this shield by Spicythai Design.

Photo by Spicythai Design

COMPOUND CURVES

Most thermoplastics will stretch quite a lot when heat activated, which makes them an ideal material choice to form complex curved shapes like chestpieces, helmets, pauldrons, and domes. The trick is to work slowly and evenly heat the material as you gently ease it into place. This will take some practice to master. Smooth thermoplastics can be formed over objects, like this skull, to create a shell with crisp curves and a smooth surface. Reinforced thermoplastics can be used to create similar shells that are much more durable but have slightly less detail around curves and details.



This skull decoration (*center*) was used to create two thermoplastic shells: the shell on the left from smooth MTP and the shell on the right from reinforced Thibra Tex.

ADDED DURABILITY ... AND WEIGHT

Most thermoplastics are heavier than EVA foam. Adding a lot of thermoplastics to your costume will add a significant amount of weight, but it will be incredibly durable. If your project needs to be very light and flexible, use thermoplastics sparingly.

CHOOSING YOUR THERMOPLASTIC

Thermoplastics are available in many different varieties, and each has unique advantages and qualities. There is no single thermoplastic that is perfect for every application.

Smooth Thermoplastics

Worbla's Black, Worbla's Finest Art, Worbla's Pearly Art, TerraFlex, MTP, Wonderflex Pro, and Thibra are all examples of the most commonly available thermoplastics. They are all smooth on both sides and very flexible when heated, and they can be formed into complex curves with minimal wrinkles and are great for sculpting. Seamlessly combine even the smallest scraps with heat to use again. Worbla's TranspArt shares some of these characteristics, but is a very different kind of thermoplastic. For technical details, see the thermoplastics charts (next page).



From left to right: Worbla's Black, Worbla's Finest Art, Worbla's Pearly Art, TerraFlex, MTP, Wonderflex Pro, and Thibra.

Reinforced Thermoplastics

Worbla's Mesh Art, Worbla's KobraCast Art, Thibra Tex, and Wonderflex are all examples of thermoplastic materials reinforced with mesh. These are smooth on one side, mesh on the other. They have some stretching characteristics but can't form steep compound curves without the surface texture changing considerably. These plastics are great for creating structural parts. They are incredibly durable and strong but are more textured than other kinds of thermoplastics.



Pellet-Form Thermoplastics

Worbla's Deco Art, Worbla's Crystal Art, and InstaMorph are all pellet-form thermoplastics. These are perfect for press molds and can be dyed with alcohol inks to change their color. The scraps can be blended to use again.



To help you decide which is best for your project, here are some of the most frequently used thermoplastics, their overall properties, and useful notes.



This thermoplastic skull was created by forming MTP over a skull shape, creating a smooth surface.



This thermoplastic skull was created by forming Thibra Tex over a skull shape, creating a very strong shell with a textured surface.

SMOOTH THERMOPLASTICS (U.S.)

	MTP	Worbla's Black	Worbla's Pearly	Worbla's Finest Art	Worbla's TranspArt	Thibra	Wonderflex Pro	TerraFlex
Activation temp	104°C (220°F)	90°C (194°F)	90°C (194°F)	90°C (194°F)	120°C (250°F)	71°C (160°F)	70°C–80°C (150°F–170°F)	95°C–100°C (203°F–212°F)
Color	Brown	Black	White	Orange/tan	Clear	Tan/gray	Tan/gray	Light brown
Surface quality	Smooth on both sides	Smooth on both sides	Smooth on both sides	Slightly textured on both sides	Extremely smooth on both sides	Extremely smooth on both sides	Extremely smooth on both sides	Slightly textured on surface, smooth on adhesive side
Can scraps be combined?	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Self-adhesive?	Yes	Yes	Yes	Yes	Yes, only at activation temperature	Yes	Yes	Yes
Tear strength	Strong	Strong	Strong	Strong	Very strong	Strong	Strong	Strong
Adhesive strength	Sticky	Sticky	Sticky	Sticky	Somewhat sticky	Very sticky	Very sticky	Sticky
Can it be wrapped around EVA foam?	Yes	Yes	Yes	Yes	No	Not recommended	Yes	Yes
Nontoxic?	Yes	Yes	Yes	Yes	Yes	Yes, also biodegradable!	Yes	Yes, also biodegradable!
Notes	Polish the surface while warm with silicone for a shiny, smooth result.	Black color is a great base for painting darker hues.	White color is a great base for painting lighter hues.	Smells like cookies when heated	Can be dyed, vacuum formed, and sanded for LED diffusion	Great for press molds and capturing small details Sandable	Great for press molds and capturing small details	Can be ironed at 130°C–140°C (266°F–284°F)

REINFORCED THERMOPLASTICS (U.S.)

	Worbla's Mesh Art	Worbla's KobraCast Art	Thibra Tex	Wonderflex
Activation temp	80°C–90°C (175°F–195°F)	80°C–90°C (175°F–195°F)	65°C (149°F)	70°C–80°C (150°F–160°F)
Color	Tan	White	Light blue	White
Surface quality	Leather-like on one side, mesh on the other	Develops a texture like thin plastic gauze when heated	Leatherlike on one side, mesh on the other	Leatherlike on one side, mesh on the other
Can scraps be combined?	Yes (mesh fibers will create a rougher surface)	Yes (mesh fibers will create a rougher surface)	Yes (mesh fibers will create a rougher surface)	Yes (mesh fibers will create a rougher surface)
Self-adhesive?	Yes	Yes	Yes	Yes
Tear strength	Very strong	Very strong	Very strong	Very strong
Adhesive strength	Very sticky on smooth side	Very sticky	Very sticky on smooth side	Very sticky on smooth side
Can it be wrapped around EVA foam?	Yes	Yes, but more suited for light, sturdy, intricate details	Yes	Yes
Nontoxic?	Yes	Yes	Yes	Yes
Notes	Made partially from recycled rice husks. Embedded mesh does not form through when heated.	Thinnest and lightest Worbla product. Can be pressed into complex molds and vacuformed.	Embedded mesh makes it extremely durable.	Embedded mesh makes it extremely durable.

PELLET-FORM THERMOPLASTICS (U.S.)

	Worbla's Deco Art	Worbla's Crystal Art	InstaMorph
Activation temp	65°C (150°F)	110°C (230°F)	65°C (150°F)
Color (when cooled)	White	Clear	White
Surface quality	Extremely smooth	Extremely smooth	Extremely smooth
Can scraps be combined into original texture?	Yes	Yes	Yes
Self-adhesive?	Yes	Yes	Yes
Can it be painted?	Yes	Yes	Yes
Can it be dyed?	Yes	Yes	Yes
Tear strength	Very strong	Very strong	Very strong
Nontoxic?	Yes	Yes	Yes
Notes	Translucent when heated, milky when cooled	Milky when heated, translucent when cooled	Translucent when heated, milky when cooled

COMMON WAYS TO USE MOST THERMOPLASTICS WITH EVA FOAM

Double-Sided Wrap Method

Sometimes referred to as the *sandwich method*, this technique adds considerable strength to your project. It is also perfect for adding strong cores and stable connection points to objects that are bulky and cantilevered.

Recommended Thermoplastics

Best with: MTP, Worbla's Black, Worbla's Pearly art, Worbla's Finest Art, TerraFlex, Worbla's Mesh Art, Worbla's KobraCast Art, Thibra Tex, Wonderflex with flat or slightly curved shapes

Possible with: Thibra, Wonderflex Pro

Not recommended for: Worbla's TranspArt, or pellet-form thermoplastics



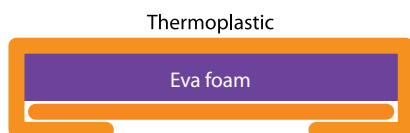
Model: Brett Downen

Cosplay Designer: Downen Creative Studios

Costume: Thor from Marvel Cinematic Universe

The chestpiece for this Thor cosplay needed to be strong and durable. Each piece was created by wrapping 2mm EVA foam with Worbla's Finest Art thermoplastic, then covered with faux leather and assembled.

Photo by Chun-I Lin



Wrapping thermoplastics around EVA foam can be done in just a few simple steps! Grab a heat gun, an EVA foam shape, scissors, and a nonstick surface to get started.

This step-by-step example uses the sandwich method with a simple geometric shape, but you can use this method with any kind of EVA foam shape.



1. Trace the EVA foam shape onto the thermoplastic twice and cut one piece $\frac{1}{2}$ " larger than the traced line and the other piece $\frac{1}{4}$ " smaller than the traced line.



2. Start with the top layer. On a nonstick surface, apply heat evenly to both sides.



3. When the thermoplastic becomes soft and pliable, gently place it over the EVA foam and press lightly.



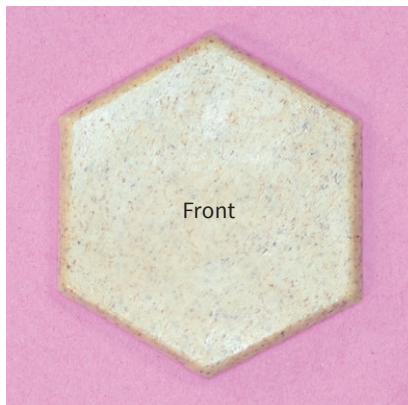
4. Trim a little away from the corners and the edges to reduce bulk.



5. Fold the edges around the EVA foam. You may need to apply more heat to the edges.



6. Heat the remaining thermoplastic piece thoroughly on both sides. Right before you connect surfaces, apply a small amount of heat to the wrapped piece to make the surface slightly tacky. Gently press together.



7. Allow to cool.



Double-Sided Flat Method

When you are using thinner EVA foam, use this variation on the previous technique to reduce bulk and help create structure for a thin EVA foam shape like a tiara or a dagger blade.



Cosplayer: Downen Creative Studios
Costume: Hippolyta from DC Extended Universe

Photo by Downen Photography

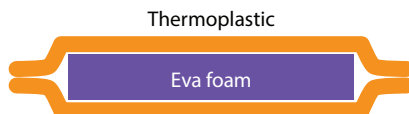
I used this method to create Hippolyta's crown using 2mm foam and Worbla's Black. This was primed, sanded smooth, and painted.

Recommended Thermoplastics

Best with: MTP, Worbla's Black, Worbla's Pearly Art, Worbla's Finest Art, TerraFlex, Worbla's Mesh Art, Thibra Tex, Wonderflex

Possible with: Worbla's KobraCast Art, Thibra, Wonderflex Pro

Not recommended with: Worbla's TranspArt or pellet-form thermoplastics



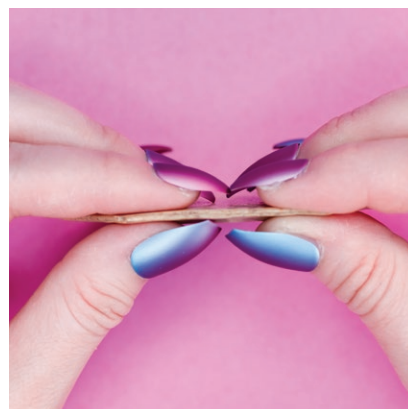
This step-by-step example uses the double-sided flat method with a simple geometric shape, but you can use this method with thinner EVA foam for projects that require a slimmer profile or seamless connection.



1. Trace the EVA foam shape onto the thermoplastic. Add a small margin and cut 2 pieces.



2. Heat 1 piece of thermoplastic and place over the foam.



3. Heat the second piece and place over the back of the foam. Press together.



4. Trim edges. If needed, apply a small amount of heat to the thermoplastic to make it easier to cut.



Finished!

Single-Side Wrap Method

You can save time, money, and material with a single layer of thermoplastics wrapped around your EVA foam piece and still have the added benefit of stability. Sometimes called the fold method, this process is good for pieces where the back is hidden from view, like a pauldron, vambrace, or helmet.

Follow the same steps as the double-sided wrap (sandwich) method, but cover the top side only.



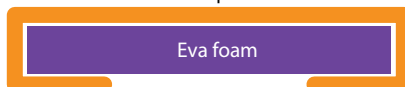
Cosplayer: Deela Designs

Costume: Malthael from *Diablo III*: Reaper of Souls

Deela Designs used the single-side wrap method to create her Malthael costume.

Photo by Lucid V Photography

Thermoplastic



Recommended Thermoplastics

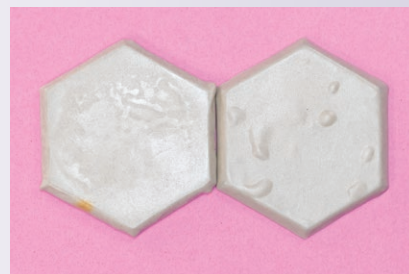
Best with: MTP, Worbla's Black, Worbla's Pearly Art, Worbla's Finest Art, TerraFlex, Worbla's Mesh Art, Thibra Tex, Wonderflex, Worbla's KobraCast Art

Challenging with: Thibra and Wonderflex Pro

Not recommended with: Worbla's TranspArt or pellet-form thermoplastics

Thibra

Thibra is unique in that it offers the smoothest surface and the most intricate detail of all the thermoplastics. Unlike other thermoplastics, the ultrasmooth property of Thibra is perfect for flawless shiny metallic surfaces and getting the best results with silicone molds. However, using this material with EVA foam takes some practice. Thibra captures every detail—including fingerprints and air bubbles—when the EVA foam releases gas during the heating process. Here are some tried-and-true tips for using this wonderful, finicky material with EVA foam.



- Heat form, heat seal, and prime EVA foam before wrapping Thibra around your project. This will reduce air bubbles from forming between the EVA foam and the Thibra.
- Touch the heated Thibra surface as little as possible.
- Avoid applying more heat once the Thibra is in position on the EVA foam.
- To add more Thibra details to the surface, use very brief heat at a low setting, or attach with quick-cure adhesive.
- Add a texture to help disguise unwanted flaws and air bubbles that may appear.

Single-Layer Shells

Sometimes you will need a part that is thinner and stronger than a sheet of foam, like if you are adding a strong headband under an oversized wig or headpiece, a chestpiece cup, or a semitranslucent orb on the end of a prop staff. Even a single layer of thermoplastic can offer rigidity and structure to your costumes and projects. Form the plastic over objects to create thin shells. For example, if you have a fiberglass mannequin, you can create thin chestpieces.



Photo by Downen Photography

Cosplayer: Downen Creative Studios
Costume: Athena, original design

I molded a sheet of Thibra over a mannequin bust to create the chestpiece for this Athena costume design.

Recommended Thermoplastics

Best with: MTP, Worbla's Black, Worbla's Pearly Art, Worbla's Finest Art, TerraFlex, Thibra, Wonderflex Pro, Worbla's KobraCast Art, Worbla's Mesh Art, Thibra Tex, Wonderflex for shapes with little to no curve

Not recommended with: Worbla's TranspArt or pellet-form thermoplastics

Creating a shell is a fairly simple process that can take some practice. Use these steps for the best results.

Thermoplastic



1. Apply a thin layer of petroleum jelly or cooking spray over your mold as a release agent. Heat form a single layer of thermoplastic over EVA foam or a shape.



2. Continue to gently heat the thermoplastic until the shape is well formed. Be careful not to wrap the thermoplastic too far around the object or you won't be able to release it from the form.



3. Once completely cool, gently remove the shell and trim.



Silicone Press Molds

Create totally smooth, intricate details with silicone press molds! Simply heat up the thermoplastic and push the material into the molds. Allow it to cool, or submerge it in cold water to instantly cool. This is a great way to use scrap pieces and add dimension and details to your projects. For more information, see Adding Textures and Details (page 53).



Recommended Thermoplastics

Best with: Thibra, Wonderflex Pro, MTP, Worbla's Deco Art, Worbla's Crystal Art, InstaMorph

Possible with: Worbla's Black, Worbla's Pearly, Worbla's Finest Art, TerraFlex, Thibra Tex, Wonderflex, Worbla's Mesh Art, Worbla's KobraCast Art

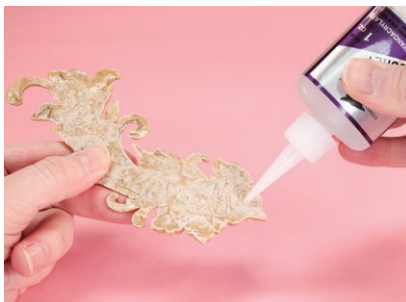
Not recommended with: Worbla's TranspArt

ATTACHING TO EVA FOAM

When some of the stickier thermoplastics are heated to their activation temperatures, they are easily bonded when pressed together. Thermoplastics that have been wrapped around the edges of EVA foam are firmly locked in place and do not need additional adhesive to remain sturdy. But if the thermoplastic is an additional detail layer, like edging or a filigree from a silicone mold, you'll need to use quick-cure adhesive, CA glue, hot glue, or contact cement to secure it in place. Be sure to test your materials and see what works best for your project.



1. For best results, lightly sand the back of the thermoplastic with sandpaper, just enough to create a roughened surface.



2. Apply glue to the thermoplastic and spread it to the edges with scrap foam.



3. Press the thermoplastic in place on the EVA foam and hold until secured.

TROUBLESHOOTING AND TIPS

Overheating and Burning

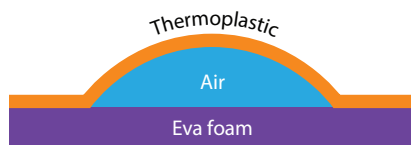
Like EVA foam, thermoplastics can burn when you apply too much high heat to one area of your material. Unlike EVA foam, overheated thermoplastics are difficult to repair once their surfaces have been damaged. Remember to keep your heat gun in motion and use a lower setting if your material seems to be activating too quickly.



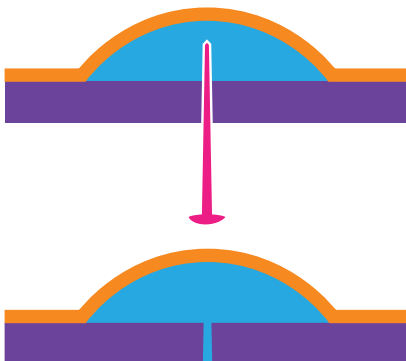
Worbla's Finest Art that was heated a bit too much (*right*).

Got Bubbles?

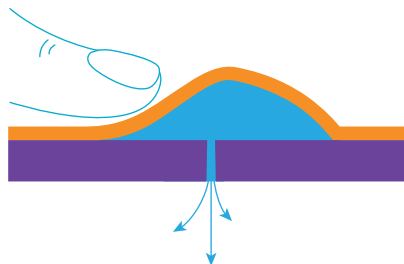
Remember that EVA foam will release gas when heated, which can cause bubbles in the surface of your thermoplastic. If this happens, try these steps to minimize the air bubbles.



1. Use a pin to make a small hole in the EVA foam without piercing the thermoplastic.



2. Lightly heat the bubbled area and gently tap the bubble, starting at the outer edges and working toward the center.



3. The hole in the EVA foam will allow the air to escape, and the bubble will flatten. Repeat if needed.



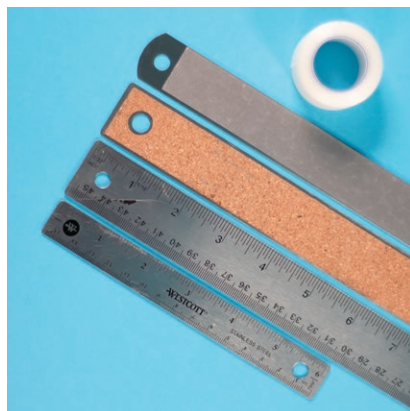
CUTTING AND MEASURING TOOLS

You'll be working with different kinds of foam for your costumes and projects, which means you'll need to know a few things about all the cool things you can do with a blade. In this chapter, you'll learn about the tools and techniques for making perfect cuts, bevels, undercuts, scored details, perfect circles, and more. With a little practice, you'll be an expert in no time!

Rulers

Metal Rulers

Metal rulers are the safest kinds of rulers to use for cutting straight lines and bevels on EVA foam with blades. Use a cork-backed metal ruler to prevent the EVA foam from slipping. You can also apply a strip of Tear-Perfect Maker Tape to add grip if your ruler doesn't have a cork backing.



Cos-Tools

Large rulers like this 20" Cos-Tools Channel Rail with a rubber backing are designed for optimal stabilization for long cuts. This particular ruler is engineered to be used with some of the company's other neat foam-cutting tools.



Foam Rulers

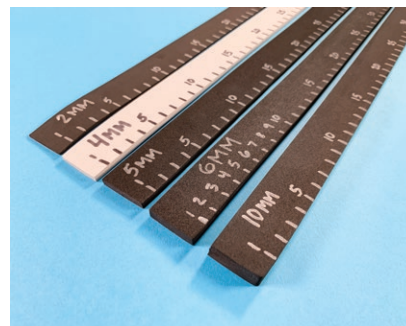
Using a DIY foam ruler made from the same thickness foam that you intend to use will help you avoid making your costume pieces too small. Remember, paper patterns will need to be adjusted to compensate for the added thickness of your EVA foam. Use a foam ruler when measuring pattern pieces that will fit around your body. With a little practice, this technique will quickly become second nature.

As always, the best method to ensure your foam pieces will fit you perfectly is to build a mock-up of a similar thickness as your proof of concept and start from there.

Making a foam ruler is very easy! Cut a strip of foam at the maximum length that your material will allow and draw measuring hash marks. Add tape to the underside to help prevent the ruler from stretching out.



As you can see, to wrap around this foam head, you would need a just over 49cm length of paper, but you would need a 54cm length of 10mm foam.



Knives and Blades

There are many kinds of knives you can use to cut EVA foam. It's helpful to have a few of these useful tools handy.

Retractable Utility Knives, Snap Blades, and Precision Blades

Retractable utility knives are heavy-duty blades that are a good all-purpose tool but are not adjustable for deeper cuts. Retractable snap blades are great for carving and cutting thicker materials. Precision blades, such as X-ACTO knives and Micro-Mark MagiCut EVA Foam Scalpels, are perfect for scoring, cutting smaller details, and precision work. Sharpen all of these blades with a sharpening stone every few cuts.



When to Replace or Sharpen Your Blade

You'll know when it's time to sharpen or replace a blade when you need to apply more force to cut through the foam; you will also see rougher edges once the blade is dull.



Disposing of Used Blades

Use a proper receptacle for used blades, and store them away from your work surface. Be diligent about safely discarding blades as soon as you change them, and don't ever throw loose blades in the wastebasket. Purchase a receptacle from a hobby store or online, or make your own using a plastic or metal container with a tight-fitting lid.



Scissors

You really can't go wrong if you have a variety of scissors at your disposal. Heavy-duty scissors can cut through thick EVA foam, tape, and even thermoplastics. Medical scissors, with a flattened underside for safe skin travel, are a necessity to safely remove a duct tape body form from your body and will easily cut through thermoplastics. Trim details with embroidery scissors, or cut decorative edges with specialty scissors.



PRO TIP ➔

Don't use fabric scissors to cut EVA foam. It won't hurt your foam but will quickly dull your expensive fabric shears.

Circle Cutters and Hole-Punching Tools

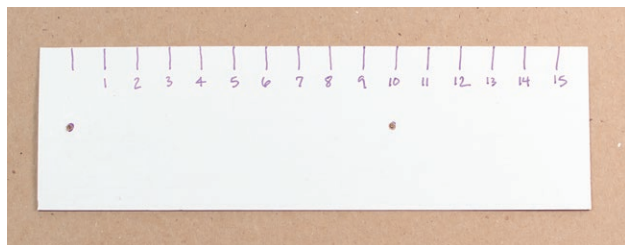
Cut perfect circles from 1" (2.54cm) to 6" (15.24cm) diameter with a circle cutter like this one from Cos-Tools by Logan Graphic Products, Inc. Their hole drills are also great for cutting holes in a variety of sizes. You can also use an awl, leather hole-punch tool, and brass or carbon fiber tubes to make perfect small holes and score circular details!

These EVA foam circles were a breeze to cut using the Cos-Tools Circle Cutter and Hole Drill. Cut perfect rings and circles in a wide variety of thicknesses and sizes with ease.

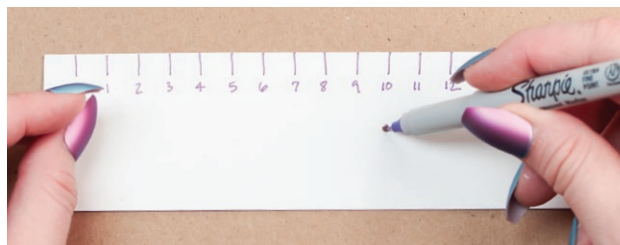


Custom-Made Circles

Finding the right sized circle template can be hard, so why not make your own custom sizes?



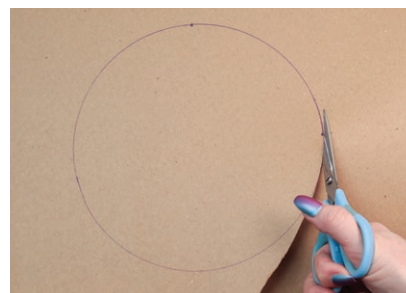
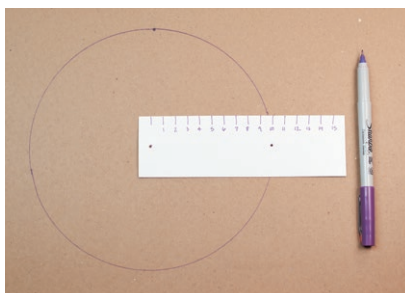
1. Cut a rectangle out of chipboard or cardboard. Label the edge with measuring marks, making the first mark a little way in from the edge. Make a pin hole at the first mark and another at the required measurement. This example uses centimeters, and a pin hole has been made at the 0cm mark and at 10cm.



2. Place the rectangle on another piece of chipboard or cardboard. Stabilize the zero end with a pin through the pinhole and position a pen tip in the hole made at the desired measurement, 10cm in this example.



3. Holding the pin steady, gently guide your pen in a circle by keeping the pen tip in the hole.



4. Cut out the circle with a blade or scissors.

5. Finished! Add a label and measurements, and save the template in your shape library. Trace on EVA foam.

Die Cutters

Machines like Brother ScanNCuts, Cricuts, and Silhouettes are all great for cutting thinner sheets of EVA foam and scoring incredible details that would otherwise take what will feel like forever to cut by hand. With a digital cutter you can create an unlimited number of shapes and textures with precision. These machines can really take your costumes and props to a whole new level.



Power Tools



If you are lucky enough to own or have access to power tools, you can cut thicker, denser foam with ease using shop tools like a band saw, scroll saw, and even some rotary tools. You can even cut perfect bevels using a band saw!

Laser Cutters

Laser-cutting machines, such as a Glowforge, are very high-end equipment that allow you to cut many kinds of materials with ease and precision. These machines come with a pretty hefty price tag and require additional safety equipment. It is also common during higher budget projects to outsource cutting to local laser-cutting businesses; reach out to your online forum of choice and you'll likely get several recommendations on reputable laser-cutting businesses or fellow cosplayers near you who can help.

Model: Makailah Johnson

Costume Designer: Kralizak

Costume: Croma, the Warmaiden, original design

Designer Kralizak used a laser cutter to create the intricate details on his beautiful original design costume and prop.

Photo by Kevin Le



CUTTING TECHNIQUES

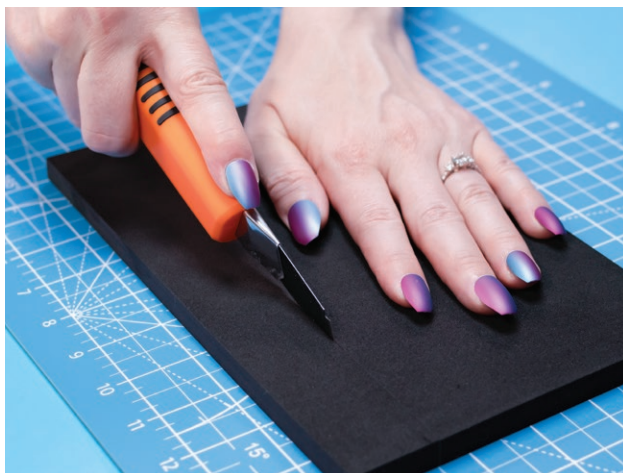
90° Cuts

The secret to cutting perfect straight lines is holding your utility knife at a 90° angle to the foam. This takes some practice, so grab some scrap foam, a metal ruler, and a cutting mat to start slicing and dicing!

1. Stabilize the foam sheet and the metal ruler with your noncutting hand on a self-healing cutting mat. Position the blade perpendicular to the ruler and the mat.



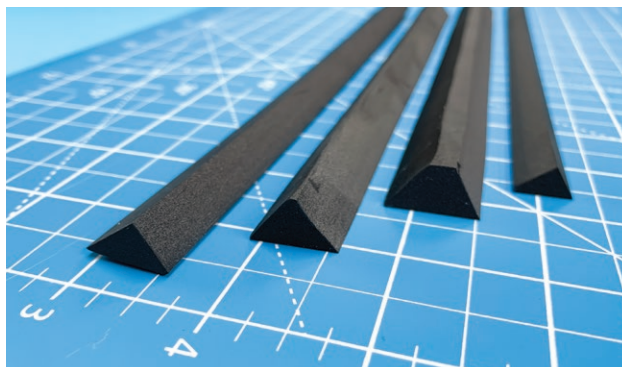
The blade is perfectly perpendicular to the cutting mat.



2. Apply even pressure with your cutting hand while pulling the blade toward you. Use a consistent speed and smooth motion for best results. Remember to keep your cutting hand positioned so the blade stays at 90° for the entire length of your cut.

Beveled Cuts

Make your own bevels or buy them from retailers like TNT Cosplay, JOANN Fabric and Craft, or Lumin's Workshop. Cutting bevels takes a little practice, but you'll quickly get the hang of it!





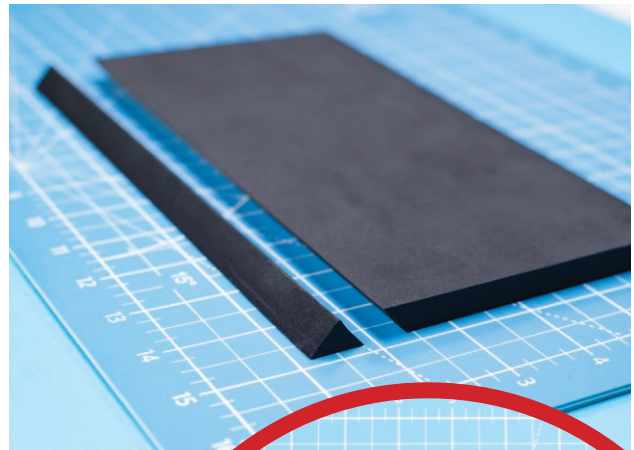
1. Stabilize the foam sheet with your noncutting hand. Angle your knife with the flat side of the blade positioned against the edge of the ruler, and place the blade tip on the cutting mat so it will travel *under* the ruler as you cut. This is the safest and best way to cut a clean bevel.



2. Gently pull the blade through the foam, keeping your hand at the same angle throughout the entire cut. Keep the flat side of the blade in contact with the ruler edge as you cut.



3. Flip over the foam sheet, and position your ruler about 1mm away from the top cut edge. Cut another line, holding the blade at the same angle you used for the first cut.



Awkward Hand Positions Are Dangerous

Don't ever cross your hands when cutting EVA foam with a blade!

Proper hand positioning is important when using very sharp blades. Don't ever cross your hands when cutting a difficult angle. You could seriously injure yourself.



SANDING

Once you are done cutting your EVA foam shape, you can refine the shape further by cleaning up the edges, creating a rounded edge, and more by sanding.

Safety Equipment



Remember to always use proper safety equipment when sanding EVA foam.

- Dust mask
- Nitrile and work gloves
- Safety glasses
- Shop vac or home vacuum

PRO TIPS

- High-density foam will sand to a smoother finish than low-density foam.
- Most foam clay is less dense than sheets of EVA foam, which can make a difference when sanding. Use care when sanding foam clay with rotary tools to avoid accidentally removing too much foam.

Rotary Tool and Accessories

A rotary tool is an essential tool to have in your maker shop. Use it with a wide range of accessory attachments to carve details, smooth edges, create bevels, refine shapes, and so much more.



Rotary tool with flex-shaft attachment

Sanding Drums

A sanding drum is great for removing large amounts of foam very quickly. Use a coarse or medium grit to remove uneven edges and carve details. Use a finer grit to further refine and smooth the edges.



Use the Dremel Flex Shaft for better control and to reduce hand fatigue, and the Dremel EZ Lock Mandrel for fast drum changes.



Engraving tips, carving tips, sanding drums, and grinding stones are all great rotary tool accessories for carving, sculpting, smoothing, and texturing EVA foam.



The Dremel EZ Lock Mandrel is a convenient tool to use for easily and quickly replacing sanding drum accessories without the need for additional tools.

Grinding Stones

Polish and tidy jagged, uneven edges and smooth seams with a grinding stone. The stone will also generate friction against the foam surface, which can help with smoothing.



PRO TIP

Create details with these rotary tool attachments. For more information, see Adding Textures and Details (page 53).



Carving and Engraving Tips

Transform the surface of your EVA foam projects with carving and engraving accessory tips for your rotary tool.



Use these attachments to easily create textures like hammered metal, bone, and wood grain; show battle damage; and much more. To learn how to use these tools to create textures, skip ahead to Adding Textures and Details (page 53).



This hammered metal texture was created with a rounded carving tip.

Hand Sanding

You can sand EVA foam by hand. This is sometimes the best option for delicate areas. To help with precision, make sanding sticks by gluing different grits of sandpaper to paint sticks and Popsicle sticks with spray adhesive, and be sure to label them with the grit. You can also use adhesive sandpaper and attach it to anything flat or round for some cool sanding effects!

PRO TIP

Higher-quality EVA foam will be easier to sand by hand and will produce better results.



A flat sheet of EVA foam can be transformed into compound curves with just a little bit of high heat. EVA foam can also be reheated and formed over and over again, which is very useful when creating rounded shapes like body armor, chestpieces, pauldrons, helmets, footwear, and more.

For extreme curves like spheres, horns, and other complex shapes, a seam or two or some darts can be added to the pattern design to help coax the foam into shape while heat forming. For more information, see Patterning (page 134).

HEAT GUNS

Perhaps the most important tool you'll need to work with EVA foam is a heat gun. A heat gun helps you evenly heat EVA foam so it can be easily formed and manipulated. Heat guns are also essential for preparing your project for sealers and paints, known as *heat sealing*. They are very easy to use and can be found at any hardware store.

There are *many* different kinds of heat guns. If you are not sure what will work best for you, remember that having a variety of heat guns gives you more flexibility as well as a backup in case one breaks.



From bottom to top, the ZeopoCase Mini Heat Gun, the Wagner SprayTech, and the Wagner FURNO

PRO TIP

While hair dryers are great for speeding up drying times for paint and glue and working with some thermoplastics, you will need to invest in a heat gun to work with EVA foam.

Safety Reminder



Be sure to follow all safety precautions when heating EVA foam and using heat guns. Carpets, wood, plastic, and fabric can all be damaged by high heat, so be sure to work on a surface that is heat-resistant. For more information, see Heat Gun Safety (page 26).

Tales from the Convention Floor

I once hosted a live workshop at a convention that required all attendees to use heat guns for the project. Once we all got started and turned on our heat guns, everyone lost power! After some scrambling and fuse resetting, we were back up and running. Unfortunately, the students had to work in pairs for the rest of the workshop. It turns out that you *can't* run twenty heat guns at the same time!

On the next page you'll find a handy comparison chart that takes the guess-work out of finding the right heat gun for you and your budget.

HEAT GUN COMPARISON

	Generic Hair Dryer	ZeopoCase Mini Heat Gun	Wagner SprayTech HT1000 (0503008)	Wagner FURNO 700 (0503070)
Heats and seals foam?	No	Yes	Yes	Yes
Temp range	60°C (140°F), will vary	199°C (390°F)	399°C–538°C (750°F–1000°F)	52°C–704°C (125°F–1300°F)
# of temp settings	2	1	2	117
Precise temp control?	No	No	No	Yes
# of fan speeds	2	1	2	5
Cooldown setting?	No	No	No	Yes
Hands-free integrated stand?	No	No	Yes	Yes
Price	\$–\$\$	\$	\$\$	\$\$\$
Pros	Perfect for reducing drying times for glue and paint Can be used with some low-temp thermoplastics	Great for small, delicate details and smaller projects	A great option for the price	Multiple fan speeds, temps, and accessories allow for the most control.
Cons	Will not heat or seal EVA foam	Heating a large surface is a challenge.	Limited temperature options and fan speed controls	Higher cost

CREATING COMPOUND CURVES



Compound curves were added to this pauldron to create flared edges and accentuate the rounded body.



Creating compound curves is easy with a little heat and some gentle stretching and manipulation!

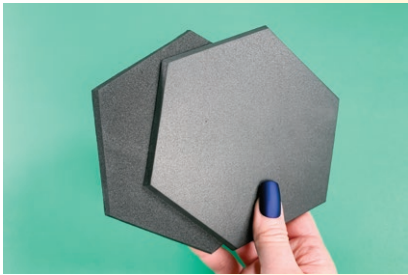


- 1. To begin, move the heat gun over the surface of the EVA foam using a continuous sweeping motion, being sure to keep the tip several inches away from the foam surface. Avoid concentrating the heat in one spot for too long.
- 2. Flip the EVA foam over and repeat. Continue this process until the entire piece is evenly heated and the foam becomes softer and malleable.



- 3. While the EVA foam is still warm, push and pull the foam with your fingers and thumbs. The EVA foam will stretch and curve into shape.

PRO TIP



When the surface of the foam becomes shiny and smooth, it is heat sealed (right).

USING SHAPES TO FORM EVA FOAM



 Use objects like an acrylic dome, an extruded polystyrene foam shape (such as a Styrofoam shape), or a wooden ball to help make steeper curves. Rounded items like softballs, bowls, and even your knee can help create complex curves. If you need a bigger, steeper curve, adding a seam or a dart on your pattern will help create the shape you need. For more information, see *Flattening and Adding Darts* (page 157).

PRO TIP

Thicker foam will take longer to heat evenly and might need to be reheated often to fully shape. Reheat EVA foam as often as needed for beautiful curved shapes!



For longer shapes, it can help to elevate the form you are using. This repurposed floor lamp (*above*) has several staff segments and the wiring has been removed. It is a very useful tool when shaping helmets and bigger pieces with larger curves that can be cumbersome to work with.

To use a mold to create curves, follow these steps.



1. Use a tape roll to stabilize the curved form you are using.

2. Evenly heat both sides of the EVA foam with a heat gun.



3. Use both hands to press the foam against the curved shape. For best results, allow EVA foam to cool in place so it will “remember” its new shape.



4. Remove from the form once cooled.

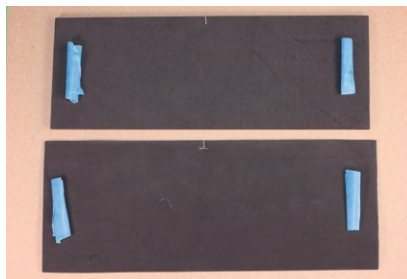
SUPPORTING CURVED SHAPES



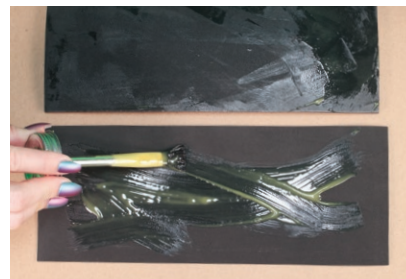
Attaching another layer of foam to the main piece while it is curved will help it maintain its shape. A thin layer of 2mm foam will work well, but you can use any thickness.



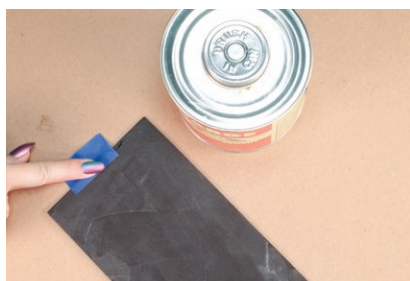
1. Cut a piece of 2mm foam slightly larger than your main piece. Mark the center on both pieces.



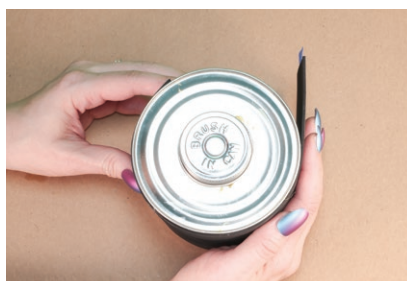
2. Apply painter's tape to the bottom of both pieces to anchor the foam in place. Contact cement will cause the thinner foam to curl when applied.



3. Flip over both pieces and adhere the taped side to your work surface. Apply contact cement evenly to the top surfaces.



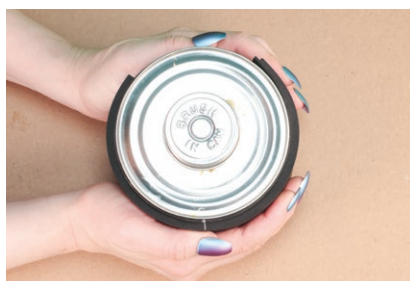
4. When the cement becomes tacky, remove the 2mm piece of foam from your work surface and remove the first pieces of tape. Apply a piece of painter's tape to the ends of the 2mm foam sheet to secure this piece to the shape. In this example, the glue canister was used as the molding base.



5. Tape the 2mm foam to the canister, with the glue side facing out.



6. Align the second piece at the centerline and press in place.



7. Continue to press the sides in place on the entire piece.



8. Allow to cure. If you are using Barge Contact Cement, allow the piece to rest for 1–2 minutes. The result is a beautifully curved shape that is supported and durable.

PRO TIP



The dome on the left was not heat formed before assembly. As a result, the surface isn't as round as the dome on the right, and the seams are more visible.

Heat form your pattern pieces before gluing them together! This aids with assembly and can also help minimize seam lines. Use a little bit of heat, and avoid stretching the edges of the foam if possible. If your foam is overstretched, registration marks on your pattern could be misaligned.

PRO TIPS

All EVA foam shrinks slightly in response to high heat. Thin foam and small details will not be repairable if overheated. Use a high-density foam like EVA-70 from TNT Cosplay Supply for small details and minimal shrinking.

- Use low heat when working with very small details. For more information, see *Adding Textures and Details* (page 53).
- Shrink test your foam before you begin heat shaping. Thin foam will shrink more than thicker foam and low-density foam can shrink more than high-density foam.



Before high heat

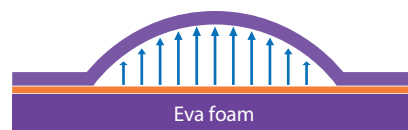


After high heat

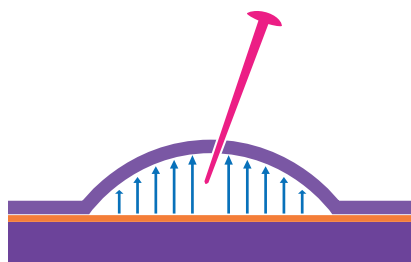
TROUBLESHOOTING**Bubbling Between Glued Layers**

Sometimes a thin layer of EVA foam that has been glued to another layer of EVA foam will begin to bubble as you are applying heat. Bubbling is a result of all the tiny foam cells collapsing and releasing gas (hydrogen bromide) that is now trapped between the glued layers. This can happen in areas that might have been missed when the layers were glued together. Luckily, it's pretty easy to fix.

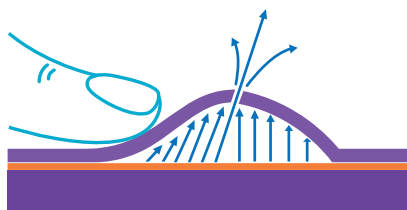
To release trapped air, follow these steps.



Trapped air between glued layers of EVA foam



1. Make a small hole in the bubble with a pin.



2. Gently smooth the surface with your finger, starting from the edge of the air bubble and moving toward the center. The trapped air will be pushed out through the hole.



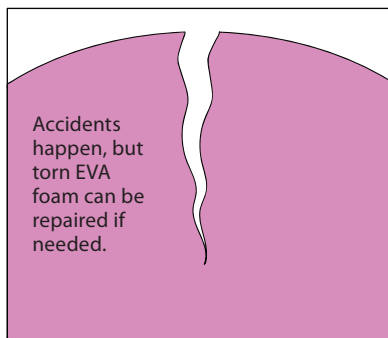
3. Smooth the surface once all air has been released. Fill the remaining pin hole with paint, filler, or a dab of quick-cure adhesive.

To learn how to fill larger holes, see *Minimizing Seams and Gaps* (page 82).

Tears



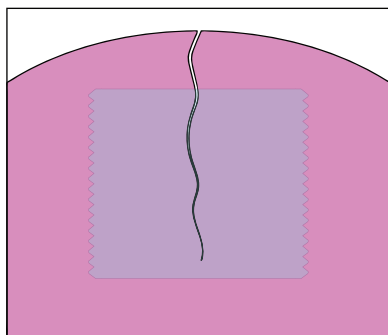
As durable as EVA foam is, it can still tear with enough force. Luckily, most tears can be fixed with quick-cure adhesive or contact cement.



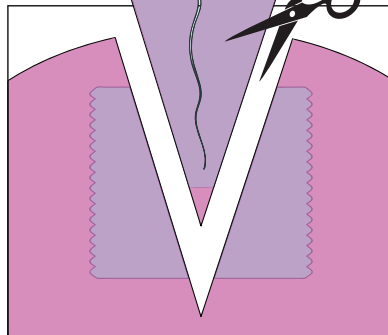
If quick-cure adhesive doesn't work, try replacing the damaged section. This is a great technique for superclean seams that are easier to conceal.

PRO TIP

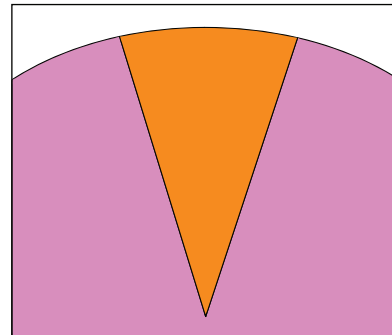
Reinforce repairs with nonstretch cotton fabric attached to the underside with contact cement.



1. Position the torn edges as closely together as possible and secure with painter's tape.

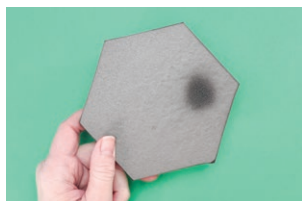


2. Cut the damaged foam away in a V shape.



3. Trace the removed shape on a new piece of foam, cut it out, and secure it in place with contact cement or quick-cure adhesive.

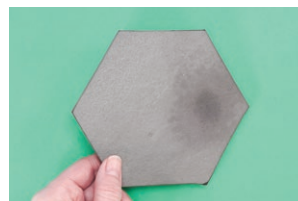
Scorched and Crispy Spots



These happen to everyone! Too much heat in one spot can scorch the foam surface.



1. Reduce the damage by lightly sanding the area with 300-grit sandpaper.



2. Apply a little heat and smooth the surface with your finger.

Finished! The damage is less visible and can be minimized even more with primer and paint.

Another method is skinning with a thin layer of 2mm foam or covering the spot with a cool detail. For more information, see *Minimizing Seams and Gaps* (page 82).

If none of these methods work, or if you're in a hurry, you now have battle damage! For more information on creating battle damage effects, see *Adding Textures and Details* (page 53).

Adding textures and details to your projects is super fun and can add another level of professionalism and finishing to your entire costume! This chapter will guide you through a few techniques that you can experiment with to find what works best for you.

→ Shrinking

Small details can be damaged quickly with high heat, so it is best to start with a lower setting on your heat gun when heat sealing. To avoid tiny pieces of EVA foam flying away into the depths of your workspace, hold the heat gun at a distance from the small details and work slowly. Luckily, there are several ways to apply heat to small details that won't leave them damaged or shriveled and won't blow them off your work surface! Here are a couple of suggestions; see what works best for you and your project.

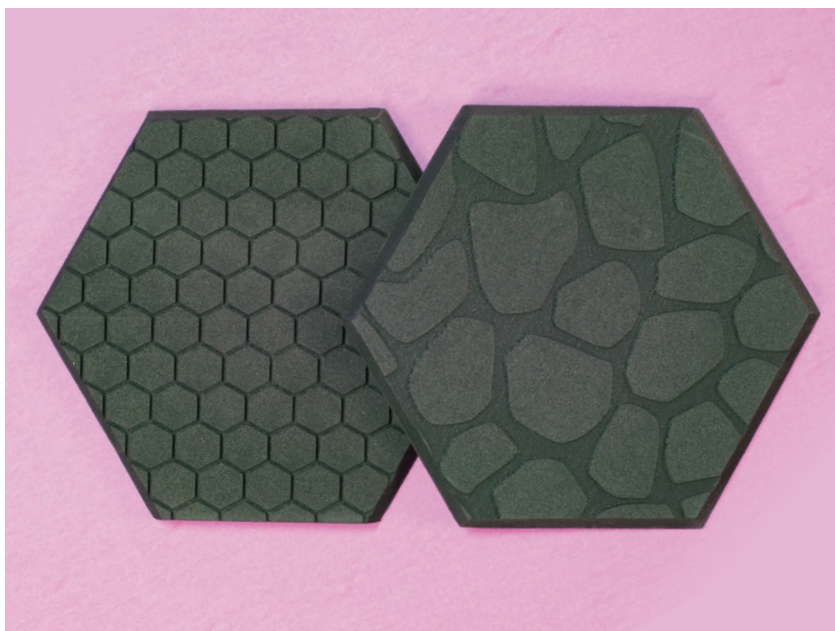
Method 1: Attach small pieces to the sticky side of painter's tape. Secure the tape to your work surface, and apply low heat with a low fan setting.

Method 2: Add details last. Once you have the main piece formed, you can easily glue small details to the surface. Use a low setting to heat seal the details once they are secured to the surface of your project. This method will result in the least amount of shrinkage.



PRETEXTURED EVA FOAM

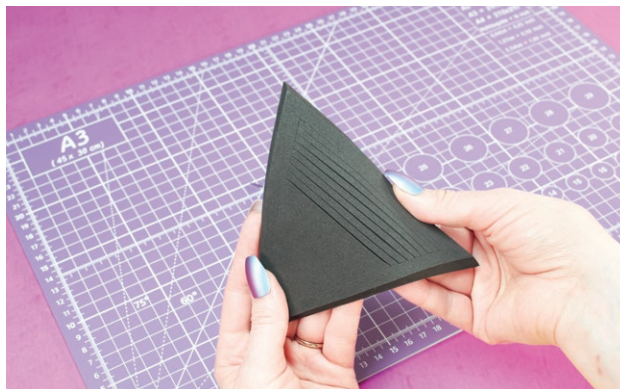
Some companies have responded to the demand for interesting pretextured EVA foam and have created many options to choose from. Yaya Han has designed a line of EVA foam that includes two textured options, conveniently available at your local JOANN Fabric and Craft store. Companies like Lumin's Workshop, Cosarmor & Props, Coscom Cosplay Supplies, and more also have several options to choose from. Currently, these pretextured sheets are available in somewhat limited options for thickness and density.



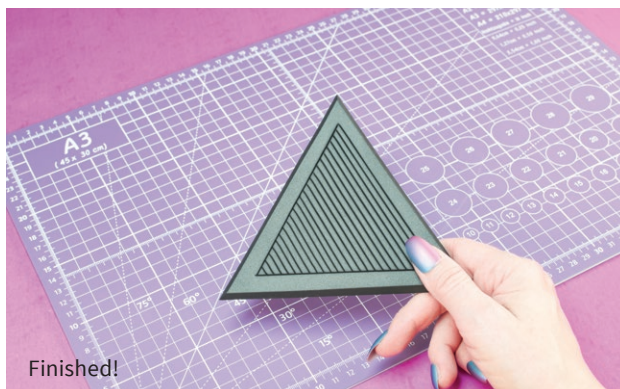
SCORING



Scoring is a wonderfully simple way to add detail to your projects. To score, lightly cut slits on the surface of the foam with your utility or precision knife. When you apply heat to the area, you'll see the line become more defined as the surface cells close in response to the heat. Use a blade, die cutter, or laser cutter to score EVA foam.



1. Cut the surface of the foam without cutting all the way through.



2. Gently apply heat to open the cut lines.

PRO TIPS

- Use scraps to test texturing techniques.
- Use a thicker foam for subtractive techniques.
- When *pressing* a texture into EVA foam, avoid using heat on that piece again to prevent diminishing or removing the detail.
- Any time you cut or remove material from EVA foam, heat seal it again. Do this *before* embossing or stamping textures into the foam.

CREATING A LEATHER EFFECT



Transform EVA foam into faux leather with some very simple techniques!

Ironing

This technique only requires an iron on maximum heat, a crumpled sheet of aluminum foil, and a heat-resistant surface. This is a great way to add texture to a larger surface. However, using an iron can significantly shrink your EVA foam, so texture a larger piece of foam and then cut the shape you need.



1. Crumple a sheet of foil larger than your iron. Position the EVA foam on a firm, heat-resistant surface.

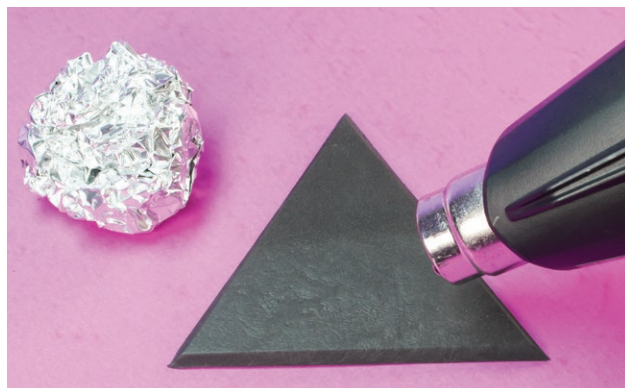


2. Position the foil over the foam, and press firmly with the iron. Repeat as desired for more texture.

Heat Gun Pressing



You can also use a heat gun to create these textures on smaller areas.



1. Heat up a small area of the foam.



2. Firmly press a ball of foil to the heated area.

PRO TIP

When texturing a larger surface, cover the areas you've already textured with a couple layers of protective foil to prevent heat from erasing your work as you continue.

CREATING A BONE EFFECT



Use a variety of rotary tool tips to gently carve detail into thicker EVA foam, and use an engraving tip to create slight bone imperfections. This example shows how to create realistic bone textures that are perfect for horns and monster teeth that have a wide base with deep valleys and trenches that taper to a point.



1. Draw guidelines from the wide base to the narrow tip to simulate natural bone growth (*optional*).



2. Use a sanding drum to create valleys on the surface. Following the guidelines that you made in Step 1, start at the base and drag the bit to the tip. Vary the pressure of your hand to make natural-looking variations.



3. Continue adding texture with sanding drums and polishing stones to create dimension and smooth edges.



4. Use the engraving tool to create deeper trenches and bone texture.



5. Sweep the engraving tool perpendicularly across the base to create growth lines.



6. Heat seal.

CREATING A WOOD-GRAIN EFFECT



Wood grain effects are easy to create using a rotary tool with a sanding drum or grinding stone bit. Lightly drag the edge of the bit across the foam surface, starting on one end and traveling across the foam in the direction that the tool is spinning.

You can also use a wood-burning tool and follow the same steps as you would with a rotary tool, but remember to use proper safety gear and lots of ventilation. Wood-burning tools have a variety of tips, which can be used to create a multitude of interesting textures.



1. Draw a wood-grain pattern (*optional*).



2. Create guidelines with the engraving tool.

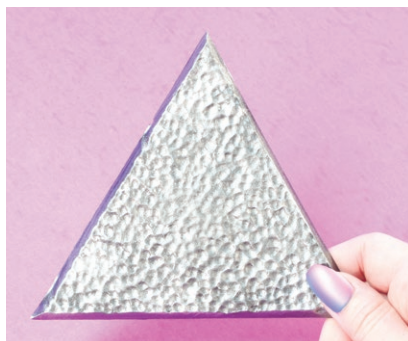


3. Use a sanding drum to carve the foam surface. Use variations in pressure and angulation to create depth and realism.



4. Heat seal.

CREATING A HAMMERED-METAL EFFECT



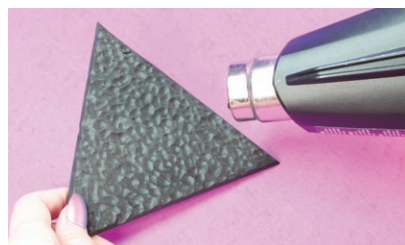
There are a few options for making this texture. One method is to use a rounded cutting tip on your rotary tool. Lightly press into the foam surface, repeating across the whole piece. Experiment with different rounded tips for more effects. You can also use a wood-burning tool, but remember to use proper safety gear and lots of ventilation. Wood-burning tools have a variety of tips, which can be used to create varieties of interesting textures.



1. With a rounded drill tip, gently press into the foam surface just long enough to remove a little bit of material.



2. Repeat along the surface.

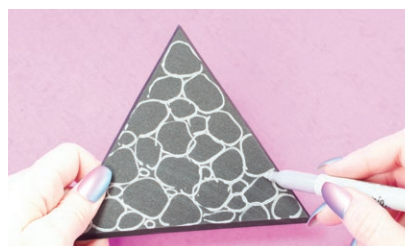


3. Heat seal and smooth the surface with your fingers to flatten any rough areas.

CREATING A PEBBLED EFFECT



Use the carving tools to create realistic pebbled effects. This method will remove more material than others, so be sure to use a thicker material.



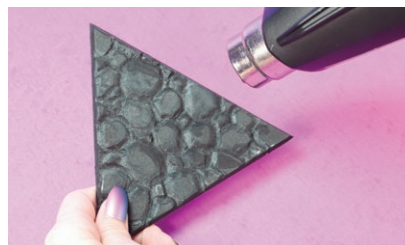
1. Draw guidelines (*optional*).



2. Use the carving tip to begin outlining the guidelines.



3. Continue working the texture, making deeper valleys and smoothing edges.

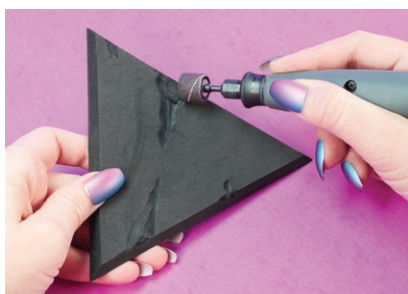


4. Heat seal.

CREATING BATTLE DAMAGE



Battle damage can give armor even more backstory and character! Use a rotary tool with a grinding bit or sanding drum and angle into the foam as you drag the bit across the surface. You can also use a wood-burning tool or, really, anything that will put some wear and tear on your projects.



1. Using the sanding drum bit and a rotary tool, lightly drag the tip across the surface of the foam. Use a medium speed setting for more control.



2. Continue removing more material, a small amount at a time. Adding randomly placed cuts and varying the depth of the damage will make this effect more realistic.



3. Heat seal.



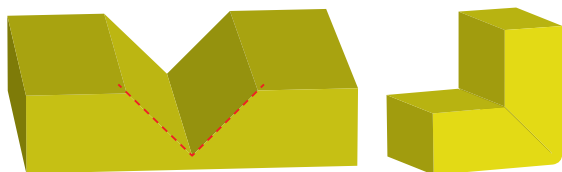
Cosplayer: Baldguycosplay
Costume: Lawbringer from *For Honor*

Photo by Downen Photography

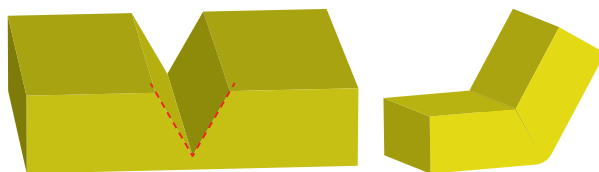
Baldguycosplay used weathering and battle damage techniques to create realistic effects on his Lawbringer cosplay.

ADDING UNDERCUTS

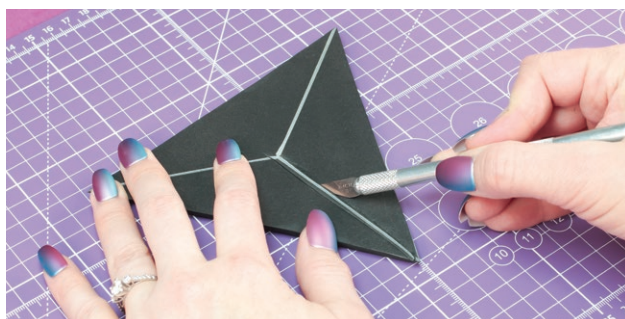
Undercutting is a simple method to add dimension and defined structure to your projects. For example, you can create abdominal accents in a chestpiece or add a soft edge to a prop or smaller project. To add an undercut, cut on the backside of the EVA foam at an angle, then repeat from the opposite angle, making sure not to cut through the foam. Next, glue the two cut edges together, creating a 3D shape.



Making undercuts at a 45° angle will result in a 90° corner when the edges are glued together. This can be helpful for making boxes with right-angled corners.



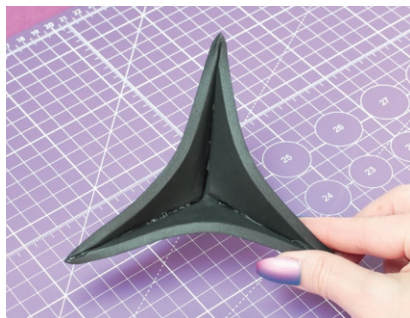
Shallow angles that are less than 45° will result in a softer shape and are great for adding subtle edges and shaped accents to foam.



1. Make a guideline on the foam. Use a utility knife to cut a bevel along each side of the line you just drew. Be sure to cut at an angle without going all the way through the material. You can also use a rotary tool to create this effect.



2. Remove the foam strip from the center. The remaining gap will allow the foam to be bent without a seam line on the front.



3. Apply hot glue to the inside of the lines and press closed to adhere.

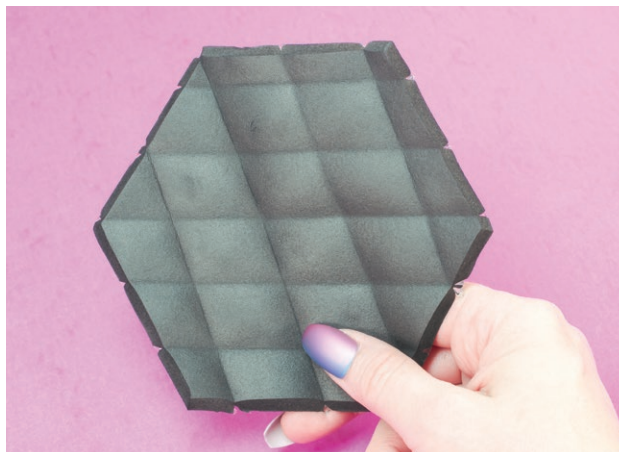


PRO TIP

Use thicker foam for undercuts.

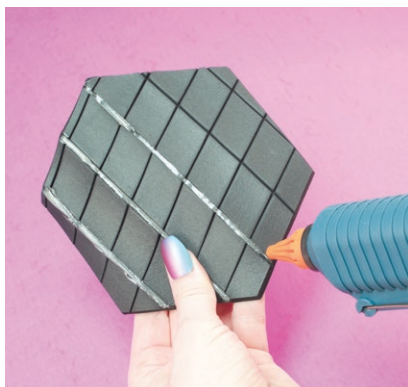
CREATING A QUILTED EFFECT

Pillowed or quilted effects are very simple to create. There are a few methods you can use, each resulting in a slightly different look, so explore the following techniques to find the right one for your project.



The hot glue method was used to create this quilted effect.

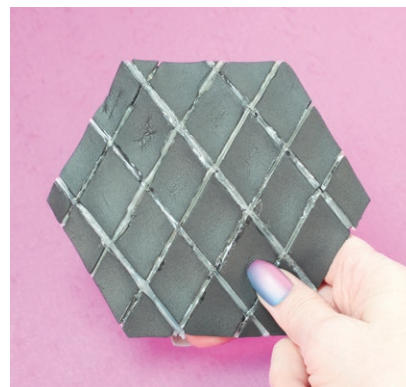
Hot Glue Method



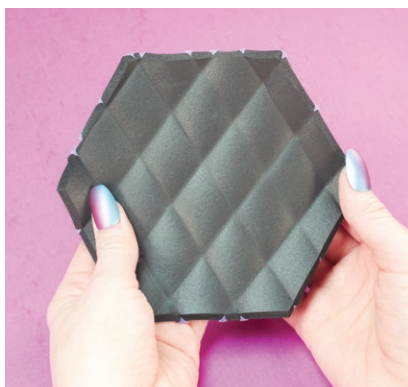
Score the underside of the foam and heat form both sides. Apply hot glue to the inside of the scored lines.



Hold the seams open until the glue cools, which will force the seams to stay open.



Bevel Method



Score the underside of the foam and heat form both sides. Glue beveled strips to the inside of the scored lines.

Heat Method



Score the underside of the foam and apply a generous amount of heat to both sides. This will significantly shrink the foam, so do this before cutting out the shape you want. This method works best with thinner foam.

The heat method creates a quilted effect on both sides of the EVA foam.



CREATING AN EMBOSSED EFFECT

Press any kind of detail into the surface with this easy technique. Use 3D-printed textures, leather stamping tools, or a pasta roller and embossing cards to create interesting textures for your projects.

Reheating an embossed surface will expand the foam, erasing the pressed pattern, so be sure to thoroughly heat seal *before* embossing.

Don't forget that thinner foam will shrink more than thicker foam when heated, so it is best to apply this kind of texture to a piece that is larger than what you will need for your project.

Foam Temperature and Embossing

Foam can be embossed at any temperature, but heated foam can be compressed more easily and will need less pressure than room temperature foam to retain a stamped shape. However, heat guns are not capable of applying heat to small, precise areas without affecting the surrounding foam and diminishing previously embossed areas. For this reason, embossing room-temperature EVA foam can lead to better results and less frustration when adding these details to larger areas.



This collar was created with a pattern designed by Evil Ted Smith and stamped with a texture using a pasta roller and an embossing card.

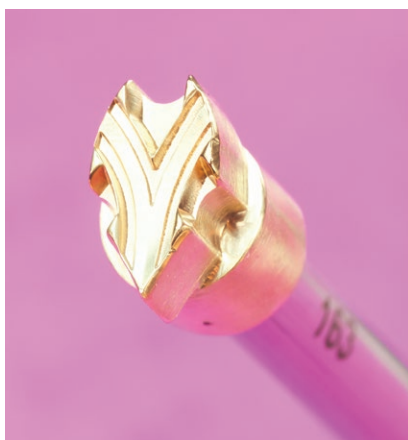
Embossing Oversized Areas

If you need to emboss a large area, using a stamp and a hammer or rubber mallet on a hard surface like wood can provide enough force needed to easily emboss a pattern. You can also use a pasta roller and an embossing card to emboss long strips of EVA foam and even dowels. Most embossing cards are designed to easily align repeating patterns. Using them will make swift work of embossing long pieces (which are perfect for adding detail to trim).

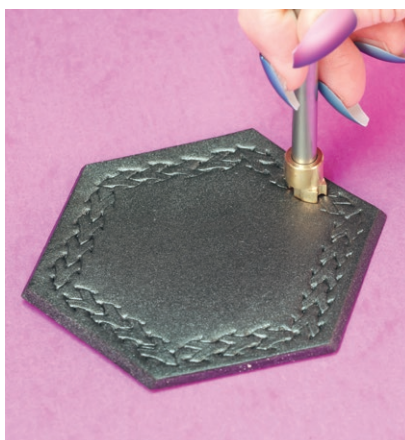


Using Leather Stamps

Leather stamps can be used on EVA foam to create beautiful and intricate embossed details. Be sure to heat seal the EVA foam entirely before stamping. Preheating the foam immediately before pressing the stamp isn't always needed if you are using enough force, especially if you are using sturdy metal stamps and a mallet.



Decorative leather stamp



Applying the stamp around the edge

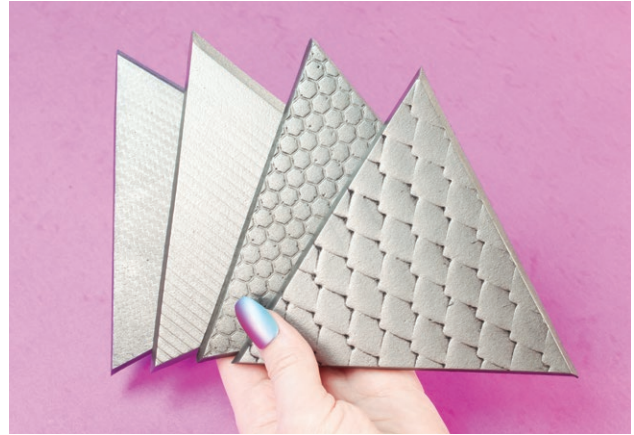
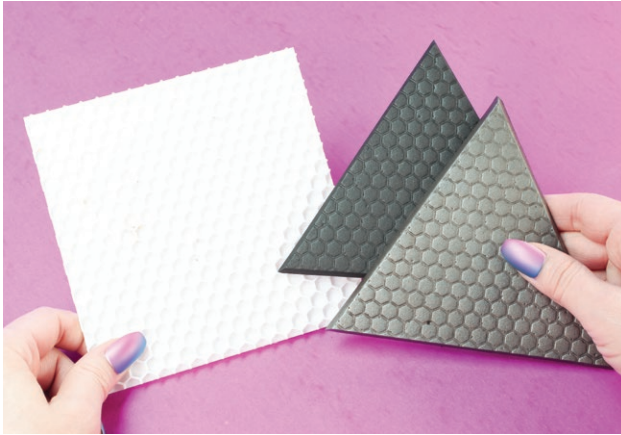


The finished effect

Using 3D-Printed Stamps



3D-printed stamps provide an unlimited number of possibilities for adding sophisticated textures to your EVA foam projects. These stamps are the perfect size for adding textured details. To create these details, apply heat evenly to the foam, position the stamp over the center, and press with force, using a vice or strong clamps before the foam cools. Allow to completely cool in place before removing. You can also apply texture to EVA foam that is room temperature. Be sure to apply force gently to avoid damaging your stamps.



These were embossed with 3D-printed embossing plates designed by Punished Props.

Using a Pasta Roller

Use a pasta roller to create textures on thin foam. This is a great way to create longer textured pieces for your projects. Add embossing plates for cool effects with the smooth roller, or create embossed pinstripes with the cutting roller.



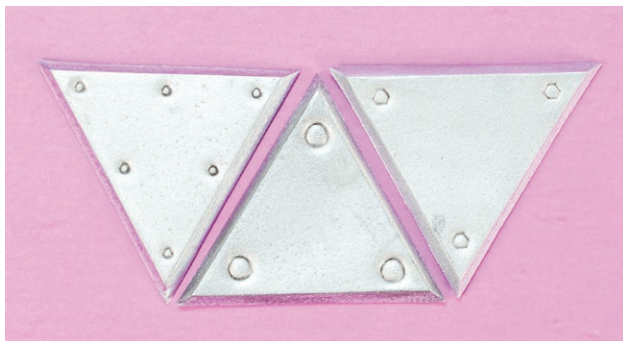
Safety Note

Once your pasta roller is used on foam, don't use it on food!

PRO TIPS

- Add embossed details after all other heat forming is done. Pressed textures will be greatly diminished when reheated.
- With enough force, you can stamp a texture on EVA foam that is cooled after heat sealing. Experiment to find what works best with the foam you are using.

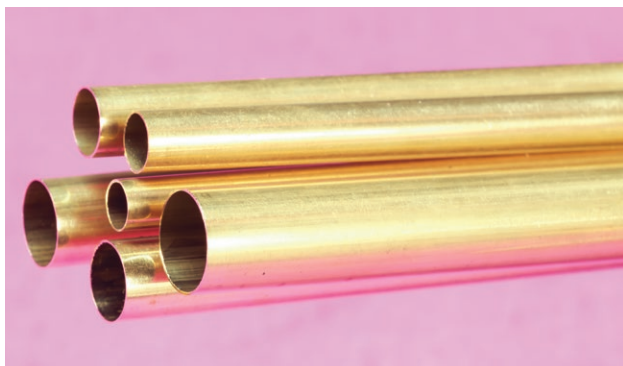
MAKING SCREW HOLE, RIVET, DIVOT, AND NAIL DETAILS



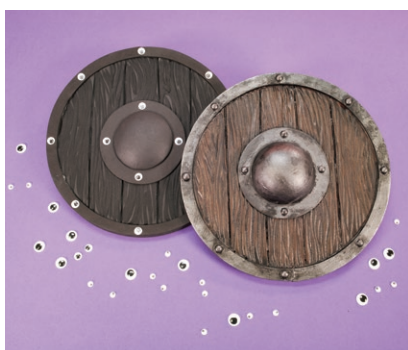
These details are simple to make and can really make a prop or a part of your costume pop. Use these shapes for rivet details, or push a cut circle into the foam for an inset or extruded effect.



Remove the tip from a retractable ballpoint pen to create nail effects.



Sharpened brass tubes can create perfect circular shapes.



You can also use googly eyes (also known as *wiggle eyes*) as rivets! Simply glue in place and paint.



Add scored lines to create realistic hardware effects on small circular shapes.



Create inset and extruded effects by cutting a hole and then pushing the circle slightly through the foam and gluing in place. To create rounded edges, apply foam clay or a gap filler and smooth with your finger or a silicone brush.

Using a Rotary Tool



Most rotary tools have sanding drum attachments that can be adjusted to create perfect holes.

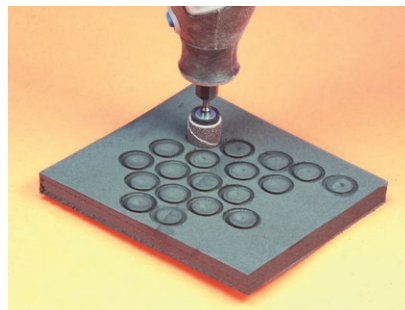
Experiment with different rotary tool attachments for different effects. You can cut a line in the middle of your rotary circles or add an X to mimic the appearance of different hardware.



1. Loosen the screw securing the barrel.



2. Offset the barrel to the desired depth and retighten the screw.



3. Hold the bit perpendicular to your piece of EVA foam and press gently. Repeat to create your desired pattern or effect.

PRO TIPS

- Use a Dremel Drill Press Rotary Tool Workstation Stand to make this method very easy—it will minimize mistakes and keep your tool perpendicular to the surface.
- Use thicker foam for these kinds of subtractive details.

ADDING EDGES



Add a strip of foam, half-round dowel, or beveled dowel along the outer sides of your armor projects for superclean edges and to hide seams before sealing and painting. Use contact cement or CA glue for best results. You can also add textures to edging before or after attaching it to your project for cool effects! Some dowels will have a slight texture from the factory, as seen in this example. This inherent texture can be sanded smooth with a rotary tool, embossed, or incorporated into the overall design.



CREATING A CARVED EFFECT



Add sophisticated details to your projects with carved designs.

Follow the steps below to add carved designs to your costume piece.



1. Start with your overall shape and design traced on 6mm or 8mm EVA foam. You'll need thicker foam to carve deeper designs.



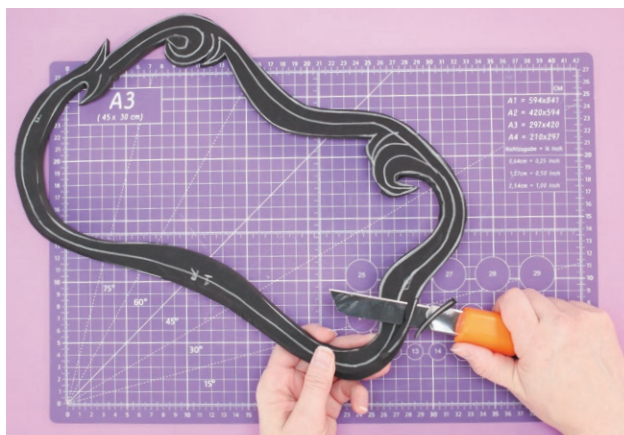
2. Drawing additional guidelines can be helpful to indicate where the highest point of each shape is located.



Prop Maker: Sameer Bundela
Prop: Alucard shield from *Castlevania*

Artist Sameer Bundela used a rotary tool to create layers of stunning detail, dimension, and texture on EVA foam for his beautiful full-size shield.

Photo by Sameer Bundela



3. For large areas that will have deeply carved areas, it can be helpful to remove excess material with a blade before carving with a rotary tool.



4. Using a sanding drum of 240 grit or lower, begin carving away material with several light passes over the edge. Continue carving and turning the piece to better reach all angles.



5. Once you are happy with the overall shape, smooth the rough areas with a sanding drum of 320 grit or higher. One or two passes will remove the rough areas and prepare them for polishing.

6. Polish the edges with a grinding stone bit and then heat seal.

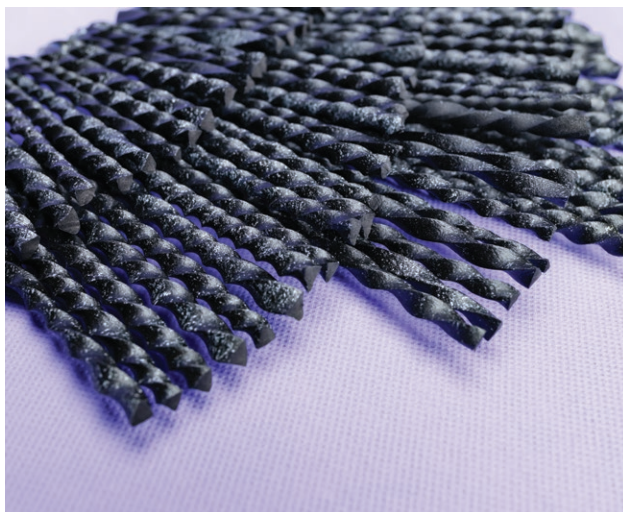


The finished piece!

CREATING A TWISTED METAL EFFECT

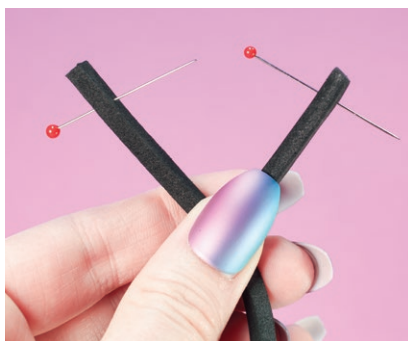


This method transforms square dowels or bevels of EVA foam into forged iron twists! Using a heat gun with an integrated hands-free stand will help tremendously with this technique.

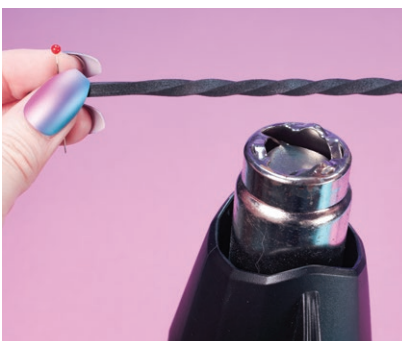


Prop Maker: Downen Creative Studios
Prop: Original helmet design

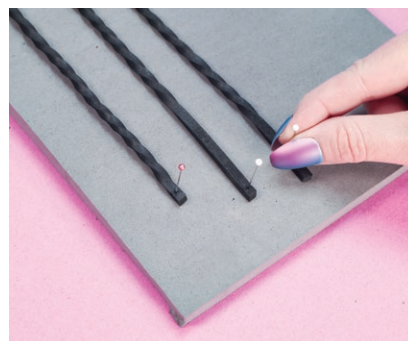
Photo by Downen Photography



1. Insert a pin through each end of the dowel.



2. Gently twist bevels while moving the foam slowly through the heat so the dowel is evenly heated. Continue to twist the foam to the end of the dowel.



3. Using the pins, secure the twists in place on a thicker piece of EVA foam. Allow the foam to completely cool.

PRO TIPS ➔

- Remember, if you reapply heat to these designs, the twists will relax.
- Use sewing pins to secure twists in place on scrap EVA foam.

BRAIDING AND WEAVING

Braiding and weaving thin strips of foam is an easy method to add interesting details!



MAKING FEATHERS



Even feathers can be created with a rotary tool! Use an etching tip or a pointed grinding stone to create texture and distress the edges.

Cut a basic feather shape from a foam sheet. Starting from the spine, glide the tip of your rotary tool along the surface of the foam to the edges. Repeat as needed.



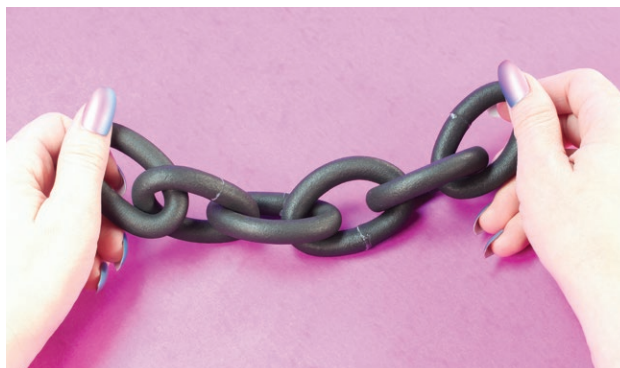
CREATING A LINKED CHAIN EFFECT



Use foam dowels or bevels to create realistic-looking chains. Cut several pieces at equal lengths and link together one at a time. Use CA glue or contact cement for best results.

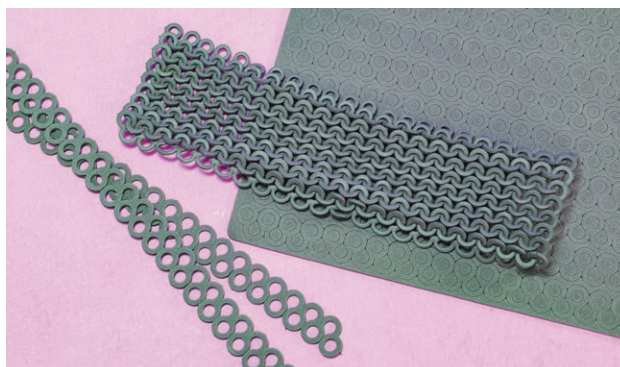
PRO TIP

Prime and paint dowels and bevels before creating the chain for a cleaner look and less painting work.



MAKING CHAIN MAILLE

Chain maille is incredibly simple to create with foam, but it can be time consuming to do by hand. If you have a die-cutting machine, cut your own chain maille design with 2mm EVA foam. If you do not have a machine, you can purchase precut sheets from suppliers like the Foam Armory.



MAKING SPIKES, HORNS, AND TEETH

To make conical-shaped details, use precut cone shapes from retailers like TNT Cosplay, create your own out of foam clay, carve them from a block of foam sheets glued together, or make a custom pattern for larger shapes that are ultralightweight. To learn how, see *Sculpting with Other Materials* (page 204).



Cosplayer: Emma of Carma Cosplay

Costume: Darth Maul from *Star Wars: The Clone Wars*

Emma of Carma Cosplay created these horns out of 4mm HD-Foam using foam clay as the base.

Photo by Emma of Carma Cosplay

USING SILICONE PRESS MOLDS

Silicone press molds are amazing! You can use them with foam clay, thermoplastics, and even hot glue. Most foam clay requires a long time to dry, so be sure to read the directions for the brand of clay foam you're using.

PRO TIPS

- Air pockets can accumulate in the foam clay, so be sure to remove as much air as possible when forming.
- To attach wet foam clay to EVA foam, use a small amount of water to lightly wet the surface of the EVA foam. Use contact cement or quick-cure adhesive to attach dried foam clay to EVA foam.
- To speed up the process, try placing the silicone mold in the freezer for 30 minutes before attempting to demold.
- Keep in mind that most foam clay will shrink slightly as the water evaporates during the drying process.



MAKING SCALES

Create scales by hand, use a die cutter, or purchase a variety of options from retailers like TNT Cosplay Supply.

You can also use a die cutter to score a larger sheet of 2mm foam to add a “skin” of scaled textures to your projects.



Cosplayer: Downen Creative Studios
Costume: Gothic Dragon Queen,
 original design

Photo: Downen Photography

SPRAY ADHESIVE



Most spray adhesives aren't strong enough to permanently bond foam to foam, but they can be useful for other applications like temporarily attaching pieces together, attaching fabric to foam, aligning intricate patterns, and more.



TAPE

All kinds of tape can be used to create patterns. Duct tape is perfect for the appropriately named duct tape body form. Some tapes can be used on foam without damaging the surface while others cannot be trusted.

Check out the handy chart on the next page for suggestions on how to use common types of tape.



PRO TIP

EVA foam chemistry varies from brand to brand, so be sure to test adhesives on scraps first.

COMMONLY USED TAPES

	Safe to use on EVA foam without causing damage?	Useful for patterns, alterations, and mock-ups?	Can be used to make a duct tape body form?	Suggestions for use
Masking tape	Sometimes	Yes	No	Some brands can damage EVA foam. Test on scrap EVA foam first.
Painter's tape	Yes	Yes	No	Great for making patterns directly on top of EVA foam and temporarily holding foam together
Duct tape	No	Yes	Yes	Strong enough to hold EVA foam together for mock-ups, but can damage the surface. Perfect for duct tape body forms and making patterns.
Clear packing tape	Yes	Yes	No	Does not stick well to EVA foam. Perfect for transferring small foam details to your projects and for pattern making.
Tear-Perfect Maker Tape	Yes	Yes	No	Keep freshly glued pieces in place without damaging the foam. Apply to metal rulers for extra stability and a nonslip surface.
Aluminum foil tape	No	Yes	No	Awesome for quick shiny elements or to amplify led light inside an object.

CONTACT CEMENT



Contact cement is just about as important as EVA foam. There are many varieties of contact cement, but Dap Weldwood and Barge Contact Cement are the most widely used by cosplayers.

Contact cement is superstrong, flexible, waterproof, and long lasting; it's perfect for attaching foam to foam, fabric, leather, and other porous materials. For nonporous materials like PVC, roughen the surface with coarse- or medium-grit sandpaper for better adhesion, and apply more than one layer of contact cement.

You'll need to wear a respirator, gloves, and have lots of ventilation when using this material.

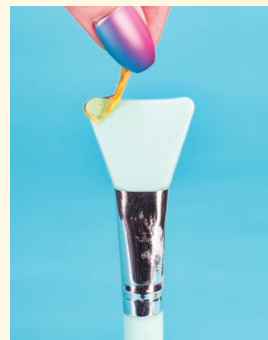


Materials

- Contact cement
- Gloves
- Respirator
- Scrap EVA foam bits, silicone brush, or paint brush
- Hair dryer (optional)

PRO TIPS

- A little glue goes a long way! It's easier to add more glue than it is to clean off excess.
- Use a slip-tip syringe, dispenser, or toothpick for precise application.
- Silicone brushes are very handy and can be used over and over again. They require very little cleanup—simply peel off dried glue and keep using the same brush.



1. Make sure the edges are smooth and free of jagged edges. Edges that will be glued together do not need to be heat sealed. In fact, it's better if those edges aren't sealed at all.



2. Apply a thin layer of glue to the edges of both EVA foam pieces with a paint brush, scrap foam, or a silicone brush.

Practice

For best results, practice these steps on scrap material until you know how much glue the kind of EVA foam you are using will require and how long it needs to dry.

Keep seams tidy and avoid buildup with a back-to-front motion when applying glue to the EVA foam edges.



PRO TIP

Drying times can be affected by humidity and temperature: Curing time is delayed by higher humidity and lower temperature.

3. Spread the glue evenly along the surface to be glued. For best results, start on the back edge and brush the glue to the front edge. This will help keep excess glue away from the front of your project. The goal is to have a thin, even layer of contact cement on both surfaces.

4. Allow the glue to dry for 10–15 minutes before bonding. This gives solvents in the cement enough time to evaporate. To speed up this process, use a hair dryer.

The top piece of EVA foam is still very glossy and has not dried enough. The bottom piece has dried for several minutes and is now tacky.



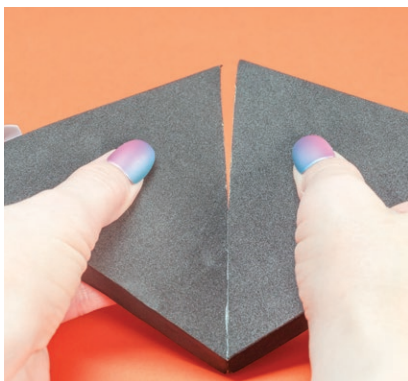
5. You'll know the glue is dry when the surface becomes less glossy and does not pull away if you gently press it with a gloved finger. If any parts are still shiny, wait a few minutes longer.



6. When the contact cement is tacky, carefully press the edges together, starting with the edge facing the front of your armor. Line up the top edge of the foam as you press the edges together, and go slowly.

PRO TIP

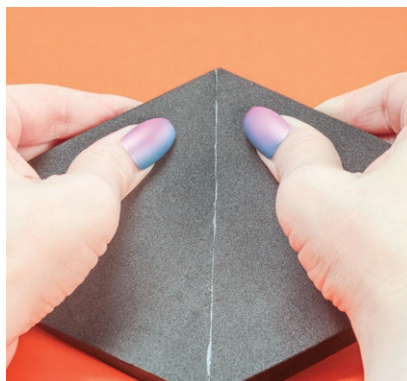
Contact cement that is allowed to dry for several hours can lose its adhesion completely. If this happens, you can reactivate the glue with a hair dryer or heat gun.



7. Continue a little at a time, using your thumbs to maneuver the foam edges together until you reach the end of the seam. Pull and tug the foam if needed.

For the cleanest seams possible, press the top edges together first. Once those edges are done, press together to close the seams in the back. This method can take a little practice, but the results are worth it.

8. Once the two parts are bonded, allow to cure for 1–2 minutes before heat forming or manipulating the foam at all.

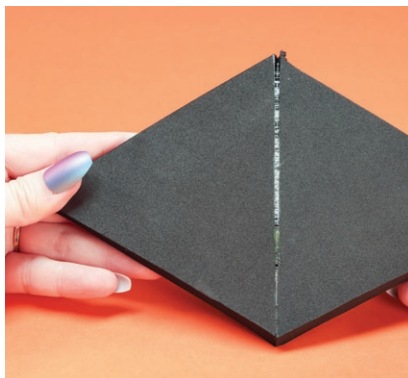


CONTACT CEMENT TROUBLESHOOTING

How Many Layers?

Low-density foam and porous materials like fabric can absorb more glue and might need an additional layer to be effective. Add another layer of glue to both surfaces if you need extra strength. Costume components that usually take a lot of strain, such as chestpieces and footwear, can benefit from an additional layer of glue.

Edges Pulling Apart

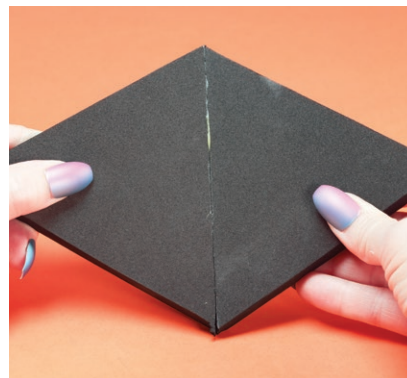


If the edges pull apart this usually means one of three things: The glue wasn't dry enough, the glue was too dry, or another layer was needed.

To repair edges that didn't seal completely, follow these steps.



1. Fold the seam apart and apply a small amount of glue with a small brush, toothpick, or scrap of foam. Hold the seam open until the glue becomes tacky.



2. Once the glue is tacky, press the seams firmly together.

PRO TIP

Placing a nonstick silicone mat between two layers can give you more control when gluing tricky pieces together with contact cement.

Use a silicone or wax paper barrier to help keep surfaces from accidental adhesion as you work.



Darts and Corners



Darts and small corners can be tricky! An easy way to reach tough spots is to fold the foam to reveal the part you need to glue.



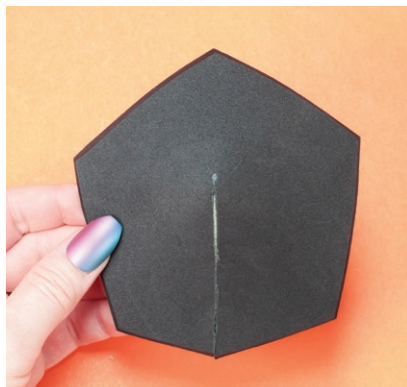
1. Apply glue and hold until tacky.



2. Speed up the drying process with a hair dryer set on low.



3. Press together.



Finished!

QUICK-CURE ADHESIVE

There are a ton of brands out there, but my favorites include Loctite Super Glue, Loctite Epoxy Instant Mix 5 Minute, Gorilla Glue Super Glue, and the Bob Smith Industries line of cyanoacrylate (CA) glues. Most of these products can be found in any hobby or hardware store.



Safety Warning



It is possible to develop a sensitivity to quick-cure adhesive. Wear a respirator for prolonged exposure.

Overspill

Contact cement thinner can be used to clean up overspill. You can also try lightly sanding the area with 320-grit sandpaper, rubbing gently with your finger, or using a little bit of tape to try to pick up any extra dried glue from the surface. Always follow safety instructions when using thinning solvents. Use contact cement thinner sparingly and only when absolutely needed. Using too much can weaken your seams.

Accelerants



Accelerants speed up the bonding process for CA glue and can even add strength to your seams. They are available as a spray or as a liquid with a small applicator tip for more precision.





After applying glue evenly to one small section at a time, spray the surface with an accelerant. Quickly press the seams together.



You can also use an applicator bottle to add a small bead of accelerant to instantly set the quick-cure adhesive.

Debonders



Debonders can soften quick-cure adhesive enough to remove overspill or separate seams completely.

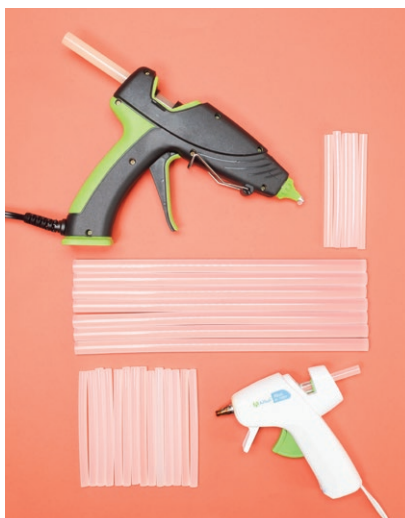
PRO TIP

EVA foam scraps can be used to spread glue evenly on the surface. They can also be used to wipe away excess as you are working.

HOT GLUE

Hot glue guns and glue sticks (also known as *hot melt adhesives* or HMAs) are an absolute must in any maker's workshop. Hot glue can quickly bond porous materials together, like foam to foam, and can be used to bond dissimilar materials together, like foam to PVC, fabric, cardboard, wood, and more. It will not form a strong bond with nonporous surfaces. Unlike contact cement, you can also use this type of glue indoors; it doesn't contain solvents, so no special ventilation or respirator is needed.

As awesome as hot glue is, it is not recommended for super precise, clean seam lines when you are gluing foam to foam, and it will reactivate if exposed to heat again. This means that if you need to heat form the EVA foam after applying hot glue, your seams could fall apart.



Safety Warning

Use caution when handling glue guns and melted glue to prevent skin burns. Glue gun tips become incredibly hot, and melted glue is like lava!

PRO TIPS

- If you get hot glue on your fingers, rub them together quickly to cool down the glue and roll it off your fingers.
- Keep a cup of cold water nearby to instantly cool hot glue and soothe burned fingers.
- Use silicone finger caps if you are prone to getting burned!

Hot Glue Pros and Cons

Pros: Fast bonding, easily found in stores, nontoxic, small and large glue guns are available, produces shiny surface for painting, can be used in silicone press molds as a detail, and available in fun colors and even glitter for use in molds.

Cons: Not so great for gluing large areas, will come apart if heated again with a heat gun, superhot to the touch, can cause burns.

Glue Gun Sizes

Hot glue guns are available in a standard size for bigger jobs and a mini size for detail work. Some professional glue guns have nozzle attachments that offer a variety of application sizes and shapes. Having both a standard size and a mini available is always handy. Some have a variable temperature, which allows you to use high- or low-temp glue sticks.



Glue Temperature

There are different temperature ranges for glue sticks.

High-temp glue offers a longer working time than low-temp glue and forms an incredibly strong bond, which is nice if you need to reposition a detail on your project.

Low-temp glue is great for delicate materials like fabrics, foil, Styrofoam, and thin plastics that can distort under higher heat.

Not every glue gun can handle high-temp glue. Check what is recommended for your specific glue gun.

Color Options

Hot glue sticks are available in neat colors and even glitter! These are great to use for details and in silicone press molds, but due to the chemical variations, they are not recommended for structural support. For building with EVA foam and thermoplastics, Cosplay Stik glue is highly recommended for the best adhesion and is available in black, silver, and clear.

PRO TIPS

- Paint hot glue for a super glossy and smooth finish.
- Paint with metallic paints for metal effects like weld details.
- Use hot glue in silicone molds to create semitransparent shapes and effects.
- Add details to EVA foam with a thin application of glue to make curly shapes, nail heads, and more.
- Easily attach straps to EVA foam with hot glue. To help with adhesion, lightly sand or score the surface of the foam where the glue will be applied.



COS BOND ATTACH & BUILD

Cos Bond is like double-sided tape on turbo. Peel and stick this tape for superfast foam-to-foam assembly. Follow the instructions for best practices when using this neat adhesive. This also comes in a handy emergency pack that is perfect to bring to events and photo shoots for on-the-spot repairs.



GLUING VERY SMALL DETAILS

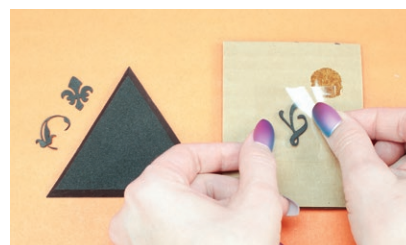


Use clear packing tape as transfer tape to glue small details to your projects without a big mess. This method is very easy and keeps glue off your fingers. The details shown here are very small and were cut out using a Cricut Maker die-cutting machine.

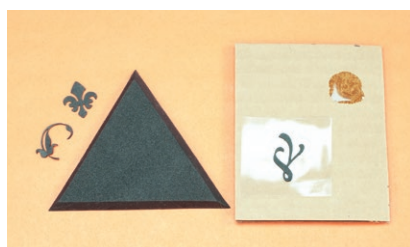


1. Apply a small amount of quick-cure adhesive on scrap paper or cardboard.

2. Cut a length of clear tape that is larger than the detail you want to glue.



3. Place the tape over the front side of the EVA foam detail and press lightly.



4. Place the tape and detail on your work surface with the sticky side of the tape facing up.



5. With a brush or scrap foam, lightly dab quick-cure adhesive on the detail.



6. Press the detail in place.



7. Peel away the tape.

11

MINIMIZING SEAMS AND GAPS

As you begin patterning and designing your project, you'll find that oftentimes you need to put a seam somewhere that will be very visible, like on a helmet or chestpiece. Some of your glued seams won't be perfect, and sometimes the materials will have a flaw or a little bit of damage that you want to eliminate before priming and painting. In this chapter, you'll learn a few methods to make your foam projects look clean and professional.

STARTING WITH CLEAN CUTS AND WELL-GLUED SEAMS



Performing the following steps will get your seamless projects off to a great start and will minimize the amount of gap filling and smoothing you'll need to do before painting. These steps take some practice, but in time you'll be a master of superclean projects that will look effortlessly perfect.

The first step for reducing seam lines is to make clean cuts in your EVA foam with sharp blades. For more information, see *Knives and Blades* (page 40).

Smooth uneven edges with a rotary tool and a medium- or fine-grit sanding drum. For more information, see *Rotary Tool and Accessories in Cutting and Sanding* (page 45).

Apply a thin layer of contact cement to both edges and allow it to become tacky, being careful not to over-apply the cement. Apply a second layer for the strongest adhesion and to reduce the chance of a seam separating. For more information, see *Using Adhesives* (page 73).

SMOOTHING SEAM LINES WITH GRINDING STONES



A grinding stone bit used with your rotary tool can reduce seam lines and smooth rough surfaces. It can also help remove residual contact cement along the seam.



Use a grinding stone bit on your rotary tool to polish and remove any uneven areas on the seam.



Before grinding stone smoothing.



After grinding stone smoothing.

COVERING SEAMS

Using Design Overlays

As you are patterning, think about where the details will be placed. You can save lots of time, effort, and materials by designing your pattern pieces so that seams are hidden under the details.



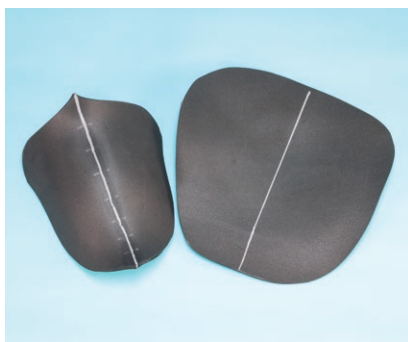
Skinning



Useful on flat or slightly curved areas, adding a layer of 1mm or 2mm EVA foam, also known as *skinning*, is a great way to hide seams. With some practice, results can be stunning and can save time you'd normally spend reducing seams by blending and sanding.

1. Smooth the seam with a grinding tool or sandpaper.

2. Cut a piece of thin EVA foam that is slightly larger than the piece you need to cover and heat form the foam over an object with a similar curve.



3. Mark the center on both sides of the skin and the center of the part you are skinning. These will be your guidelines.



4. Brush contact cement on both surfaces.



5. Once the glue is tacky, line up the centerlines and gently press down along center.



6. Press and smooth the sides down, working from the center out to the edges.



7. Trim excess.

PRO TIPS

- Thin foam will curl when contact cement is applied. Use painter's tape to secure the foam to your work surface to prevent the piece from curling and sticking together.
- Use nonstick baking paper, wax paper, or silicone sheets as barriers to help prevent the contact cement from sticking to itself.
- Smooth glued seams before skinning for the best results.
- Use your heat gun to soften the EVA foam to form complex curves and compound shapes before applying contact cement.

Hiding Crimes

You might hear this term a lot in cosplay maker circles! Hiding crimes refers to covering up a messy seam or surface damage with a design element. With some planning and a little creative thinking, you can hide crimes with top layers, fabric, trim, or an interesting detail.

Using Sandpaper



Sandpaper can help reduce slight imperfections along a seam and is a good method for cleaning up areas that you can't reach with a rotary tool or that are too delicate for a power tool. Sanding sticks offer a flat, rigid surface that can give you more control and smoother results.

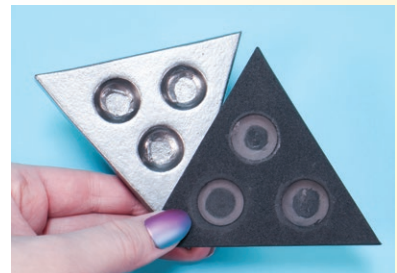


GAP FILLERS

There are many ways to reduce visible seams in your foam projects, fill gaps, and repair blemishes. Here are a few methods and materials to experiment with. Drying times will vary depending on layer thickness, temperature, and humidity. To reduce drying time, apply these products in several thin layers and circulate the air in your workroom with a fan.

PRO TIP

Transform a hard inside corner or edge into a smooth, contoured surface with a gap filler! Apply the filler with a gloved finger to inside edges and corners and blend until smooth.



GAP FILLERS

Brand	Available colors	Blending	Drying time	Cure time	Flexibility	Sanding	Surface quality	Notes
Flexi Filler	Black, gray, white	Moderately easy	5–15 minutes	12–24 hours	Very flexible	Wet sand when cured for a shinier result	Rubbery, smooth, matte	Very fast drying, several color options
Foam Putty	White	Very easy	20 minutes to 2+ hours	Same as drying time	Flexible, but thicker layers can crack	Sand with 200–400 grit when dry	Gritty, but can be sanded smooth, matte	Very fast drying, extremely lightweight
Gap Filla	Dark gray	Very easy	1–24 hours, depending on layer thickness	24 hours	Very flexible	Can be sanded when dry to the touch, wet sand when fully cured if desired	Smooth, matte	Fast drying, highly recommended for minimizing seams and filling gaps
Kwik Seal Plus	White	Moderately easy	2 hours or more	24 hours	Very flexible	Not easily sanded, use 220 grit when cured	Rubbery, smooth, matte	Very inexpensive and easy to find, waterproof.

Flexi Filler



Flexi Filler is a nontoxic material with a thick, sticky frosting consistency that you can apply directly to EVA foam to fill seam gaps, hide blemishes, and repair other damage. Flexi Filler remains semiflexible and durable once dry and can be wet sanded after fully cured. Drying times will vary. Thinner layers will dry faster than thicker layers. Flexi Filler will shrink slightly when dry.

To minimize a seam or fill a gap using Flexi Filler, follow these steps.



1. Apply Flexi Filler with your finger or a silicone brush.



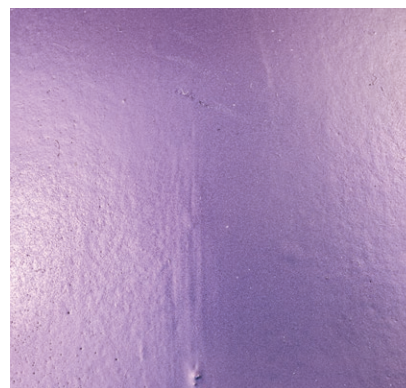
2. Smooth the material with a wet finger and allow it to dry. Apply more layers if needed.



3. Wet sand the filled area for a smoother surface if desired.



4. Prime and paint your piece once fully dry.



Close-up of a painted seam smoothed with Flexi Filler. It was primed with two layers of Flexi Paint and airbrushed with two layers of purple.

Foam Putty



Foam Putty is a nontoxic water-based product with a smooth, chalky paste consistency that bonds to EVA foam and can fill holes and gaps. It resists shrinking and is sandable, semiflexible, paintable, and very lightweight once fully dry. It dries to a gritty texture that can be sanded smooth with sandpaper of 200–400 grit, leaving a surface that is a similar texture to high-density EVA foam. Add a small amount of water to remoisten the mixture if needed. One tub of Foam Putty goes a long way and has a shelf life of 2½ years!

To use Foam Putty as a filler, follow these steps.



1. Apply with your finger, spatula, or a silicone brush.

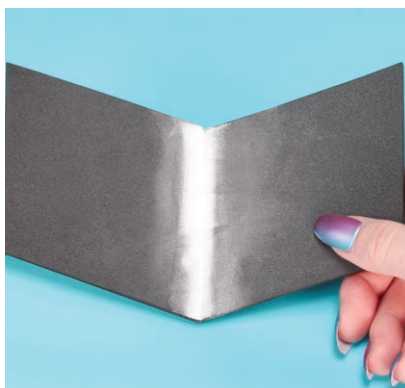


2. Smooth with a small amount of water.

3. Allow to dry. Add another layer if needed.



4. Sand with fine- to medium-grit sandpaper.



This is a close-up of a painted seam smoothed with two layers of Foam Putty. It was primed with two layers of Flexi Paint and airbrushed with two layers of purple.

Gap Filla



A great product from Prop Monkey Studio, Gap Filla is designed specifically for filling gaps and is perfect for reducing and smoothing seams on EVA foam. This nontoxic acrylic-based material has a thick, whipped paste consistency and is very easy to work into EVA foam. It is lightweight, flexible, and fast drying with little to no shrinking. When Gap Filla is dry to the touch, it can be sanded, and acrylic-based products like Rapid Fill, Fine Finish, and acrylic paints can be applied without impeding drying and curing time. Wet sand after 24 hours when it has fully cured.

To minimize a seam or fill a gap using Gap Filla, follow these steps.



1. Apply to the seam with a spatula for best results. You can also use your finger.

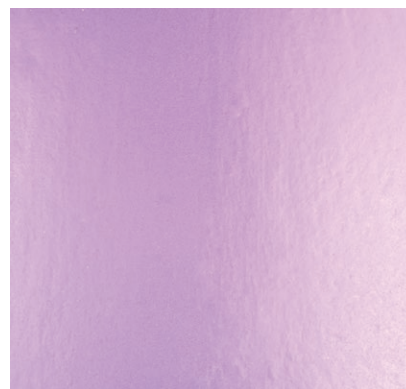


2. Smooth with a small amount of water on your finger.

3. Allow to fully dry.



4. Sand with fine- to medium-grit sandpaper until smooth.



This is a close-up of a painted seam smoothed with one layer of Gap Filla. It was primed with two layers of Flexi Paint and airbrushed with two layers of purple.

Kwik Seal Plus



Kwik Seal Plus is an inexpensive siliconized acrylic *latex* sealant for smoothing seams and will fill medium-sized holes and gaps with little to no shrinking. It is flexible and paintable once dry, but its waterproof properties make it harder to sand and more difficult to achieve a completely seamless result. To fill large gaps, apply several thin layers and allow to dry between applications.

To apply Kwik Seal Plus to your seam or gap, follow these steps.

Latex Allergy Warning

Do not use this product if you or anyone in your work area has an allergy to latex.



1. Apply with the applicator tip, a small flat spatula, or a finger.



2. Smooth the surface with a wet finger.

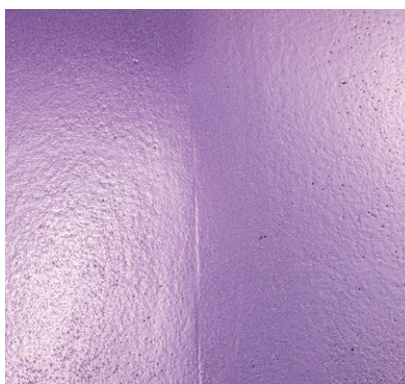
3. Allow to fully dry. Apply more layers if needed.



4. Sand slightly with 220-grit sandpaper.



5. Once dry and sanded, prime and paint as needed.



This is a close-up of a painted seam smoothed with Kwik Seal Plus. It was primed with two layers of Flexi Paint and airbrushed with two layers of purple.

Once your EVA foam project has been assembled and detailed, it's time to prime and paint. There are so many products to choose from that it can make deciding what to use quite overwhelming. Not to worry! This chapter will help demystify how to use these products and will help you decide what to use on your EVA foam projects.

You will learn all about what priming is and how to use many of the most common products that are available. You'll also learn about surface smoothers and primer and paint combination products and how to choose what is best for your project, workspace, time, and budget.

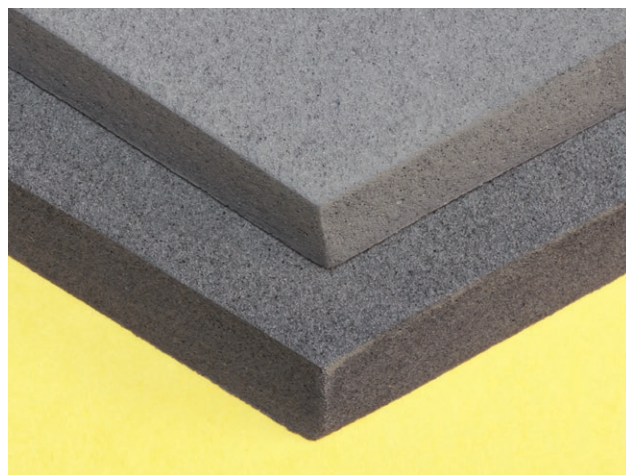
Finally, you'll learn about how to paint your projects using various methods, techniques, and products to create base coats and cool, show-stopping effects!

HEAT SEALING



Almost every foamsmith can agree that it's important to heat seal EVA foam to prepare the surface for painting. Heat closes the pores of the foam, making the surface smoother. Unsealed EVA foam absorbs paint very well, so save paint and time by heat sealing every project prior to painting. Your costumes will look professional and clean with this easy step!

Both of these pieces (*below*) were painted with one layer of grey Angelus paint. The top layer was heat sealed before paint and is much smoother and has more visible paint. The bottom layer was not heat sealed and has a rougher surface, and less paint is visible.



Check your project for areas of foam that still have a matte finish and apply heat to those areas with a heat gun. Be sure to avoid areas that you've embossed or stamped as additional high heat will diminish embossed details.



Before heat sealing



After heat sealing

Some EVA foam manufacturers claim that heat sealing isn't needed for their foam products, so be sure to experiment with what works best for your project and the foam, primer, and paint you are planning to use.

PRO TIPS

- If you heat formed your project, you've probably already done this step!
- If you don't have time to prime your project, at least heat seal it before painting.

Heat Sealing Small Pieces

You can heat seal, prime, and paint small details without losing them on your workshop floor. To keep them from blowing away and make them easy to handle, use painter's tape to hold them in place.

Secure painter's tape—with the sticky side up—to a piece of cardboard or other painting surface. Place the details securely on the sticky tape and heat seal, prime, and paint as you would a larger piece.



PRO TIP →

If you have several details that are the same, cut a few extra to have on hand in case one of them is lost or is damaged. You can also test paint on these extra pieces!

PRIMING AND PAINTING TOOLS

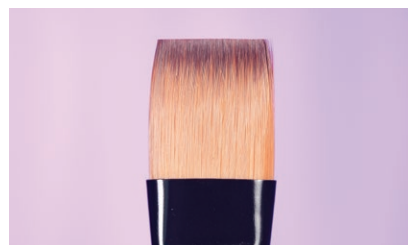
Brushes

You'll need a few different kinds of acrylic brushes to apply primer and paint to your projects. These are great brushes to have and come in a number of specialized shapes and sizes, all for different applications. If you are using brushable primers or acrylic paints, soft synthetic brushes are highly recommended. You can also use synthetic makeup brushes! Natural fiber brushes can break down in water over time and can be damaged by acrylic paints—natural bristles are best for oil painting.

PRO TIP →

Makeup brushes are sometimes much softer and finer than regular acrylic brushes and will leave fewer brush strokes.

A wash brush is used to apply paint to a wide surface. Wash brushes are also great for adding primers and surface smoothers.



A flat brush can be used to apply different kinds of paint stroke techniques, but it can also be used to apply paint to a medium-sized surface.



Filbert brushes are rounded and thicker and are great for blending.



Angled brushes can be used for precision painting and are great for adding straight lines and painting along edges.



Airbrushes



Airbrushing is a wonderful painting method for achieving lots of coverage in a short amount of time. It also allows you to paint gradients with ease. Airbrushing is the process of atomizing paint with pressurized air using a small spray gun with which you can control the flow rate and area coverage. Airbrushing is a fantastic painting technique, but it does take some practice to master this skill.

Equipment

Airbrushing requires some equipment, including a compressor, cleaning tools, and adequate ventilation. Fortunately, you can jump into learning how to airbrush with an inexpensive kit, compressor, and cleaners, which are easily found online and in hobby stores.

Airbrush Paint vs. Acrylic Paint

Paint must be thin enough to pass through the fine nozzle of an airbrush gun. For this reason, acrylic airbrushing paints are formulated with a high pigment load and a low viscosity. Quality airbrush acrylic paints like Angelus, Createx, Testors, and Wicked require a minimal amount of reducer, which means great adhesion with better coverage, and higher color strength and intensity.

Primer and Paint Combos

Some primer and paint combos can be airbrushed, including Angelus, Flexi Paint, Hexflex Colours Sealer+Primer, and PlaidFX Smooth Satin. These products must be diluted to a skim-milk consistency in order to be thin enough to atomize

through an airbrush. Be sure to check the product instructions for recommended reducer products, reducer-to-paint ratios, and drying times.

Heavy Body Acrylics

Heavy body acrylics are not recommended for use as airbrush paints. A very high ratio of reducer would be required to adequately increase the viscosity, and this would most likely impair the adhesion, strength, and transparency properties of the heavy body acrylic paint.

Paint Reducers

Airbrush paint should be a consistency similar to skim milk in order to pass through the airbrush

nozzle. Choosing the right reducer to make the paint thin enough for airbrushing is an important step. The best choice is one that is engineered for use with the brand of paint you are using. If you are reducing airbrush paint that is already a lower viscosity, start with a smaller reducer to paint ratio of about 1:4, but for other kinds of acrylic paint, use a higher reducer to paint ratio, like 1:1. You can also experiment with distilled water, Windex Original Glass Cleaner, or rubbing alcohol at the same ratios. Remember that adding too much reducer can adversely affect adhesion strength, color strength, and intensity, so be sure to test before painting your final project.



ULTRASONIC CLEANERS

Cleaning your airbrush after every use is important to avoid a clogged nozzle, but getting all those tiny parts sparkling again can be a chore. An inexpensive basic ultrasonic cleaner is a hands-free way to clean even the smallest paint particles from those tiny airbrush pieces.



Almost any kind of acrylic paint can be reduced for use in an airbrush, although testing for adhesion, opacity, and color strength should be done before applying paint to your final project. Paints are not all the same, so remember to always add reducers according to the manufacturer's instructions.

SURFACE SMOOTHERS

Searching for a nontoxic method to create incredibly smooth surfaces that are flexible, durable, and compatible with any kind of primer and paint? Look no further than these amazing smoothing products!

Apply these products after heat sealing and filling gaps but before priming. Gap fillers will smooth the surface of the foam where they have been applied, and sometimes this surface appears much smoother than the surrounding EVA foam, even after priming and painting, which can cause unwanted streaking over your seams and gaps. To avoid this effect, apply surface smoothers, like Rapid Fill and Fine Finish, and then sand lightly to seamlessly blend the surfaces together.

Sand away brushstrokes to leave a smooth surface, but be sure to apply in thin layers to build up the surface enough to sand.

The samples shown in this section were allowed to completely cure and then were airbrushed with one coat of PlaidFX Satin Beta Blue paint and two coats of PlaidFX Saber Blue metallic paint.

Rapid Fill

This nontoxic, brush-on, flexible, sandable, acrylic-based product is an absolute must for any workshop. Use two or more layers of Rapid Fill to smooth EVA foam surfaces and to quickly fill small holes and surface blemishes. Available in white and dark gray. Rapid Fill is very flexible once cured.



1. Brush in all directions to work the material into the entire surface of the foam. Try to minimize brush strokes that you'll have to sand later.
2. Allow to dry between layers. Speed up the drying process with a hair dryer set on cool.
3. Once completely dry, lightly sand with 220-grit sandpaper until brushstrokes are minimized.
4. Apply two or more thin layers for the best results. Allow 60 minutes of drying time between coats.
5. Rapid Fill needs 24 hours to cure.



Two thin layers of Rapid Fill were applied and lightly sanded to reduce brushstrokes.

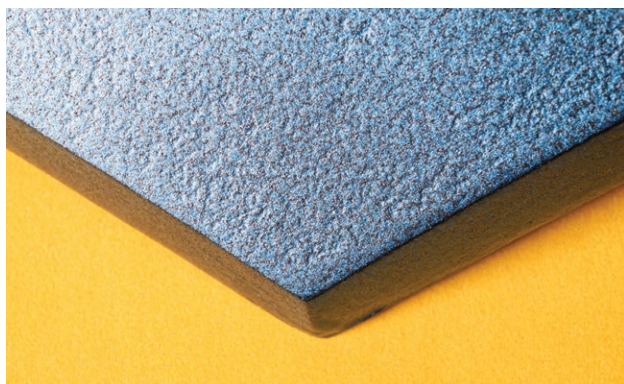
Fine Finish

Also made by Prop Monkey Studio, this surface smoother is used after Rapid Fill for creating a smooth surface free of brushstrokes on your EVA foam. Fine Finish is very flexible once cured.



For great results, follow these steps.

1. Apply three or more coats of Fine Finish with a fine, soft brush to the entire surface of the foam. Blend brushstrokes as much as possible to minimize sanding later.
2. Once dry, the surface can be wet sanded. Do not wet sand if you have used fewer than three coats.
3. Allow 30 minutes drying time between coats.
4. Let cure for 24 hours.



Two layers of Rapid Fill and two layers of Fine Finish were applied to this sample. Light sanding between layers removed all brushstrokes and smoothed the surface.

PRIMING

Priming your projects before painting not only smooths and reduces surface flaws, it prepares the foam surface for paint adhesion. The job of a primer is to provide a durable surface on your material that paint can firmly adhere to. Without a primer, you risk paint over-absorbing into the foam and then chipping and flaking.

Priming before you paint:

- Provides an important layer that helps paint adhere to your projects;
- Helps prevent paint from peeling away when masking;
- Fills small holes and minimizes surface defects;
- Creates supersmooth, flawless painted surfaces;
- Reduces wear and tear; and
- Extends the life of your project.

PRO TIPS

- Temperature and humidity can greatly affect drying times for primers.
- Use a flexible primer if you are concerned about cracking.
- Eliminate brush strokes by using spray-on primers.
- Some paints aren't compatible with some primers. Be sure to follow all directions and test for compatibility.

Commonly Used Primers

There are many different kinds of primers that can be used to prepare EVA foam for paint. This section covers the most commonly used products and how to use them for the best results on your projects. Primers in this section should be applied after heat sealing and before painting. Read about the products on the following pages or use the chart for a quick reference and to easily compare these products.

To illustrate the differences between these products, all of the samples in this section were cured according to the product recommendations and then airbrushed with one coat of PlaidFX Satin Beta Blue paint and two coats of PlaidFX Saber Blue metallic paint.

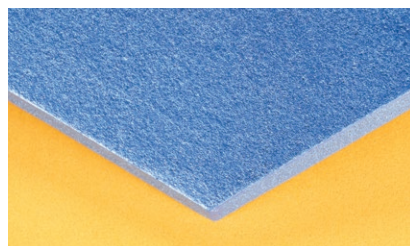
PRIMERS

Name	Toxic?	Available colors	Application	Drying & curing	Sanding	Flexible?	Surface quality	End result
Contact Cement	Yes	Semi-translucent amber	Brush	5–15 min between coats, full bond after 24–72 hrs	Not sandable	Very	Rubbery, slightly textured	Extremely durable
Creature Cast Rubber	No	Off-white or black	Brush, airbrush, spray gun	24 hrs to several days, depending on layer thickness	More layers will be easier to sand, but will be more prone to creasing	Very	Soft, rubbery, lightly textured	Durability and rigidity increase with more layers
Epsilon PRO	Yes	Translucent, can be tinted	Brush, apply in thin layers to preserve details	4 hrs between coats, 16-hr cure time	Yes, after fully cured	Semi	Glossy smooth	Durable, additional layers will add strength
Flexbond for Worbla	No	White, dries clear	Brush, apply in thin layers to preserve details	30–45 min between coats, fully cured after 7 days	Can be wet sanded	Very	Satin smooth	Durable
LeakSeal Flexible Rubber Coating	Yes	Clear and multiple colors	Spray can	1 hr between coats, 24-hr cure time	Not sandable	Very	Slight orange peel-like texture	Extremely durable, heavy applicator will remove small details
Mod Podge	No	Goes on white, dries clear	Brush, apply in thin layers to preserve details	1 hr between coats, cure time varies with many layers	Can be wet sanded	Yes	Smooth matte, satin, or gloss	Durable
PlaidFX Paint Primer	No	Goes on white, dries clear	Brush, airbrush, spray gun, apply in thin layers	1 hr between coats, 24-hr cure time	Not needed	Yes	Matte	Durable
Plasti Dip	Yes	Clear and multiple colors, glossy and matte options	Spray can	10–15 min between coats, 24-hr cure time	Not sandable	Yes	Slight orange peel-like texture	Extremely durable
PRIME: First Coat for EVA Foam	No	Goes on white, dries clear	Brush	10–15 min between coats, 24-hr cure time	Not needed	Yes	Matte	Durable
PVA Glue	No	Goes on white, dries clear	Brush	1 hr between coats, 24-hr cure time	Can be wet sanded	No	Satin smooth	Cracks easily
Wood Glue	No	Goes on off-white, dries clear	Brush	30 min between coats, 24-hr cure time	Can be wet sanded	No	Glossy	Smooth, cracks easily

Contact Cement



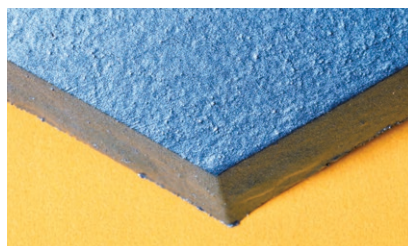
If you need a virtually indestructible surface, try priming your heat-sealed EVA foam with contact cement. Contact cement may leave an uneven surface or brushstrokes if not applied thinly enough, so be sure to test this method. Contact cement has a very fast cure time, but it can depend on many factors including layer thickness, humidity, temperature, and more.



One layer of Barge Contact Cement was applied before painting.

Creature Cast Rubber

If you're searching for a water-based, extremely durable, nontoxic, neoprene-based liquid rubber that is sandable, Creature Cast Rubber is a great option. Available in two colors and several rigidities, this versatile material can be thickened with NEO-THIX. Apply lower viscosity Creature Cast Rubber in multiple thin layers for a durable, even coating that is extremely flexible.



Five layers of Creature Cast Rubber were applied and lightly sanded before painting.

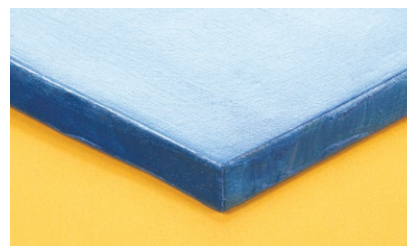
PRO TIP

If your desired end look is glossy, choosing a glossy primer can help enhance the final result. However, be aware that glossy surfaces will greatly magnify any surface flaws or unevenness of the EVA foam surface.

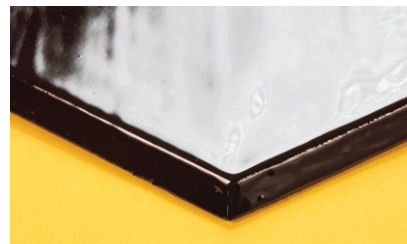
Epsilon PRO



Epsilon PRO is a two-part epoxy product from Smooth-On that is self-leveling and extremely durable after several thin coats. Epsilon PRO is clear but can be tinted with Ignite fluorescent colorants or UVO color pigments or combined with metallic powders for special effects. It cures to an ultrashiny surface that is sandable, slightly flexible, and impact resistant. Recoat time is 3 hours, cure time is 16 hours.



Two layers of Epsilon PRO were applied and sanded before painting.



This sample has two layers of Epsilon PRO that was tinted with black UVO pigment. This shiny black surface does not need to be sanded or painted unless you desire a different color or effect.



Cosplayer: Downen Creative Studios
Costume: Hela from *Thor: Ragnarok*

Photo by Downen Photography

I used several layers of Epsilon PRO tinted with black UVO pigment to seal and paint my Hela headdress and horns.

Flexbond for Worbla

Flexbond is a water-based material that creates a strong, flexible adhesive bond on EVA foam and thermoplastics, including Worbla. It paints on white but dries to a clear, flexible coating that is tack-free. Flexbond can also be used as an adhesive, and it can be tinted with Rosco paint, Off Broadway, latex paint, or other water-based colorants.

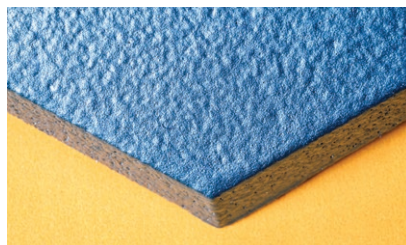


Two layers of Flexbond for Worbla were applied to this sample before painting.

LeakSeal Flexible Rubber Coating



Another popular aerosol rubber coating is LeakSeal. Produced by Rust-Oleum, this coating material sprays fast and can be a little startling at first. Test thoroughly before using. Initial spray may have some foaming or bubbling, but it will dissipate as the coating dries. Apply two coats for best results. Allow 15–30 minutes between coats and 24 hours to fully cure before painting. A great advantage of LeakSeal Flexible Rubber Coating is its ability to release creases caused by wear and tear with a small amount of heat from a heat gun.



Three layers of LeakSeal Flexible Rubber Coating were applied before painting.

Mod Podge

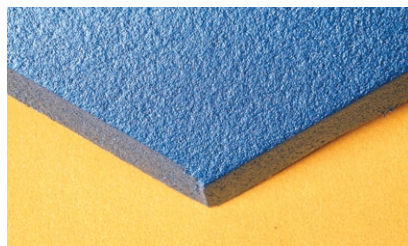
Mod Podge is a nontoxic sealant, glue, and finish available in gloss, satin, or matte varieties. It brushes on white and dries clear and flexible. You can dilute it with a small amount of water to get your desired consistency. Allow to dry for about an hour between coats. Cure time depends on layer thickness, but it can be wet sanded after it is completely dry for a very smooth result.



Two layers of Mod Podge Matte were applied before painting.

PlaidFX Paint Primer

PlaidFX Paint Primer is a water-based, clear, flexible primer designed for EVA foam to help with adhesion and reduce surface pores and flaws before painting. For best results, apply two to three layers with a brush, or thin to use with an airbrush or spray paint gun. Allow 1 hour between coats, and allow to cure for 24 hours before painting.



Two layers of PlaidFX Paint Primer were applied before painting.

Plasti Dip



Plasti Dip is one of the more commonly used primers among cosplayers. Its slightly textured, rubbery coating can be painted with almost any kind of paint when cured and is available in a wide range of color options in both gloss and matte finishes. For a smooth application and a better finish, place the can in warm water for several minutes before spraying. Apply at least four coats for a smooth surface and complete coverage. A great advantage of Plasti Dip is its ability to release creases caused from wear and tear with a small amount of heat from a heat gun.



Three layers of Plasti Dip were applied before painting.

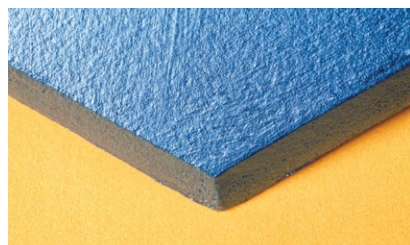
PRO TIP

Use a spray grip handle to save your fingers and hands from getting fatigued if you are spraying often. These are inexpensive and will fit on most standard spray cans.

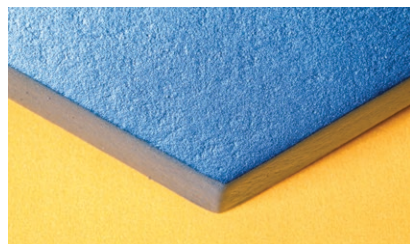


PRIME: First Coat for EVA Foam

PRIME brushes on semitranslucent and dries clear. It promotes great adhesion, so it's great if you need to mask areas for painting later because the paint has a better chance of sticking to the surface and not peeling away with the masking tape. Apply one to two thin coats or two to three coats if thinned with water. Allow to dry for 15 minutes between coats; it is cured after 24 hours. You can reduce drying time with a hair dryer on a cool setting. PRIME is very flexible once cured.



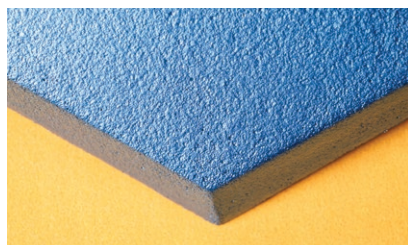
Two layers of PRIME were applied to this sample before painting.



Two layers of PRIME, two layers of Rapid Fill lightly sanded between layers, and two layers of Fine Finish lightly sanded between layers were applied. The final result after painting is flexible and very smooth with no brushstrokes.

PVA Glue

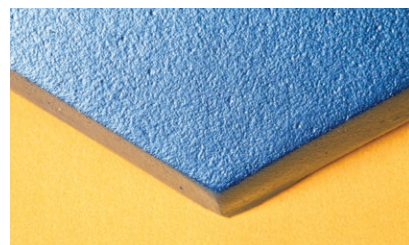
PVA glue, or white glue, is an inexpensive, nontoxic material that can be used for priming foam. It can be thinned with water and applied easily with a brush. Beware, though, this glue is prone to cracking and is best for surfaces that won't be stressed or touched. PVA has a very smooth surface when fully cured and can be wet sanded to remove brushstrokes.



Two layers of PVA glue were applied before painting. The surface is very smooth but brittle.

Wood Glue

Wood glue is more durable than PVA glue, but it cures to a glossy finish. Dried surfaces can be wet sanded to reduce brush strokes. Unfortunately, wood glue is very prone to cracking and should be used sparingly on projects that have any kind of flex.



Three layers of wood glue were applied before painting for a smooth but brittle surface.

Primer and Paint Combos

These high-quality materials can prime and paint in the same step, which can save precious time otherwise spent painting and drying. Although they typically carry a higher price tag and are only sold at a small number of specialty shops, these products are great to have on hand. Most of these can be diluted with water and still offer excellent coverage with minimal brushstrokes, which means that a bottle will last much longer. To learn more about using these unique products to add paint effects to your projects, skip ahead to Specialty Acrylic Paints for EVA Foam (page 106).

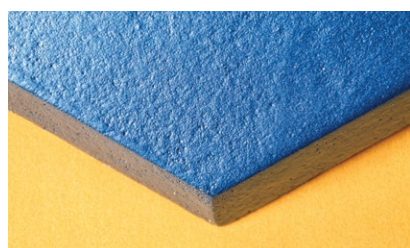
To illustrate the differences between these products, all of the samples in this section were cured according to the product recommendations and then airbrushed with one coat of PlaidFX Satin Beta Blue paint and two coats of PlaidFX Saber Blue metallic paint.

PAINT AND PRIMER COMBINATION PRODUCTS

Name	Toxicity	Available colors	Application	Drying & curing	Sanding	Flexibility	Surface quality	End result
Angelus Leather Paint	Nontoxic	Clear and multiple colors	Brush, airbrush, spray gun	10–25 minutes between coats, 24-hour full dry time	Not needed	Very flexible	Additives needed to create satin, matte or gloss effects	Durable, apply in thin layers for best coverage
Flexi Paint	Nontoxic	Clear and multiple colors	Brush, airbrush, spray gun	Very fast drying, 24-hour cure time	Can be wet sanded	Very flexible	Satin smooth matte	Durable, apply in thin layers to preserve details
Hexflex Colours Sealer+ Primer	Nontoxic	Clear and multiple colors	Brush, airbrush, spray gun	Fast drying, 3 hours between coats, 12-hour cure time	Not needed	Very flexible	Satin smooth matte	Durable, apply in thin layers to preserve details
Krylon Fusion All-In-One	Toxic	Clear and multiple colors	Spray can	Handle after 2 hours, 7-day full cure time	Can be lightly sanded with high grit with several layers	Flexible	Satin, matte, or gloss	Durable, drying and cure times affected by humidity
PlaidFX Smooth Satin	Nontoxic	Multiple colors	Brush, airbrush, spray gun	1 hour between coats, 24-hour cure time	Not needed	Flexible	Matte	Durable, apply in thin layers to preserve details

Angelus Leather Paint

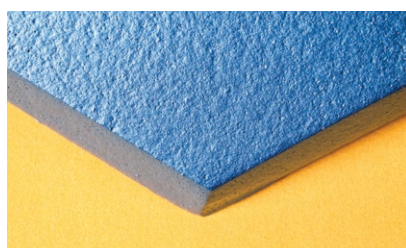
If you don't have access to many products, are short on time, or are working in a small space without the ventilation required for an aerosol spray, Angelus leather paint is commonly found at specialty art supply stores and can be used in a pinch as a primer and a paint. However, several thin layers will be necessary for complete coverage, and it tends to be more expensive.



Two layers of Angelus leather paint were applied to this sample before painting.

Flexi Paint

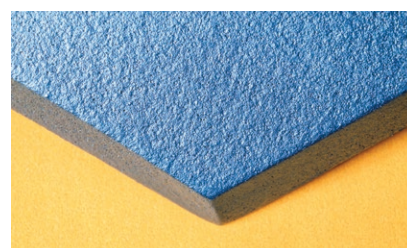
Flexi Paint is a nontoxic formula that can be applied to foam with a brush, airbrush, or spray paint gun. This concentrated formula should be thinned with water to the consistency of whole milk before painting to reduce brushstroke visibility. Flexi Paint has a variable drying time between coats depending on environmental factors. Drying time is fairly fast and can be reduced further with a hair dryer on a low heat setting. To learn more about using Flexi Paint to add painted effects to your projects, skip ahead to Specialty Acrylic Paints for EVA Foam (page 106).



Two layers of Flexi Paint were applied to this sample before painting.

Hexflex Colours Sealer+Primer

Hexflex is available in clear and multiple colors. Add other water-based acrylic paints for different effects and custom colors, dilute slightly with water and apply several thin coats to build up layers for great coverage and minimal brush strokes, or thin for use in an airbrush or spray paint gun. Allow 3 hours between coats, and allow to fully cure for 12 hours at room temperature. Drying and cure times can be reduced with low heat. Hexflex cures to a matte surface that is flexible and tack-free.



Two layers of Hexflex were applied to this sample before painting.

Krylon Fusion All-In-One



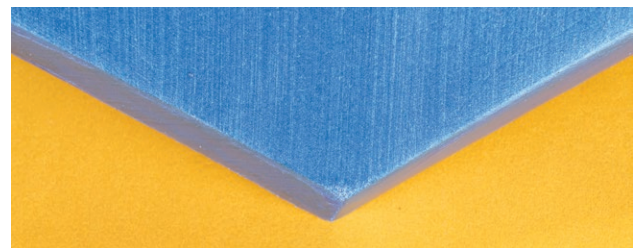
Krylon Fusion is a popular aerosol paint that can prime and paint at the same time. Although this paint will be dry to the touch after a few hours, it requires at least 7 days to fully cure for maximum durability. This paint is a great option if you are in a hurry and need a project painted as soon as possible, but it is more prone to scuffing and cracking before it has fully cured. This spray paint is available at most hardware stores in gloss, satin, or matte options in many colors, but it cannot be mixed to create custom colors. Krylon Fusion All-In-One offers a durable, flexible finish that has a slight texture. Like many other aerosol paints, it is also affected by humidity, so be sure to follow all instructions and recommendations for application, recoat, and cure times.



Three layers of Krylon Fusion All-In-One were applied to this sample before painting.

PlaidFX Smooth Satin

PlaidFX Smooth Satin acrylic paint can be used as a primer and a paint. This special nontoxic paint is formulated specifically for EVA foam. PlaidFX Smooth Satin is available in a wide variety of colors and can be applied with a brush or reduced for airbrushing. Apply in thin layers for a flexible and durable satin finish that won't diminish fine detailing on your projects.



Two layers of PlaidFX Smooth Satin were applied to this sample before painting.

PAINTING

Painting is perhaps the best part of creating a costume or a prop. All of your hard work, planning, long nights, blood, sweat, and tears have gotten you this far, and you are now rewarded with one of the best parts—transforming your EVA foam pieces with paint into works of wearable art!

PRO TIPS

- Add straps and other hardware before painting.
- Whenever possible, paint your costume pieces at the same time if you are using aerosols or mixing a custom color.

Base Coats

A base coat is the first layer of color that is applied across the entire surface after priming. This base color should be close to your final overall color. If you've used a clear primer, a base coat will not only create a uniform color, it will hide written labels and other surface markings. When the base coat is dry, it can also show spots of EVA foam that may not have enough primer. These spots will appear rougher than the surrounding area and are typically along seams, edging, and other areas where the EVA foam was sanded. To correct this, apply another layer or two of primer and try again. Once the base coat is dry, it is ready for additional paint layers and effects. If you primed with a product like Flexi Paint, Hexflex, or PlaidFX Smooth Satin, you have already applied the base coat and can jump right into painting!



Before applying black Hexflex primer/base coat



After applying black Hexflex primer/base coat

Commonly Used Paints

There are many kinds of paint that can be used with EVA foam. This section will focus on acrylic paints, specialty EVA foam paints, leather paints, oil paints, and, of course, aerosol paints.

Acrylic Paints

Acrylics are nontoxic, fast-drying, inexpensive, and incredibly versatile paints that provide great coverage. Compatible with almost every kind of material and primer, they can be brushed on by hand or airbrushed. They can be combined with other acrylics, metallic powders, and mediums to change the flexibility, gloss, drying times, and more! Acrylics can be found in any hobby store and are usually very inexpensive.



LIQUITEX HEAVY BODY

These kinds of flexible acrylic paints have high pigment concentrations and are long lasting, very easy to blend, and available at any art supply store in a large variety of colors. They will remain flexible once brushed on EVA foam that has been sealed and primed. These tube paints are best applied with a brush, as airbrushing heavy body paint requires an excessive amount of airbrush thinner that can compromise the adhesion, transparency, and color properties of the paint.



SLOWING DOWN DRYING TIMES

Acrylic paints dry very quickly, sometimes in minutes! If you need a few extra minutes of working time, try using an acrylic retarder medium to prolong drying times. This is useful for painting large areas, weathering, and blending.



ADDING FABRIC MEDIUM FOR FLEXIBILITY

Many hobby-store acrylics are not inherently flexible and will flake off your costumes and props if the foam is compressed or bent, even if the surface is primed. Adding fabric medium at a 1:1 ratio will transform any acrylic paint into a flexible paint. For best results, apply your paint and medium mixture in multiple thin layers. Fabric medium is nontoxic and dries clear. It can sometimes alter the paint color slightly so be sure to test this process before painting your full piece. You can also use fabric medium to thin acrylics for airbrushing on foam and fabric.



PRO TIP

If you need your costume to be flexible, ensure that all materials you apply to the foam are also flexible, from the gap and seam fillers you use to your primer, base coat, paint, and sealers.

Specialty Acrylic Paints for EVA Foam

Flexi Paint, Hexflex Colours Sealer+Primer, and PlaidFX Smooth Satin paints are specifically designed for use on EVA foam. These water-based paints have higher pigment concentrations and contain unique bonding agents that prevent flaking and cracking when EVA foam is flexed. For this reason, they can be used alone as primers and base coats as well as for final colors and effects. Their water-based nature makes them compatible with other water-based paints and allows them to be combined with other acrylics to create custom colors and effects. These special paints offer excellent coverage and tend to have thicker viscosities than hobby acrylics, but they can be diluted with water to minimize visible brushstrokes or be combined with a reducer for airbrushing. These specialty paints tend to be more expensive than hobby acrylics and can be purchased from online retailers and specialty hobby stores. To learn about using these unique products as primers for your EVA foam projects, including drying and cure times, see Primer and Paint Combos (page 101).

FLEXI PAINT

Flexi Paint is a concentrated acrylic paint formula that is nontoxic, durable, and flexible. You can combine Flexi Paint with other acrylic paints or add metallic powders such as Pearl Ex by Jacquard (up to 30% volume) to create different effects. Thin with a small amount of water and apply with a soft brush. Flexi Paint can also be airbrushed.

A unique property of Flexi Paint is its slight tackiness when drying. During the tacky phase, you can add pearlescent and metallic powders and pigments to the surface to create stunning effects. After 24 hours, the surface tack is greatly reduced and becomes a flexible and durable rubber finish that can be wet sanded. As a final step, apply silicone oil to smooth the surface, seal metallic powders, and remove any remaining tackiness. The new Flexi Paint formula has less tack than the original.



Use metallic powders to add luster and shine to pieces that are still tacky.

HEXFLEX COLOURS SEALER+PRIMER

Hexflex is a line of advanced acrylic paint formulas that can double as both primers and paints. Available in several colors, these nontoxic paints can be mixed with any water-based acrylics and pigment powders for custom colors and effects, and they can be brushed on or combined with a reducer for airbrushing. Apply several thin layers to avoid leaving visible brushstrokes.



PLAIDFX SMOOTH SATIN

PlaidFX Smooth Satin paints bond incredibly well to EVA foam and will remain flexible and durable after 24 hours. They can be thinned with airbrush reducer or glass cleaner for airbrushing. Available in many colors, these high-pigment paints are vibrant and are easy to use.



PRO TIP

Mix more paint than you think you'll need! If you are mixing paint for your costume, write down the ratios that you use so you can mix more if needed. You can also mix a larger batch of paint for touch-ups or to create more armor pieces at a later time without worrying about color matching and having enough for additional coats. To give you an idea of what kind of coverage you might need, a 3-ounce bottle of PlaidFX paint covers approximately 7 square feet (.65 square meters).

Leather Paints

Leather paint is a type of water-based acrylic paint that is formulated for leather but can also be used on EVA foam. Leather paints have more flexibility than regular acrylic paints you'd find in a hobby or hardware store. Paints like Angelus are wonderfully flexible and offer really great coverage. They can be brushed on or thinned with airbrush reducer for airbrushing, and they can be applied to fabric and deglazed vinyl as well. Angelus has a variety of special mediums that can be combined with any acrylic paints to modify gloss, add or reduce flexibility, and seal your final paint projects.



DEGLAZING

Vinyl fabrics have a protective surface coating that will inhibit paint from adhering to the surface. A gentle wipe with a product like Angelus Leather Preparer and Deglazer or acetone will remove this layer and prepare the material for paint.

Oil Paints

Oil paints should not be used on unpainted EVA foam and cannot be mixed with water-based paints like acrylics. However, these slow-drying paints can provide beautiful weathering and aging effects on top of acrylic or spray-painted surfaces.



Oil paints are durable and can last a long time, but they can take many days to dry. To speed up drying times, try adding Winsor & Newton Liquin Original.



Rattle Can Spray Paints



When choosing a rattle can spray paint for your EVA foam project, the best options will be brands that adhere well to plastic and are flexible. Many spray paints are enamel paint designed for exterior use, and these will eventually crack and flake when flexed. A great brand to try is Krylon Fusion All-In-One spray paint. To improve the atomization of Krylon Fusion All-In-One spray paints (and other aerosol paint and primers), place the cans in a container of warm water for at least 5 minutes. This will smooth the paint flow and reduce the chances of a large paint clump forming and landing on your freshly painted surface. Always test spray paints before applying to your final pieces. There's nothing worse than finding out the hard way that something isn't compatible or will crack and flake away with use. Be sure to pay attention to humidity and temperature requirements as well as ventilation and safety precautions.

There are many kinds of spray paint you can try, but Krylon Fusion All-In-One is handy to have around for a quick coat of paint that bonds to EVA foam really well. You can use this paint as a base or a main color.



Krylon Fusion can be used as primer and paint for last-minute rushed projects if you are willing to sacrifice durability for a quick turnaround time—these aerosol paints aren't as flexible as acrylic-based paints and tend to crack over time. They are typically available in several colors.

Metallic Paints

There's nothing quite as satisfying as shiny metallic armor! But before you start painting, be aware that there are some challenges involved with using metallic paint. One of the biggest challenges is getting a supersmooth, shiny surface. Metallic paint will enhance every flaw on your projects, including visible brushstrokes. Avoid making heartbreaking mistakes and getting less-than-optimal results by testing and following product recommendations for application and drying times.

AEROSOL METALLIC PAINTS



It can be tempting to cover your entire project with a shiny metallic spray paint, but use caution—these paints can be very challenging to work with. Most metallic spray paints are not water-based and can react poorly with surfaces that have any hidden oil, debris, or other residue that aren't compatible, causing devastating results.

BASIC TIPS FOR GETTING A SMOOTH FINISH WITH AEROSOL METALLIC PAINT

- Use a few layers of sandable primer and sand your projects to a smooth surface before applying a base coat.
- Use a glossy base paint for a glossy metallic surface.
- Make sure the surface is free of dust, debris, and oil before applying metallic paint.
- Be sure to wear gloves when touching the project after applying the base paint. Fingerprints will leave traces of oil that will not be compatible with many aerosol paints and will cause visible flaws.
- Use an aerosol paint or airbrush to avoid leaving visible brushstrokes.
- Allow the paint to completely cure according to product instructions before handling. A fingerprint in uncured paint cannot be repaired easily.



Cosplayer: Downen Creative Studios

Costume: Athena, original design

Photo by Downen Photography

This costume was airbrushed with metallic acrylic paint thinned with a reducer for a super shiny surface free of visible brushstrokes.

BRUSH-ON METALLIC PAINTS

Brush-on metallic paints are far less sensitive than aerosol metallics tend to be. Most are water-based and will be compatible with other acrylic paints. Some brush-on metallic paint brands are semiopaque and will need several layers and extra time for layers to dry in order to completely cover a small area. To solve this problem, try mixing a metallic with a similar nonmetallic base color for your first layer. Add more metallic paint layers for a full-coverage maximum-metallic effect. Brushing metallic paints can sometimes result in some visible brushstrokes but is still a great option if you are working in a small room or don't have proper ventilation to use an airbrush or spray paint. As always, test on scraps before you paint your entire costume or prop!

REDUCING BRUSH STROKES

Here are some helpful tips and techniques for reducing brush strokes when hand painting all types of acrylics:

- Use soft, high-quality synthetic brushes.
- Add an acrylic retarder medium to increase blending time.
- Apply in thin layers.
- Allow layers to dry between applications.



Cosplayer: Downen Creative Studios
Costume: Lady Sif from *Thor: The Dark World*

Photo by Downen Photography

The armor on Lady Sif was primed and sanded smooth before brushing on metallic paint.

PAINTING EFFECTS

There are so many different kinds of painting effects that you can use to add dimension, detail, and texture to your props and costumes. Here are a few common methods used with a few different materials to get you started. The best way to get good at painting is to practice!

Terms

- **Base Coat:** To apply a first coat of paint to the entire surface after heat sealing and priming.
- **Blot:** To gently press the painted surface with a paper towel or absorbent material to pick up paint.
- **Drybrush:** To add scratchy highlight and lowlight effects using undiluted light or dark paints applied with a dry bristle brush.
- **Highlight:** To add lighter colors sparingly to edges and areas that would naturally appear brighter. Use in combination with lowlights to create depth.
- **Lowlight:** To add slightly darker shades of a base color to areas that would naturally have shadows. Lowlights add realism and dimension.

Adding Lowlights

Lowlights are the opposite of highlights—adding lowlights will add darker tones and shadows to your pieces to add depth and dimension. Use darker hues and tones of the colors you used on the piece instead of simply using black.



1. Lightly brush a small amount of dark paint into the edges, corners, and around any area where you want to add some depth. Dilute the paint with a small amount of water or acrylic retarder medium for easier application and to increase working time.



2. Add or remove paint to increase or decrease the effect!

Weathering

Add character to your projects by creating dust, grime, and evidence of wear and tear with paint. Use oil or acrylic paints for this process. Oils allow for a much more fluid application and can be blended beautifully, but they can take days to dry. Acrylics can sometimes be difficult to blend because of the swift drying times. Add drying or retarding mediums to your paints if needed.



This Eagle Axe designed by Mathew Grigsby was weathered with acrylic paints.



1. Load the tip of a paintbrush with a small amount of slightly diluted paint that is a darker color than the base color of your project.



2. Apply the paint into the creases of your project.



3. Gently wipe away excess quickly before the paint dries.

You can also do a wash over the entire surface to fill small pores, blemishes, and to add more overall character and grime. If you are using oils, you can easily wipe away the paint almost entirely for a subtle effect. Experiment with multiple thin layers of different hues of paints to create realistic weathered effects.

SEAL BEFORE WEATHERING

Sealing your painted surface with varnish before adding weathering and grime will add a protective layer on your base paint. The varnish will provide a smooth surface that will make the weathering process a little easier and allow you to blot and wipe without damaging or lifting the base coats on your project. Be sure to allow the varnish to completely dry before painting additional layers and weathering effects.

Adding Highlights

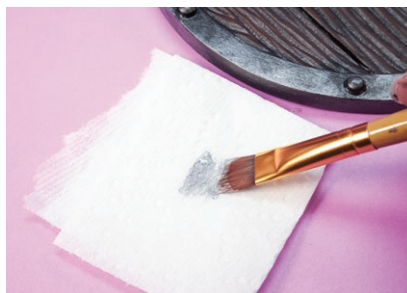
Apply highlights after lowlights to make edges pop, enhance weathering, and add more dimension to your projects. Highlights are one of the last steps of painting. A few common methods include dry brushing, applying Rub n' Buff, and using metallic writing tools.

Dry Brushing

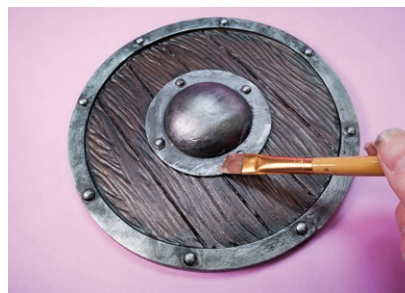
Acrylics are great for dry brushing because of their fast drying times. Using a short bristle brush, dip the tip of the bristles in the paint and blot on a tissue or paper towel to remove excess. Next, lightly sweep the bristles across the area you want to cover. Add as much as you want or change the color to add more dimension, building up the texture and paint a little bit at a time.



1. Load the tip of a paintbrush with a small amount of a bright acrylic color, like silver.



2. Blot the tip of the brush on a paper towel to remove excess paint.



3. Lightly sweep and dab the bristles across the edges of your piece. Go slowly and add thin layers. Repeat if needed.

Rub 'n Buff

A favorite among all kinds of makers, Rub 'n Buff's line of products adds amazing metallic highlights. Apply sparingly with a cloth, your finger, or even a brush, and rub with a soft cloth until shiny. Add this material a little at a time to avoid overapplication—it's all but impossible to remove. Add light layers with a brush until satisfied, or rub all over for more coverage. Rub 'n Buff should be the last step of the painting process and applied only after all other paints are dried.



Costume: Hippolyta from DC Extended Universe

Several hues of Rub 'n Buff gold were applied to these Hippolyta vambraces to create a sophisticated metallic color palette.

Metallic Writing Tools

A quick way to add metallic highlights to your project is with a metallic pen or marker. Gold, silver, and bronze Sharpies and liquid chrome ink pens are just a few types of writing tools that can be used for this technique. Apply sparingly to edges and other areas to simulate evidence of wear and tear. Each pen will have a different drying time, so be sure to follow all directions and test accordingly before using it on your project.



Creating Metallic Effects

Create metallic and pearlescent effects in acrylic paint by mixing metallic powder pigments directly into the paint. If you're using Flexi Paint, you can also apply these powders directly to the surface during the tacky stage to create a brilliant metallic shine. Be sure to seal Flexi Paint with silicone oil to lock the metallic powder pigment in place after application. Brands like Jacquard Pearl Ex and Cast Magic from Smooth-On are incredibly fine powders that will not create texture when blended into paint and are small enough to use for airbrushing. Larger particles, such as glitter, can add interesting effects but can be seen clearly in the paint and will create a textured surface; they are also too large to airbrush. Be sure to experiment with metallic powdered pigments before using them on your final project.



Creating Chipped-Paint Effects

Chipped-paint effects are really fun and easy to do! This is a simple way to add character to your projects. There are many methods to make your costume and props look like they have been aged and battle-worn. In this section, you'll learn an easy masking technique using toothpaste or liquid latex. The trick is to allow each layer to completely dry.



1. Imagine what the raw material of your piece would look like. Is it steel or a dark, rusty brown? Start with whatever color you think would appear underneath layers of paint. Paint a base color, and allow the layer to dry completely.



2. Apply toothpaste or liquid latex in a random pattern on your piece and allow it to dry completely. Latex will turn clear when completely dry.



3. Paint over the dried toothpaste or latex with a different color, covering the entire surface. Is the top-coat paint red or orange? Silver? You decide!



4. Once fully dry, gently remove the paste or latex. Repeat these steps to add as many layers as you like.

SEALING PAINT

We've talked about sealing EVA foam, but what about sealing paint? Sealing paint protects your hard work from scratches and water damage, and it can extend the life and durability of your projects. If flexibility is important, be sure to use a flexible sealer or risk your paint cracking and getting damaged under stress.

There are many brands of sealers, including Mod Podge (gloss or matte), Flexbond for Worbla, Hexflex Clear, Flexi Paint (gloss or matte), Angelus Acrylic Finisher (gloss, satin, or matte), varnish, and many more. Testing these products before applying them to your entire project is highly encouraged to make sure your paint isn't ruined in a matter of seconds.

PRO TIP

Sealing will help preserve the paint and will add durability to your projects, but it isn't always necessary if you aren't expecting your project to be subjected to stress or the elements. This process is also referred to as clear coating.

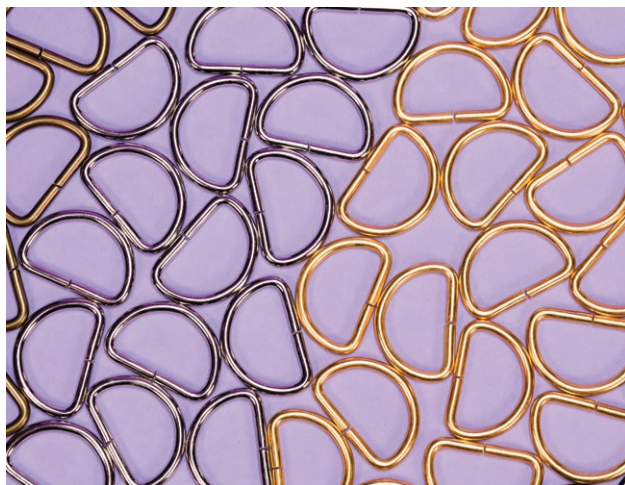
Sealing Metallic Surfaces

Common sealants can greatly dull the metallic shine you've worked so hard to perfect. Products like Pledge Floor Gloss and DecoArt glossy varnishes are good brush-on options for sealing and protecting metallic surfaces. However, it isn't always necessary to seal metallic paints unless you need to protect the paint from potential damage caused by heavy use, so be sure to test your product combinations thoroughly before using a product on your final pieces. Allow at least 24 hours to see if there is a reaction between materials and to determine what the sealer and your metallic paint surface *really* looks like once completely cured.

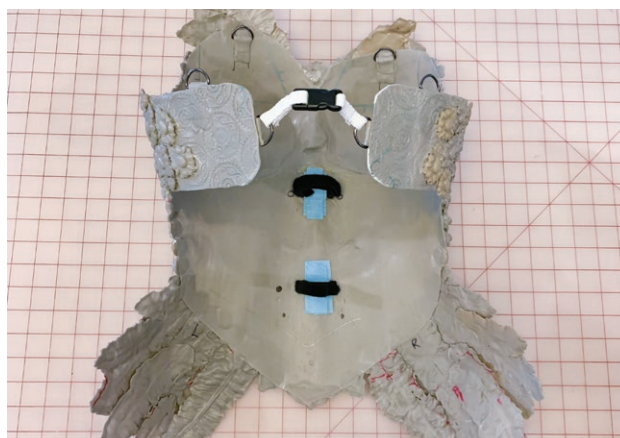
There are endless ways to attach costume pieces. This chapter will cover the most common hardware. Use a combination of these attachment methods to secure your costume pieces in place and avoid wardrobe malfunctions.

D-RINGS

D-rings are widely used by cosplayers to easily add attachment points for straps. These versatile metal rings come in a variety of sizes and colors, and are very strong.



Attach them with nylon strapping or leather strips glued down with contact cement or hot glue. They are great for pauldrons, corsets, chestpieces, headdresses, vambraces, leg armor, and foot armor.



BUCKLES

Parachute Buckles

Parachute buckles are perhaps some of the most commonly used items for attaching armor. These lightweight, versatile plastic buckles are available in many different sizes and styles, are very easy to install, allow for adjustable strapping, and can be quickly released with one hand. They are great for upper and lower body armor.



Metal Buckles

Create realistic, functional, decorative strapping with metal buckles. Paired with any kind of strap, these buckles can easily be adjusted for comfort and fit, just like any belt you might own.



Some buckles have an integrated metal brad that can be inserted through EVA foam and thermoplastics for very quick installation. These kinds of smaller buckles are perfect for parts that are decorative and won't be stressed too heavily, like vambraces.



HOOK-AND-LOOP TAPE

Hook-and-loop tape is handy for all kinds of projects and applications. Use it to attach pieces together, like belts, overlays that hide seams, corsets, chestpieces, and footwear. These attachments allow for quick one-handed release and for slight positional adjustments as needed.



Hook-and-loop tape is available pretty much everywhere in several different sizes, strengths, styles, and colors including sewable, double-sided, industrial strength, superthin, and more.



Generic brand hook-and-loop tape (*left*), generic thin hook-and-loop tape (*center*), and super-thin hook-and-loop tape from Imperial Surface (*right*)

Attaching Hook-and-Loop Tape

Hook-and-loop tape that does not have an adhesive backing can be attached in a variety of ways. Here are two easy ways to attach hook-and-loop tape:

- 1. Sewing:** Separate the hook-and-loop tape into two pieces. Sew each piece of hook-and-loop tape to fabric or nylon strapping. Glue the fabric side to foam with contact cement, and reinforce edges with hot glue. This will create a very strong bond.
- 2. Hot gluing:** Separate the hook-and-loop tape into 2 pieces. Slightly score the foam for better adhesion and apply each piece using hot glue. Reinforce the bond by adding more hot glue along the edges. This is not as strong as the first method, but it is very fast.

A Note on Adhesive-Backed Hook-and-Loop Tape



It is better to spend time creating strong, reliable bonds to avoid wardrobe malfunctions. Sometimes body heat can weaken adhesives, and this kind of hook-and-loop tape has been known to cause issues. For this reason, cutting corners and using adhesive-backed hook-and-loop tape is sometimes the least reliable option and is not recommended.

Thin Hook-and-Loop Tape

Standard hook-and-loop tape will add several millimeters of bulk between surfaces, which is not always ideal. For projects that need surfaces to be flush, specialty slim-profile (also known as low-profile) hook-and-loop tape like Ultra Thin Hook & Loop from Imperial Surface is extremely useful for closures that need to be strong but remain thin and almost invisible. Use this kind of hook-and-loop tape for attaching foam to fabric. Simply sew or use hot glue to secure the hook-and-loop tape to fabric, collars, vambraces, leg armor, and other pieces that should appear to float on the body without a lot of extra bulk.



Generic hook-and-loop tape (*top*) compared to the superthin hook-and-loop tape from Imperial Surface (*bottom*).

ZIPPERS

Zippers are very easy to add to EVA foam costumes and can be used to create full enclosures for vambraces, lower leg pieces, and chestpieces. These versatile attachments are great for creating low-profile seams.

PRO TIPS

- Use separating zippers—zippers that can fully separate into two pieces—whenever possible.
- Use invisible separating zippers for a streamlined look; these are available at online specialty shops.
- Sew a few centimeters of heavy-duty nonstretch fabric to the zipper for extra durability.
- Use at least three layers of contact cement to attach to EVA foam.



Installing zippers on EVA foam is an easy way to add sophisticated enclosures on your armor pieces. Separating zippers are best, but any kind of zipper can be used.

This method will add about a centimeter of width to your armor pieces, so be sure to factor that into your design before installing the zipper. To install a zipper, follow these steps.



1. Draw a glue guideline on the zipper and the edges of the EVA foam with a contrasting color Sharpie or pen. Make sure to leave enough room for the zipper to freely glide up and down without getting stuck on glue or brushing against the foam.

2. Mark the end of the glue line on the zipper. Extend this line a few millimeters just in case.

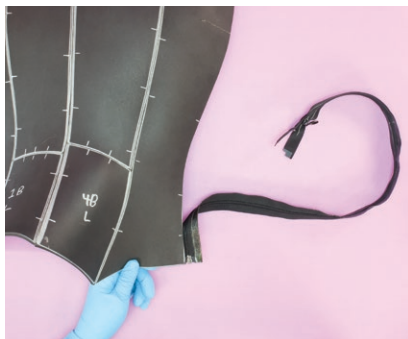


3. Apply at least three layers of contact cement to the zipper and the edges of the EVA foam. The zipper tape will absorb the first layer, so it is important to add extra layers for a strong bond.



PRO TIP

Use duct tape to mask the zipper teeth and foam for a clean glue edge.



4. Keep the zipper closed. Align the bottom edges of the EVA foam and the zipper together and press.



5. Continue gently pressing the zipper to the EVA foam along the seam to the top without stretching the foam.



6. Align the ends of the remaining zipper edge and the foam.



7. Press firmly and unzip the zipper.



8. Continue pressing the zipper edge to the foam.



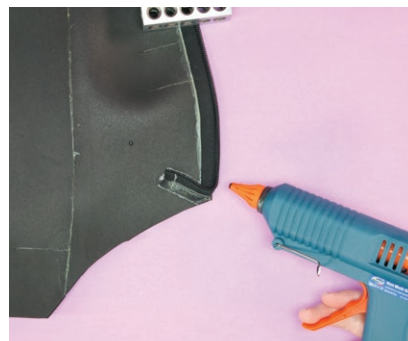
9. Trim the zipper tape, leaving about 5cm on the end.



10. Fold the zipper tape to the inside of the foam and trace the outline.



11. Lightly score the surface of the EVA foam.



12. Apply hot glue and press. Add more hot glue around the edges for a strong bond.



13. Add hot glue to the opposite ends of the zipper to strengthen the seam.



Finished! For added strength, use contact cement to attach a layer of nonstretch fabric or other porous material to the seam, or add hot glue to the seam.

PRO TIP

Use a silicone mat to flatten and smooth hot glue before it cools.



SNAPS

Heavy-duty snaps are great for attaching lightweight pieces that won't be overly stressed. Attach snaps to canvas or denim and use contact cement (at least three layers) to attach to foam. You can also attach snaps to elastic and sew the elastic to fabric that is then attached to foam. This can provide some ease and comfort. Snaps can also be secured to thermoplastics and easily attached to thermoplastic-covered pieces.



STRAPS

Connect thigh armor to belts with nylon straps and parachute clips, snaps, or clear plastic bra straps if you need the connection to be hidden. You can also create your own straps with a reinforced backing, or wrap EVA foam in faux leather, vinyl, or fabric.



This is how to attach nylon strips using D-rings.



1. Use hot glue to connect D-rings to nylon straps. Loop the strap end through a D-ring and hot glue together.



2. Position the straps and mark where they will be attached.



3. To help with adhesion, lightly score the foam before adding hot glue.



4. Apply hot glue to the scored area and press the strap to the glue.



5. Add more hot glue around the strap edges to firmly secure it in place.

ELASTIC

Use elastic to connect parts that need to move (like to connect knee armor and greaves, thigh armor and belts, or shoulders), to enable pieces to slide over each other or footwear, and more. Elastic cording is perfect for lacing foam corsets and chestpieces because the elastic will stretch slightly with your body as you move, and connecting leg and arm straps with elastic will add tension. You can connect elastic to your costume pieces using buckles, snaps, or hook-and-loop tape.



GROMMETS

Grommets can be installed directly on EVA foam and used to lace pieces together, like corsets, vambraces, or chestpieces. Grommets will sometimes not fit on very thick EVA foam pieces. In these instances, install grommets on heavy-duty fabric and attach to your EVA foam pieces with contact cement.



HOOK-AND-EYE CLOSURES

Hook-and-eye closures can be useful to help anchor lightweight pieces to straps or other pieces. They are also useful for hiding bra straps under pauldrons!



MAGNETS

Neodymium magnets (rare earth magnets) are superstrong, available in many strengths and sizes, and easy to install in EVA foam. Use magnets to attach almost any part of your costume to another (as long as the attachment isn't stress-bearing), create seamless connections on body armor, or as closures on pockets or pouches. Install magnets with hot glue or quick-cure adhesive. You can countersink magnets for flush application.



Some magnets are encased in a plastic pocket that allows for speedy attachment to foam with hot glue, or sewn to fabric and attached with contact cement.



This Wonder Woman corset from *Wonder Woman* (below) was created by Emma of Carma Cosplay. You can see that the back panel, which is not stress-bearing, is attached using magnets and a zipper.

PRO TIPS

- Use a drill or brass tube to make pilot holes for magnets.
- Lightly sand the surface of the magnet for better adhesion.
- High heat will demagnetize a magnet, so be sure to heat seal before installing.
- Use a strip of ferrous material for closures instead of always using two magnets.



Photo by Emma of Carma Cosplay



Photo by Emma of Carma Cosplay

CHICAGO SCREWS

There are endless uses for Chicago screws in costuming. Flat on both ends, they can provide attachment points and connect foam parts together with ease—and without glue! These handy pieces of hardware are available in many different lengths and can simulate rivets: Just screw them together. They can also be taken apart and adjusted. Chicago screws are all the same diameter size, so if you need extra depth for multiple layers, switch to a longer shaft size. The heads are flush, which doesn't add bulk or pointy parts that can be uncomfortable when wearing. Embed Chicago screws in props and accessories to easily disassemble for travel and storage or to easily add straps to props such as shields.



HITCH FASTENERS

Hitch fasteners are similar to Chicago screws, but with a ball head.



These can be used to easily connect straps and provide decorative and functional attachment points for costumes created with 2mm foam. These screw together, so no glue is needed. Hitch fasteners are very handy if you need to put on your costume pieces by yourself. However, be aware that these attachments are shorter and will connect less material than Chicago screws. Reinforce the backs with sturdy fabric glued to the foam or a small amount of thermoplastic.



3-PRONG TEE NUT

These nifty pieces of hardware are designed to be flush against the surface of your material. The three-prong design helps keep these in place.



These are great for installing durable hardware that you might want to break down for travel or storage—shield straps, or even cantilevered helmet parts, can be easily assembled and disassembled with this hardware.



This hardware is best with thicker materials. For added reinforcement, glue a piece of sturdy fabric or thermoplastic over the hardware. Punch a hole through the material first so you can install the corresponding bolt.

SUSPENDER CLIPS AND OVERALL BUCKLES

Suspender clips and overall buckles are incredibly useful for attaching capes, straps, and more to your costume pieces. These handy items allow for quick release and easy repositioning.



Overall buckles were used to attach this cape to the chestpiece.

HARNESSES

For builds with multiple parts that need to be strapped together, a harness can be invaluable. A properly fitting harness can provide good weight distribution and can be designed for making adjustments where needed. Install attachments like straps, hook-and-loop tape, buckles, and more to these handy devices. Harnesses are especially useful for comfortably wearing wings, mounting larger-than-life pieces, and so much more. There are many kinds of harnesses that can help you make a costume possible and comfortable to wear. Modify a prefabricated harness or create your own with nylon straps, padding, and parachute buckles or with hook-and-loop tape and elastic. For wing harnesses, check out designers like The Crooked Feather for tutorials.



Cosplayer: Downen Creative Studios

Costume: Captain Marvel from *Captain Marvel* (2019) #2

Photo by Downen Photography

Belts and straps were used to create a harness to attach the cape, pauldrons, and thigh accessory of this Captain Marvel costume.



OTHER USES FOR EVA FOAM IN COSTUMES AND PROPS

BELTS

Need a belt? Then make a belt! This is incredibly easy to do with EVA foam. Use an existing belt of yours as a template to make your own. Get creative with textures—from leather to stone, create any kind of texture you need for easy belts and waist pieces.



These belts were created from a long strip of EVA-70 wrapped in a layer of vinyl. Both buckles were created with Worbla's Finest Art thermoplastic with inner structures of foam (the large belt) and wire (the smaller belt) to prevent tearing and cracking under stress. The belt on the right was created by Alex Cautley.

PRO TIPS

- Create custom belt buckles with thermoplastics using the Double-Sided Flat Method (page 35).
- Cover foam with vinyl using contact cement. To learn how, see Wrapping EVA Foam with Vinyl (page 128).
- Add D-rings, hook-and-loop tape, and other hardware to the underside of belts to attach upper leg pieces, tabards, accessories, and more.

HOLSTERS

Use EVA foam to create sturdy holsters for your props. In this example, EVA-70 from TNT Cosplay Supply was used as a base and covered with faux leather vinyl. Add some snaps or hook-and-loop tape to attach to a belt, and add a magnet closure to easily access the prop gun.



Prop Makers: Downen Creative Studios and Deela Designs

Prop: Cara Dune belt from *The Mandalorian*

WRAPPING EVA FOAM WITH VINYL



You can wrap vinyl fabrics over your EVA

foam projects to create professional-looking results. Use this method as a substitute for painting, to add texture to your project, and much more. The creative possibilities are endless with this simple technique. It is best to consider wrapping EVA foam around pieces that are not overly complex and don't have multiple compound shapes.



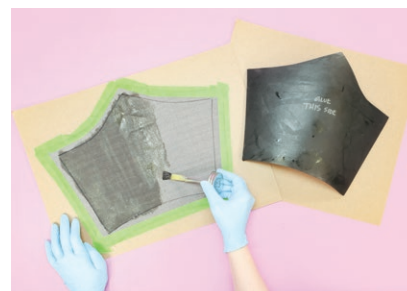
1. Cut out the EVA foam that you want to wrap. Trace the shape onto vinyl using a bright marking pen that is easy to see. Draw a margin large enough to wrap around all edges of the EVA foam by at least 2cm. Use a wider margin for wrapping thicker foam.



3. Once the contact cement is tacky, carefully align the EVA foam on the vinyl, pressing the surface to smooth out any wrinkles or air pockets on the surface.



5. Apply contact cement to the edges of the EVA foam and inside the traced lines. Once the contact cement is tacky, press the edges in place.



2. Cut out the vinyl and secure it to a work surface with tape or pins. Apply contact cement to the EVA foam and the wrong side of the vinyl. The porous surface of the vinyl will absorb the contact cement, so be sure to apply a second coat for full coverage.



4. Fold the vinyl margin over the EVA foam and trace, clipping at corners where needed.

STRUCTURAL BASE

Add EVA foam as a support structure for corsets, collars, and more! A thin, dense foam like EVA-70 from TNT Cosplay is perfect for projects that need extra support. Be aware that perforations of any kind in foam are permanent and can weaken the structure along the stitch lines. Reinforce your foam with more foam, nonstretch fabric, or twill tape glued to the underside of the seam.



Cosplayer: Coffee Powered Cosplay
Costume: Nightingale armor from *The Elder Scrolls: Skyrim*

Photo by Downen Photography

Coffee Powered Cosplay used thin EVA foam as a structural component under stretch vinyl for the greaves and pauldrons of her Nightingale costume. She was able to sew the fabric directly onto the foam!



PRO TIP

Use a medium-weight sewing needle (12–14) to perforate the EVA foam and a longer stitch length of 4–5mm/5–6 SPI (stitches per inch) to prevent the foam from tearing at the stitch perforations.

STRUCTURAL SUPPORT

EVA foam can be inserted inside layers of fabric and used as an inner layer for soft, supportive decorative structures, like the inside of a corset. The corset below was created with EVA foam and was then covered with vinyl fabric. The corset functions as an attachment for the thermoplastic shell bodice, transferring the weight of the bodice to the corset. This helps make the costume much more comfortable to wear for extended periods of time.



Cosplayer: Downen Creative Studios
Costume: Athena, original design

Photo by Downen Photography

HAIR

EVA foam can be transformed into amazing hair and wigs, like Jen Schachter did for her awesome Marie Antoinette costume. She used 2mm EVA foam to create multilayered wefts and worked the foam sheets into gentle waves and curls with scoring and shaping techniques. Avera Cosplay used EVA foam clay to sculpt organic shapes for her Mei Hatsume wig.



Cosplayer: Jen Schachter
Costume: Marie Antoinette, original design

Jen Schachter used sheets of EVA foam to create her wig.

Photo by Norman Chan



Cosplayer: Avera Cosplay
Costume: Mei Hatsume from *My Hero Academia*

Avera Cosplay used EVA foam clay to create her wig.

Photo by Anthony Hernandez

POUCHES AND POCKETS

Use foam to easily create functional costume pouches and pockets to hold items! You'll need to store keys, phones, emergency costume repair kits, and other essentials somewhere, so why not design one for your costume? Add a pouch to a belt or tuck one away inside a shield for easy access to important items. For added security, reinforce cell phone pouches with thermoplastic.

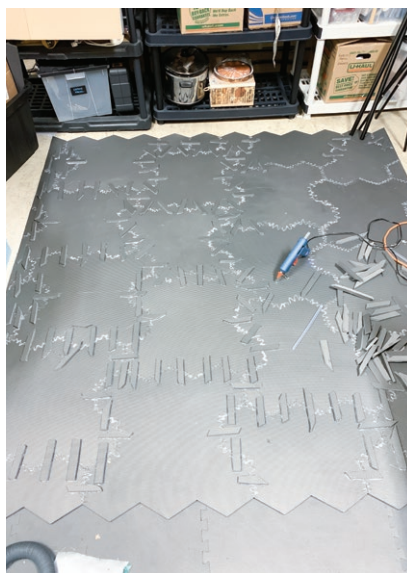


Prop Maker: Spicythaidesign

Photo by Spicythaidesign

PHOTOGRAPHY BACKDROPS

If you like to take work-in-progress photos of your work and would like to have a nice backdrop for your photos, you can design one with EVA foam! Floor mats are an inexpensive way to create an interesting backdrop to hide a cluttered workspace or to create different looks if you shoot your own photos.



This backdrop was created with several pieces of inexpensive low-density floor-mat foam. The sheets were scored with a hexagon shape and glued together with high-temp hot glue. All of the glue seams were reinforced with scrap EVA foam and hot glue. To hang the backdrop, several PVC plugs were inserted along the top edge and fastened to the backdrop stand with zip ties.

Cosplay is a hobby that can generate a lot of waste, but with a small amount of effort, you can make the most of EVA foam scraps and send less of these materials to the landfill. Scraps are perfect for testing paint, applying glue, making mock-ups and prototypes, adding details, adding support, and more! Here are a few ideas.

MAKING MOCK-UPS AND PROTOTYPES

A great way to use scraps is to use them when working out the finer details of a prop or a part of your costume. The smaller size of a prototype allows you to use scraps and save larger portions of material for your final project.

As you can see, when I created my version of the Child Floating Pod from Star Wars' *The Mandalorian*, I made several smaller prototypes using scrap material to perfect the pattern for a full-size pod.



Photo by Downen Photography

ADDING DETAILS

Any kind of small detail that you would like to add to a prop or a costume can most likely be created with a small piece of scrap foam. Using up scraps will save larger pieces of material for bigger projects and keep EVA foam out of the refuse bin.



The details on this helmet were all constructed using small scraps.



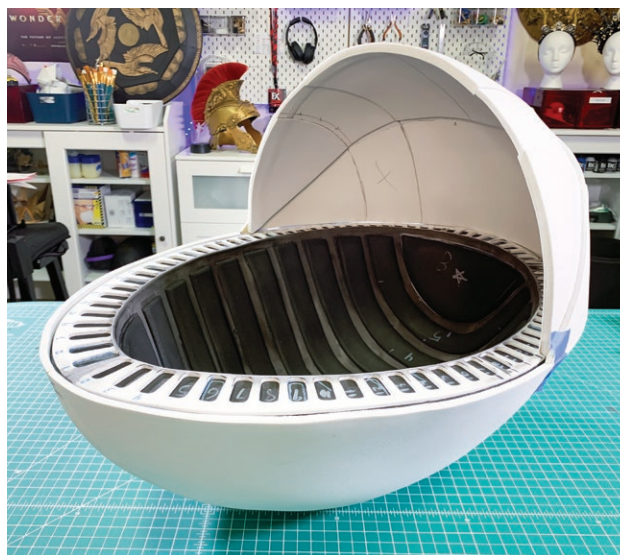
Create intricate details like feathers using scraps.

ADDING SUPPORT

Adding scraps of EVA foam can provide added support to the structural integrity or the position of a prop or a costume piece.



The hollow shell of this pod prop was reinforced by adding several strips of scrap EVA foam to create an inner support structure.



The EVA foam strips provided support and prevented the surfaces from collapsing into each other.

TEST PAINT AND PROCESSES AS YOU WORK

Make a paint testing board! Glue several pieces of scrap foam to cardboard, and keep it nearby. Seal, prime, texture, and paint the pieces with the same methods you use for your final piece. Make notes about what paint ratios and how many layers you are using.



PRO TIP

These test boards can double as presentation boards. If you are competing with your costume, these kinds of visual presentation boards are a great way to show the judges your processes and techniques.

SPREADING CONTACT CEMENT

Instead of immediately throwing your scraps in the garbage, cut them into wedges that you can later use to spread glue on foam. Keep the scraps bin nearby to remind you to utilize all of the material you purchased—even the scraps.



MAKING PAINTING HANDLES

Make a temporary painting handle by attaching scrap with a small amount of hot glue to the underside of your costume piece. Cut or carefully twist the handle to remove it when you are done painting.



MAKING BEVELS

Practice making bevels with smaller scraps! Keep the ones you create in a bin for later use. Bevels are great for creating details and are nice to have on hand. Small bevels can be inserted into scoring lines to enhance a quilted effect or glued in place to stabilize undercuts. Cut equal lengths of hand-cut bevels and assemble them to create linked chains—learn how to make these details in Creating a Linked Chain Effect (page 70).



CREATING A SHAPE LIBRARY

Keep a bin nearby for storing different-sized circles and shapes for easy access later! Getting into the habit of creating a variety of common shapes from the scraps you generate as you work will mean less work to complete on a future project.



PART 3

PATTERNING

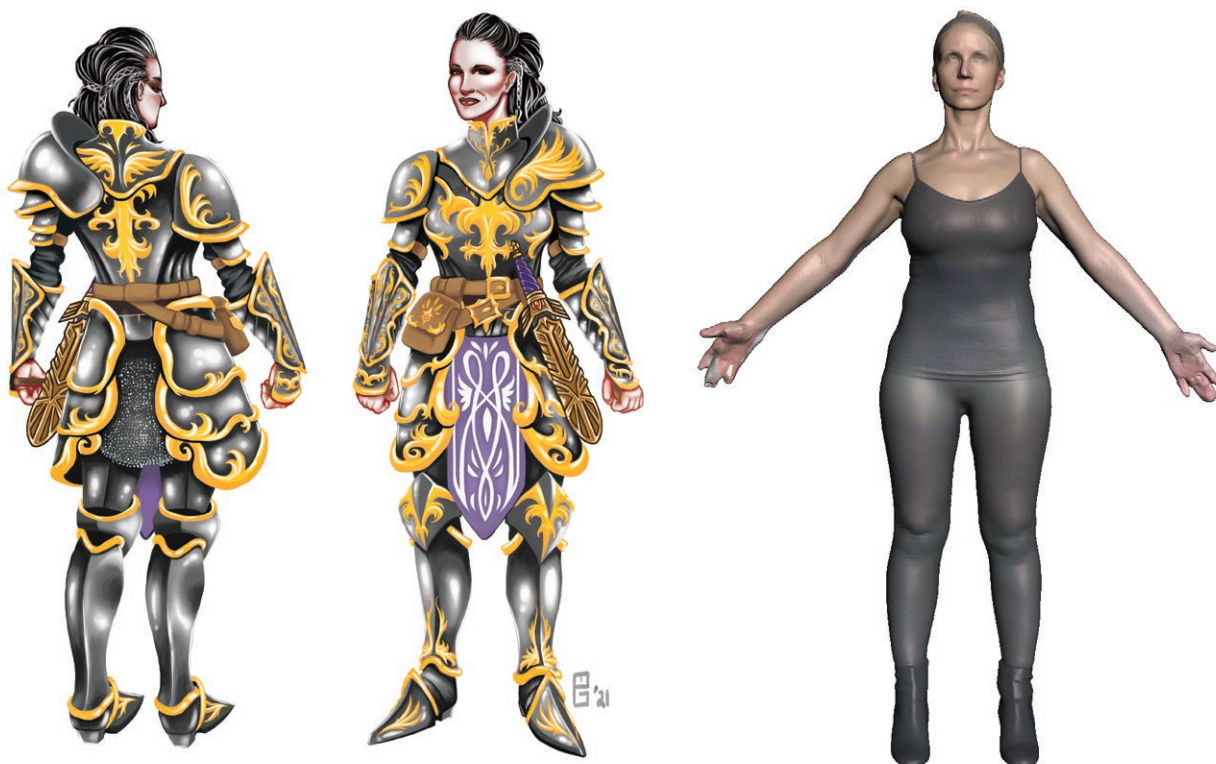
COSPLAYER'S ULTIMATE GUIDE TO EVA FOAM



Cosplayer: Downen Creative Studios
Costume: Original Fantasy Armor design
Costume Concept Art: Mathew Grigsby

Photo by Downen Photography

To walk you through the design process, I collaborated with my friend, illustrator and conceptual designer Mathew Grigsby, to create an original Fantasy Armor design. In fact, the front cover image is the result of the patterning process you'll learn about in this chapter! You'll see Matt's beautiful and detailed illustrations as I walk you through each step of patterning armor.



Fantasy Armor costume concept art by Mathew Grigsby.

This is a 3D scan of my body. You can also use 2D photos taken on your phone as reference photos.

3D Body Scans

Also known as photogrammetry, 3D body scanning can be performed on a full body or a body part. The scans generated from these devices can be used as a digital reference or for 3D-printing miniature and full-size models of your body.

PLANNING THE BUILD

When you’ve found a costume that you want to create, it’s time to start planning the build. Before you start designing, patterning, building, and buying materials, spend a little bit of time on these important preproduction steps.

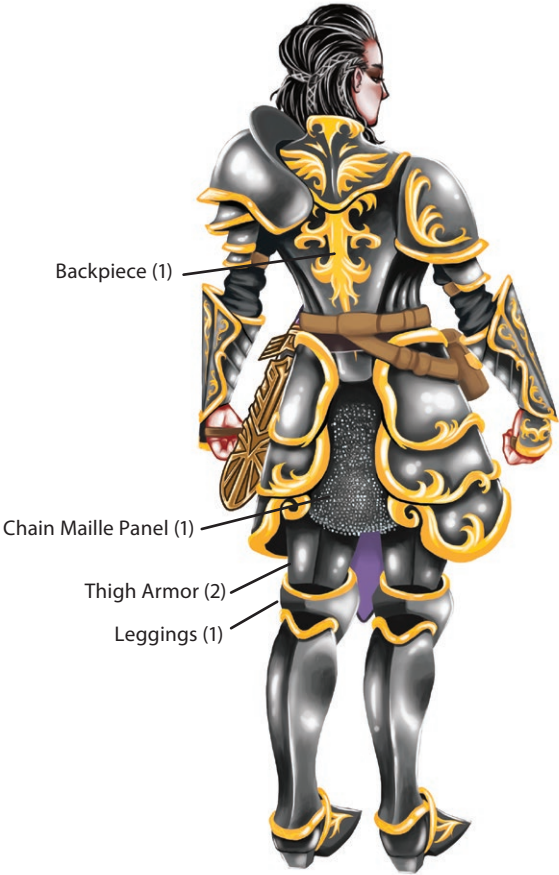
Gathering Assets

Assets are all the images and videos that can help as you create each piece in the upcoming days, weeks, and months. This includes images of the costume, props, or accessories in as many angles and views as you can find. Save images of textures on the costume and props, color swatches, hardware options, and fabric swatches. Also be sure to have full-length images of yourself from the front, back, and side views to help you design and plan the build from all angles.

Making a List

Look at your reference images and make a list of all costume pieces, props, and accessories you will need for your build. Categorize this list into pieces that need to be created, items you already have, and items you will need to purchase. Assign items you aren’t sure about to the “To create” list.

To create	Already have	To buy
Gorget (1)		
Chestpiece (1)		
Backpiece (1)		
Pauldrons (2)		
Pauldron with neck guard (1)		
Right spaulder (1)		
Left spaulders (2)		
Vambraces (2)		
Tassets (6)	Undershirt (1)	Shoes (1 pair)
Thigh armor (2)	Leggings (1)	Wig (1)
Knee guards (2)		
Greaves (2)		
Sabatons (2)		
Belts (2)		
Pouch (1)		
Dagger (1)		
Tabard (1)		
Chain maille panel (1)		



PLANNING NEXT STEPS

Now that you have a costume you want to make and an idea of how many parts there are to create, it's time to begin figuring out how the parts will be assembled and answer that burning question: How much material will you need?

How Will You Put It On and Take It Off?

Much of patterning is very dependent on where you want to attach each piece. Begin to think about where and how pieces might attach to each other or to you. Sketching out ideas can help with this process and give you inspiration about how you might want to approach some of the more challenging parts. Keep in mind that you will most likely change a few things when you arrive at that part of the build.

Here are some recommendations:

- Use superthin hook-and-loop tape or magnets for connections that need to be concealed or flush.
- Use buckles as both functional and decorative elements.
- Use D-rings to connect straps to other pieces.
- Use elastic to connect pieces that need to flex and move with your body.

PRO TIPS

- Friction and tension are your friends during a build. Use stretchy fabric and elastic and nonslip materials like hot glue and rubber cement to help pieces stay up and stay in place.
- Use two points of attachment whenever possible for maximum stability.

Helmets and Headpieces

Attaching helmets and headpieces to your head seems easy enough, but there are some challenges. Make sure that you have vision, range of motion, and mobility with the helmet on. Can you see out of the helmet? Can you move your neck side to side without parts of your helmet hitting your shoulders or your collar? Refine your design as you work to ensure the helmet will fit well over the rest of your costume. For more information, see *Patterning Helmets and Headpieces* (page 187).



Cosplayer: Downen Creative Studios

Costume: Athena, original design

Photo by Downen Photography

This helmet fits over my head and was designed to leave room for additional padding and a wig.



Cosplayer: Downen Creative Studios

Costume: Hela from *Thor: Ragnarok*

Photo by Downen Photography

This helmet is very snug and was designed to evenly distribute the weight of the horns without needing additional straps.

Gorget, Neck Pieces, and Collars

These useful additions can be used to hide hardware and straps that connect other upper body pieces; they can also be used to anchor pauldrons.

When sizing neck pieces, look at the other adjacent pieces. Do they overlap or remain separated if needed in the design you are creating? Is the collar too small or too large? Making small adjustments to collars for design and also for comfort is important before you start attaching other pieces.

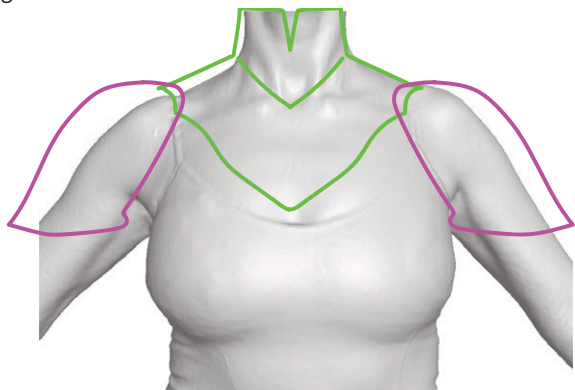
Enclosures can be placed at the front, back, or at the shoulders. If you're dressing yourself without help, enclosures at the front or side are helpful. Use hook-and-loop tape, plastic parachute buckles, snaps, or magnets. Avoid laced enclosures unless you have someone to assist you.

PRO TIPS

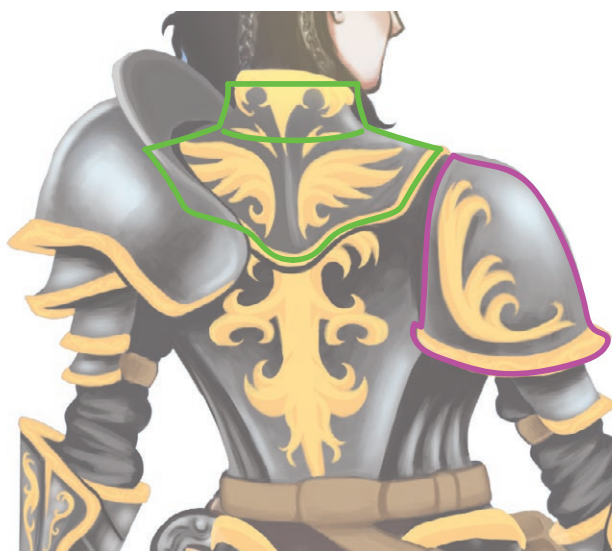
- Don't make neck pieces too tight. Always leave extra room for movement.
- Lining neck pieces with a bit of fabric can help keep collars comfortable and wick away sweat, keeping you cooler and more comfortable.



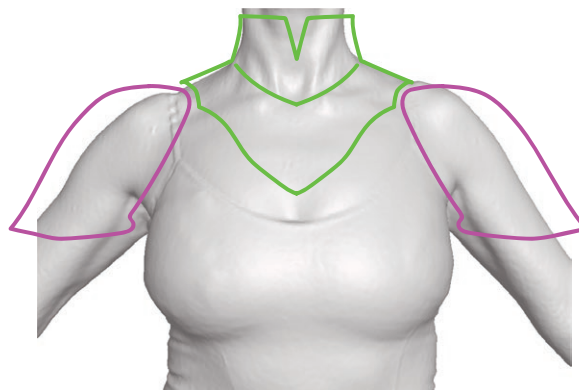
The gorget for this design is too wide and must be sized down slightly to allow room for the pauldrons to move with the arm and prevent the pieces from being damaged due to rubbing together.



When copied to the body image, the outlines are overlapping and must be adjusted.

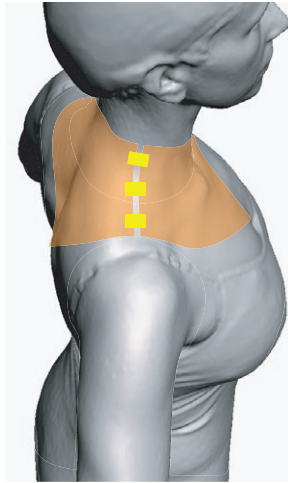


The gorget and pauldron shapes are outlined.



The gorget size was decreased to remove overlapping.

Since there are decorative designs on the back and front of the gorget, the gorget enclosures should be on the sides along the line between the neck and the shoulder, where there is empty space free of detail. Hook-and-loop tape or magnets will be great attachments for this kind of seam that needs to be flush. If you use magnets, create the gorget with EVA foam that is thicker than the magnets you will be using.



Example of where hook-and-loop tape can be placed for a gorget enclosure



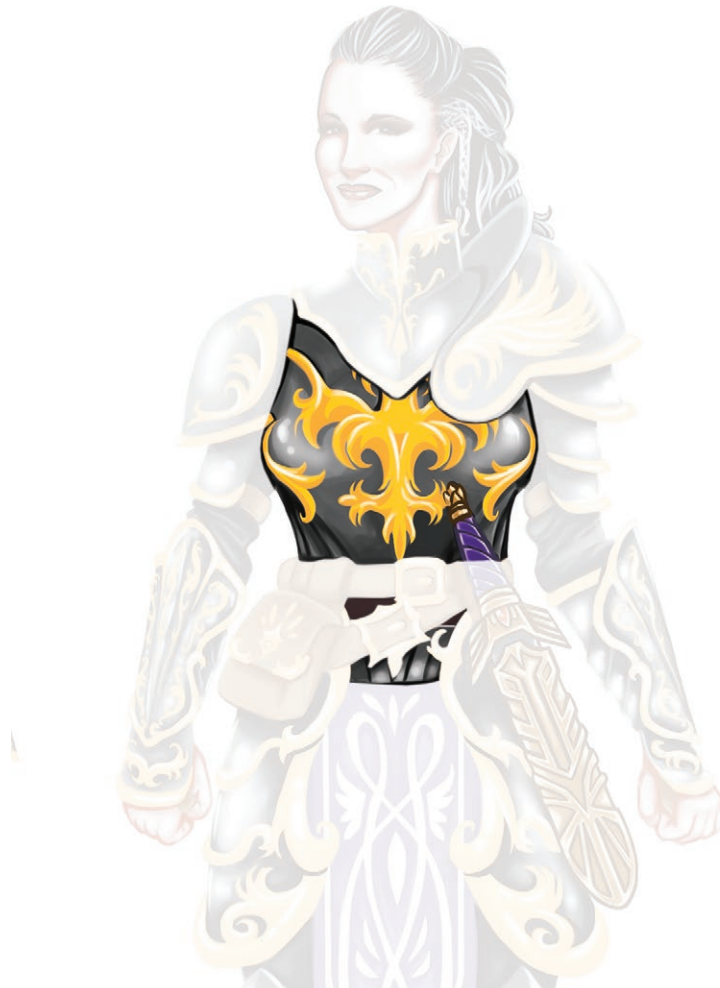
An example using magnets

Chestpieces and Backpieces

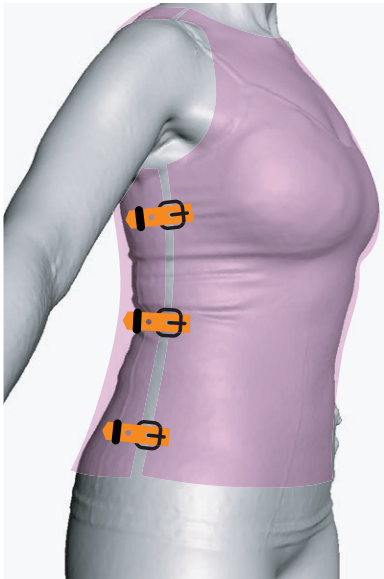
There are many ways to attach chestpieces, backpieces, and other armor and costume pieces to your torso. Many other elements of a costume can be attached to these, which is why they are frequently created first.

Did You Know?

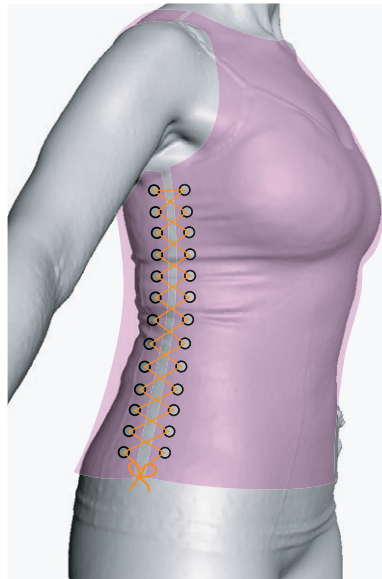
A **chestpiece** can also be called a **chestplate**, **breastpiece**, or **breastplate** and a **backpiece** can also be called a **backplate**. These terms are interchangeable, which can be a little confusing! Additionally, a **cuirass** refers to armor with both a chestpiece and a backpiece and is commonly referred to as **torso armor**. To simplify, this book uses the terms **chestpiece**, **backpiece**, and **torso pieces** when referring to upper body armor components that cover the front or back or both.



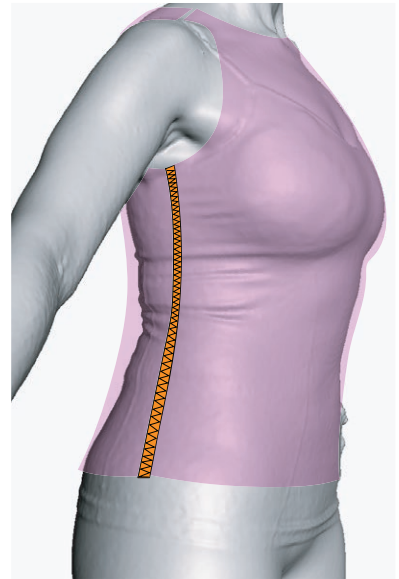
Here are just a few examples for attaching torso pieces at a side seam. These methods can also be used for a back or front enclosure.



Buckles



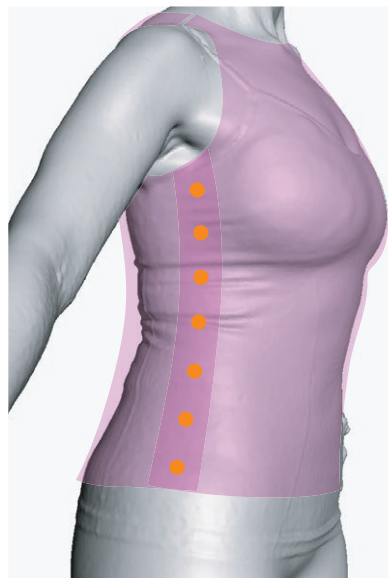
Lacing



Zipper



Hook-and-loop tape



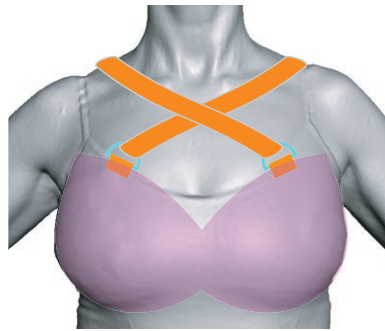
Magnets

Unless the opening is large enough for your head to fit through, you'll need to add an attachment to the straps as well. This can be anywhere on the strap.

Here are some additional examples of attaching straps to torso armor.



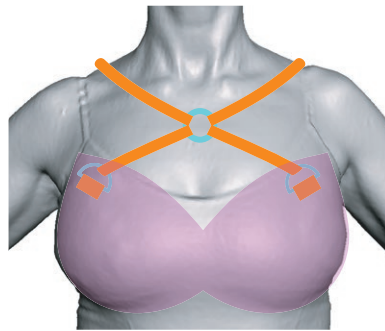
Hook-and-loop tape



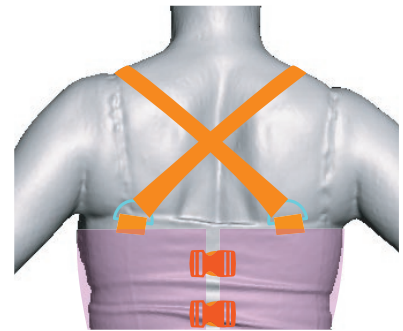
Crossed in the front



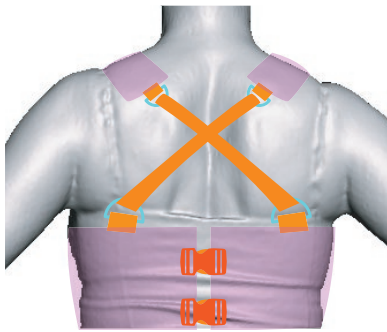
Straight over the shoulders



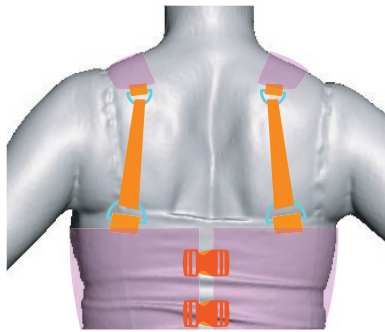
Crossed, connected to an O-ring



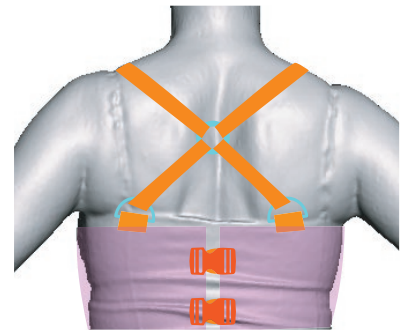
Crossed in the back



Crossed in the back, connected to shoulder straps

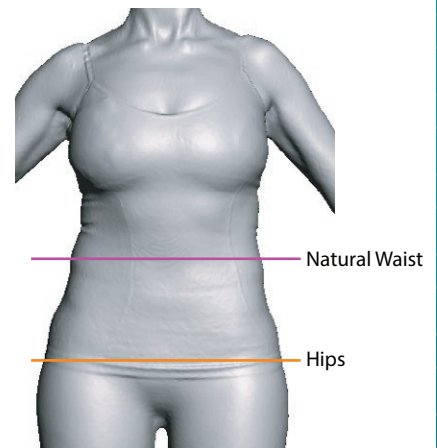


Straight in the back, connected to shoulder straps



Crossed in the back, connected with an O-ring

To move and walk naturally in your costume, your hips need to be unimpeded. If you want to be able to sit, make sure your torso piece doesn't extend far below your hip line. You can also try to design torso pieces in two pieces, an upper and a lower part, so you can easily bend at your natural waist.



Pauldrons

Pauldrons (shoulder armor) need to move, sometimes in multiple directions at once. The shoulder joint can freely rotate more than any other joint. For this reason, it's a good idea to plan for at least three attachment points to keep a pauldron in place on your shoulder and to accommodate multidirectional movement.



There are so many ways to connect pauldrons to your costume. The method you decide to use will ultimately depend on the style of your costume and what structures are available to use as anchors and attachment points.

Here are just a few examples of common ways to connect pauldrons to your costume and body using hook-and-loop tape, elastic, D-rings, snaps, and buckles.



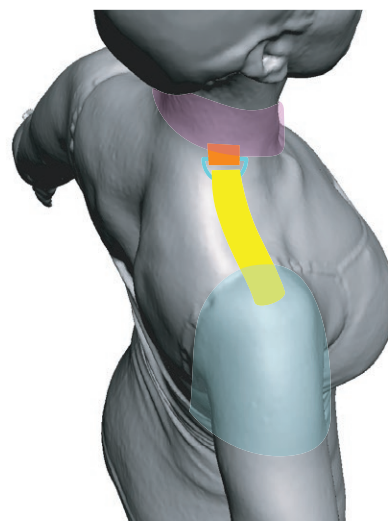
One strap



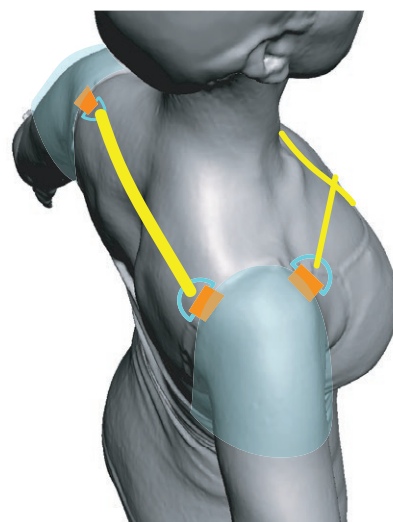
Two straps



Anchored with a fastener



Strapped to a collar



Multiple straps



Buckle



Two hitch fasteners and an arm band strap were used to attach this pauldron to the chest armor.



Costume: Hippolyta from DC Extended Universe

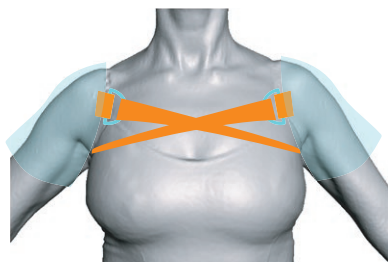
Other methods you can try include using wide hook-and-loop tape to connect the pauldron to an undersuit, snaps or hook-and-eye connectors to connect it to shoulder straps, or strong magnets. With all of these options, adding arm straps or hook-and-loop tape anchoring the pauldron to an undersuit will add stability.

PRO TIP →

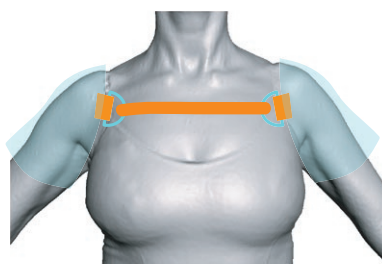
For added comfort, flexibility, or tension, sew a small amount of elastic to the ends of straps where they attach to the underside of your costume piece.

D-rings are extremely versatile and quick to install, and they can allow you to get really creative with the strapping on your costumes. Here are just a few examples.

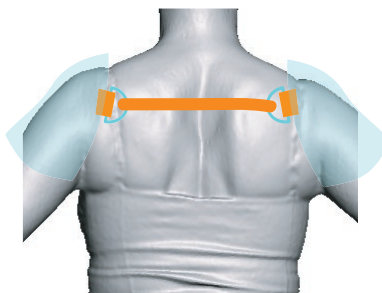
Use an elastic strap for tension and flexibility. This kind of connection sometimes needs an additional anchor mid-torso to prevent it from slipping up toward your head.



Pauldrons supported in the front with two straps and D-rings and wrapped around the bust to anchor in the back



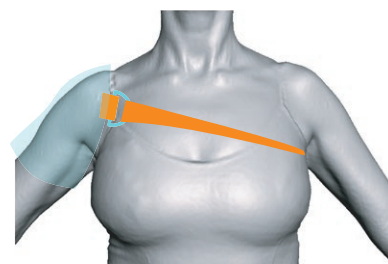
Pauldrons supported in the front with a strap and D-rings



Pauldrons connected with D-rings and a strap

PRO TIP →

Connect D-rings to the costume base with nylon straps and hot glue. See [Attaching Costume Pieces](#) (page 116).



A single pauldron supported with a strap and D-ring across the chest and under the armpit, anchored to the chestpiece

PRO TIP →

Tension is a good thing when you need pieces like shoulder armor to stay on a rounded shape like your shoulder. Using materials like elastic, adjustable straps, and hook-and-loop tape can help you make small adjustments throughout an event day.

Spaulders

Spaulders are parts of upper arm armor. These can be attached to pauldrons with straps, D-rings, Chicago screws, or rivets to create one piece. To add stability, install straps to the spaulders so they snugly rest on or below your biceps. You can also anchor them in place to an undersuit with hook-and-loop tape or add a bit of hot glue or rubber kitchen shelf liner—this adds friction to help them stay in place if you want them to appear to float in place.

Vambraces

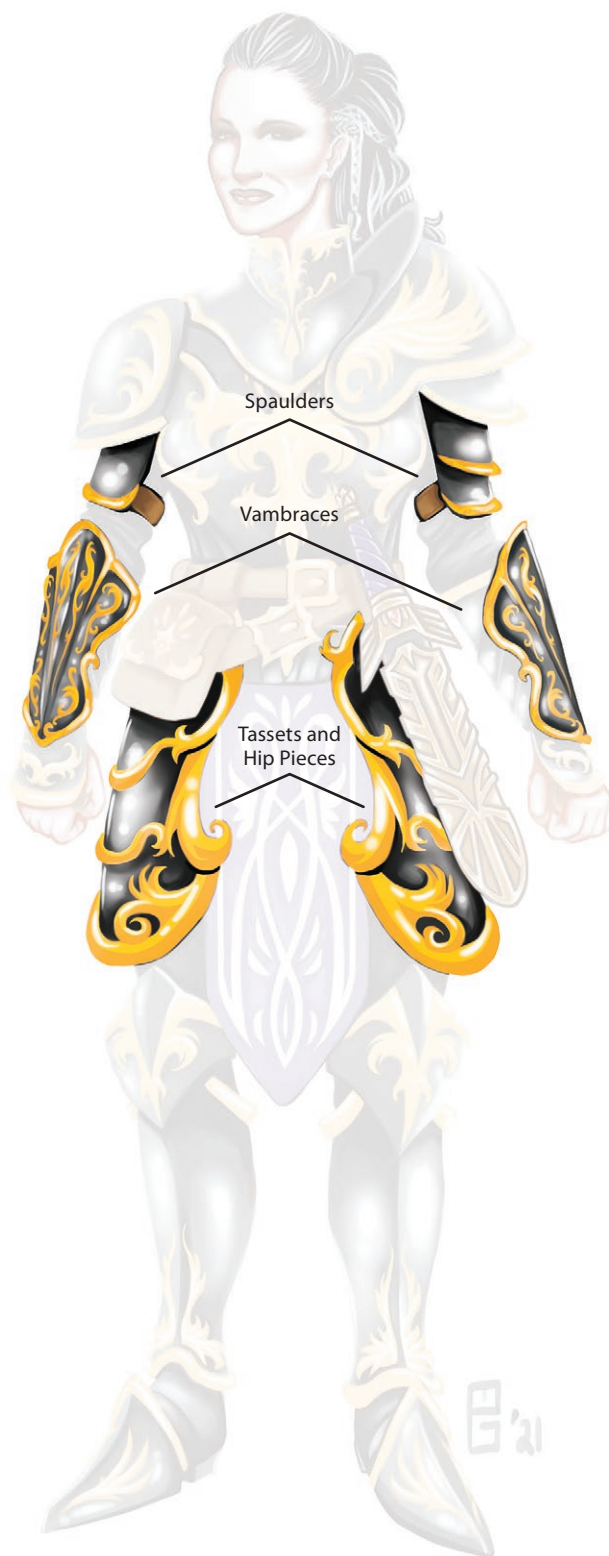
Vambraces are perhaps the easiest pieces to get in and out of and are often the last pieces put on and the first taken off. Some common attachments for vambraces include buckles, hook-and-loop tape, zippers, magnets, hitch fasteners, elastic, and more. As with all other armor pieces, I recommend two points of attachment for vambraces.

As simple as vambraces seem to be, there are some design elements that are important to keep in mind as you are designing:

- Allow for wrist movement by considering the size of the opening at your wrist and where it meets your wrist joint.
- Protect bony parts of your wrist from seams, buckles, and thermoplastic edges with padding.

Tassets and Hip Pieces

Tassets and other armor pieces that sit on your hips will usually need to be attached to a belt or a harness underneath the torso piece. These will need to move with your body as you walk. Sitting with tassets like these will be very difficult without somewhat damaging the foam. To solve this common issue, they can be created so they can be repositioned for sitting or removed from the harness with magnets, snaps, or hook-and-loop tape.



Thigh Armor

If your costume has thigh armor, there are some key points to think about as you are designing. A thigh piece can be a single piece that your leg slips into, or you can use small buckles to attach the piece at your inner thighs or any size buckles to attach the piece at your outer thigh.

Thigh pieces are prone to slipping down your leg. To fix this, you can attach your thigh pieces to a belt harness; attach them to your undersuit with buckles, hook-and-loop tape, or strong magnets; use elastic on the inner seam to add tension; or add a layer of hot glue or rubber cement to the inside of the thigh armor to help the foam grip to your leg wear.

Knee Armor

Strap knee armor in place with buckles or with a bit of elastic to make it easy to slip up over your feet. Anchor these pieces in place with—you guessed it—friction and tension. If your knee pieces are very large, consider adding another strap to connect them to your thigh pieces. Depending on the design of your costume, you can also attach knee armor to your greaves with elastic.

Greaves

You can attach greaves (lower leg armor) with straps, buckles, hook-and-loop tape, hitch fasteners, and more. You can also use zippers or magnetic panels to create the illusion of a practically seamless leg piece.

Sabatons

Sabatons (foot armor) can be designed to be removable or permanently affixed to a pair of shoes. You can create a slipcover or use straps with buckles and hook-and-loop tape to attach armor to footwear. For more information, see *Patterning Footwear* (page 183).



Adding It All Up

This Fantasy Armor build is a big one! There are many pieces that need to connect together. Let’s figure out how each piece will attach together. This list is an estimate and will most likely change as the build progresses.

COSTUME PIECES AND ATTACHMENTS

Costume piece	Attachment method	Materials and estimated quantity
Chestpiece and backpiece (1)	Thin hook-and-loop tape at shoulders and buckles on sides to connect front and back	Metal buckles (6) Thin hook-and-loop tape
Gorget	Thin hook-and-loop tape enclosure on side seam 1 hitch fastener along collar	Thin hook-and-loop tape Hitch fastener (1)
Pauldrons (2)	1 buckle and 1 strap each to attach to gorget 1 arm strap each	Metal buckles (2) Straps (4)
Pauldron with neck guard (1)	Magnets to attach to smaller pauldron	Magnets (4)
Spaulders (3)	Fabric to connect to pauldron 1 arm strap each	Straps (3) Fabric
Vambraces (2)	2 buckles each 2 straps each	Metal buckles (4) Straps (4)
Tassets (6)	Attached to harness belt or to torso with 2 buckles or snaps each Segments attached together with Chicago screws on fabric or hook-and-loop tape	Buckles (4) D-rings (4) Chicago screws (8) and fabric OR Hook-and-loop tape
Thigh armor (2)	Attached to harness belt or torso with 1 buckle or snap Strap around leg or enclosed with thin hook-and-loop tape	Buckles (2) OR Snaps (2) Straps (2) Thin hook-and-loop tape
Knee guards (2)	1 or 2 straps each with elastic for tension Rubber backing to help keep in place	Straps (2–4) Rubber backing Elastic
Greaves (2)	Buckles on outer sides connected with straps and Chicago screws	Buckles (6) Chicago screws (12) Straps (6)
Sabatons (2)	Straps with elastic Foam pieces attached to fabric slipcover Rubber backing for traction	Straps (2) Elastic Fabric Rubber backing
Belt and pouch	Thermoplastic wrapped around foam for buckle Magnetic enclosure for pouch or hitch fastener D-rings to attach dagger	D-rings (2) Magnets (2) OR Hitch fastener (1)
Chain maille	Attached with hook-and-loop tape tabs to backpiece	Hook-and-loop tape

PRO TIP

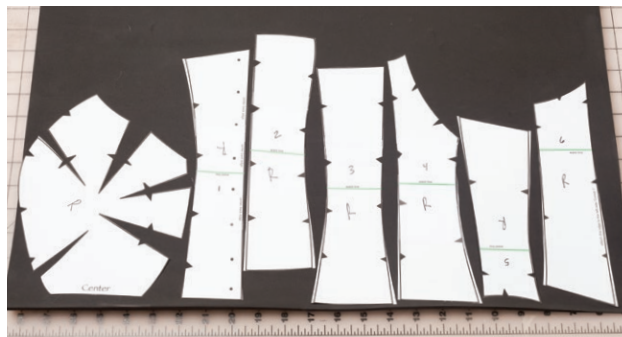
Recycle hook-and-loop tape and straps from packaging and other household items destined for the landfill to use on your projects.

How Much Foam Will You Need?

This is probably the *most* frequently asked question! We are jumping ahead a little bit here because this is such a frequently asked question and we're at the point when you will be wondering when to go shopping. The truth is, it's very hard to figure out how much foam you'll need without having a pattern.

You'll most likely have to replenish your EVA foam as you work unless you are able to purchase a good amount of foam to have in your personal stock. This is especially true if you are making mock-ups (and hopefully you are!), although sometimes your mock-ups turn out so well that you can use them as final pieces!

Once you have your pattern, place the final pattern pieces within an area of the sheet size you'll be purchasing to get an estimate of the amount of material you might need. Most foam suppliers like TNT Cosplay Supply carry 24" × 60" sheets that are shipped in rolls. Chain stores carry slightly smaller sheets that are stocked flat. Always buy extra for fixing mistakes and making mockups!



These pattern pieces for one side of a corset cover an area approximately 12" × 24", so for the entire corset you'd need 24" × 48" of foam.

What Foam Thickness Will You Need?

Figuring out what thickness of foam you'll need can be tricky, but there are a few general guidelines that can help. The thickness of most EVA foam sheets is measured in millimeters. I always have a few sheets of 2mm, 4mm, 6mm, and 8mm foam on hand, but this is my own preference. As you build, you will find your preference for certain thicknesses, densities, and brands.

Here are a few guidelines to get you started:

1–2mm: This is perfect for adding detail layers, edging, skinning, hiding crimes and creating hair, embossed details, and more. This thickness can be cut with a die cutter.

3–4mm: Use this thickness for textured layers, details, thinner armor pieces, accessories, costumes for smaller children, collars, headpieces that need more structure, pouches, belts, and details on props.

6–10mm: Use this thicker EVA foam for armor pieces that need more structure like helmets, shields, swords, pauldrons, and props. These thicknesses can also be used for larger-than-life costume pieces and bulkier armor designs.

DESIGNING, PATTERNING, CREATING A MOCK-UP, AND REFINING

Time to roll up your sleeves and start creating! In this chapter, we'll tackle designing methods you can use to create patterns for your costume—the first hands-on step of the creation process.

These are the steps:

- **Design**—Make design decisions about the structure, silhouette, and details of your project.
- **Pattern**—Create templates from your design that can be traced on EVA foam, cut out, and assembled together.
- **Create a mock-up**—Create a prototype of your project to check fit, proportion, and silhouette.
- **Refine**—Make adjustments to the mock-up and use it to create a revised pattern.

As you work on your project, you'll bounce between these steps for almost every piece. By the end of a build, you'll be well versed in the art of creating a costume with EVA foam!

Designers, are you ready?!

DESIGNING

Creating a fantasy art piece to fit a real person will always require design adjustments. Here are a few methods to try to make this part of the process more manageable. As you try different methods, you'll eventually find one that works best for your own creative style.

Remember that it's always okay to alter, add, or remove elements of a costume to best fit your own proportions and to make sure you can move when you're wearing it.

Design Programs

There are several software programs available that can help you create a digital view of the costume you want to create in relation to your body. These programs include subscription software like Adobe Photoshop or Adobe Illustrator and free programs like GIMP and Inkscape. All of these programs can be used to import, edit, and save images as files you can then use to print a full-scale reference image. These programs are all slightly different and have their own learning curves. Fortunately, there are a wealth of tutorials available online that can provide in-depth instruction for use.

Side-by-Side and Superimposed Images

Looking at reference images placed side by side or superimposed over your image can be very handy as you are designing. These visual references can give you a rough idea of general proportions, where pieces will fit on your body, and where adjustments will have to be made for the costume to fit your body.

To create side-by-side or superimposed images, you'll need a good front view of the costume you want to create and a full-length image of your own body. When taking full-length images of yourself, wear close-fitting clothing to clearly show your body silhouette and ensure that the camera is not at an angle to minimize image distortion.



Side by side: I'm using a full-length image that I took while making a duct tape body form because it clearly shows my silhouette.

Creating a Printable Full-Scale Reference Image

A physical print of a full-scale reference image can be very helpful for figuring out the scale for costumes and costume parts like wings, large headdresses, props, and larger-than-life builds. If you are able to print out a 1:1 scale image of the prop or costume that you want to make, it can assist as you make modifications during the design process to better fit your size and proportions.

You can create a full-size printable PDF file using an image editing program. Depending on your computer and the imaging editing program you use, the steps you will take may differ slightly from these but the overall concept outlined here will be similar.

Terminology and Tools

Document refers to the entire document containing the canvas, images, and layers. Changes to the dimensions of the document will affect all images and layers simultaneously.

Canvas refers to the digital base layer that you will position your images on. Changes to the dimensions of the canvas will only affect the base layer and will not affect images or layers.

Layers include image layers, text layers, color layers, and so on. An image that is imported into the document and placed onto the canvas is an image layer.

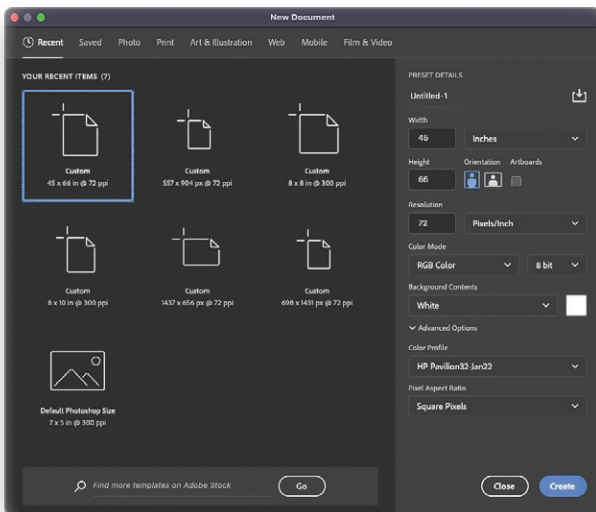


Use the *Move* tool to move the image layer on the canvas.

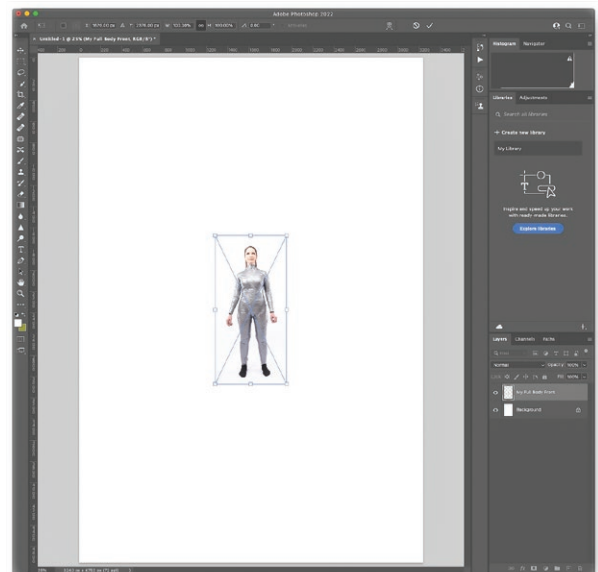


Use the *Resize/Transform* tool to change the size of an image layer on the canvas.

In this example, I am using Adobe Photoshop, but you can also use Adobe Illustrator or free programs like GIMP or Inkscape or any other program that allows you to import and resize images.



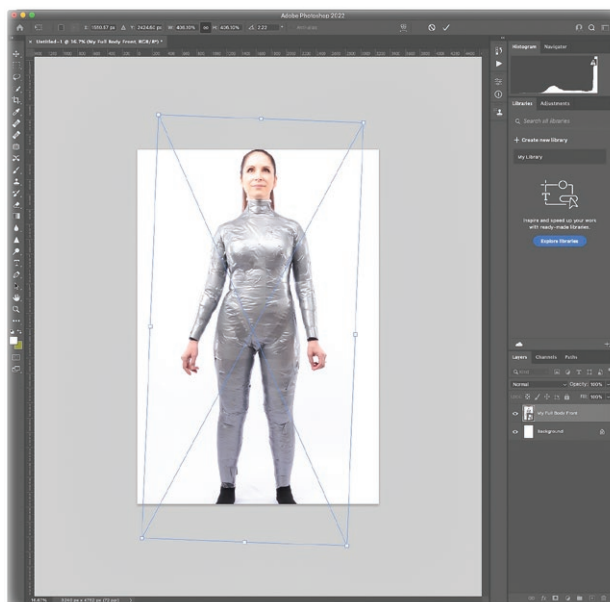
Options for creating a new document in Photoshop can be confusing. All you need to do is create a document that is the same height and approximate width as your dimensions.



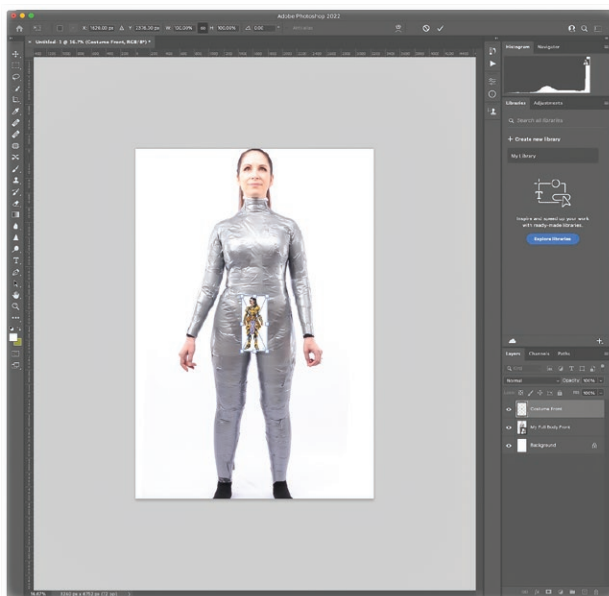
The full-body image will most likely appear much smaller than the document.

1. Create a new document.
2. Change the document size to your height and approximate width. I am 5' 6", so I input 66" into the height field. I'm using 45" as a width. These dimensions can be changed in a later step if needed.
3. Copy and paste or import your full-length photo into the document. In Photoshop, this will place the image on the canvas as an image layer.

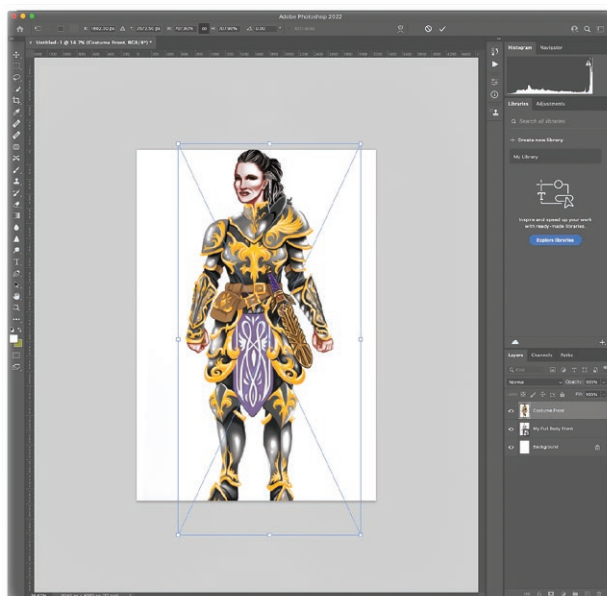
4. Use the *Resize/Transform* tool to increase the image layer size so the top of your head is at the top of the document and your heels are at the bottom. This will likely cut off your feet, but you will adjust this later.



You may need to zoom out to resize the image on the canvas.

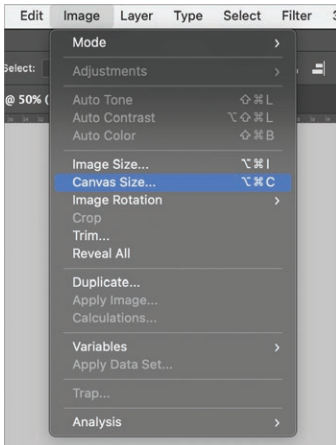


The costume image is very small when it is imported to your document.

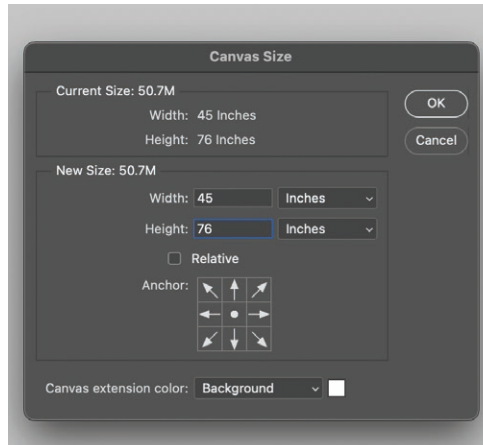


Use the *Resize/Transform* tool to increase the image size so the head and the heels extend to the top and the bottom of the canvas.

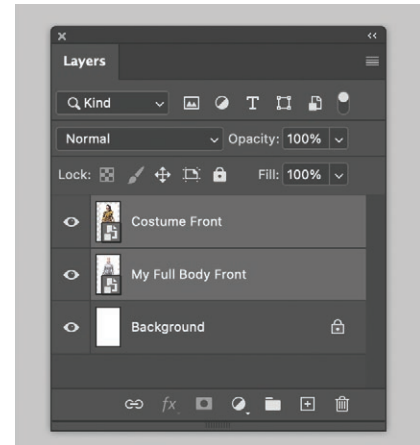
5. Next, copy and paste or import the costume image into the document. Resize the new image layer until the head and feet are also lined up with the top and bottom of the document. You now have a full-size image of your body and the costume!



To change the canvas size, select **Image > Canvas Size**.



Increase the height of the canvas by typing a higher number in the fields. Click **OK** when done.



To view or hide the layers, click the eye icon to the left of each layer.

6. If your feet are cut off, increase the canvas height a few inches. In Photoshop, this setting is found in **Image > Canvas Size**.

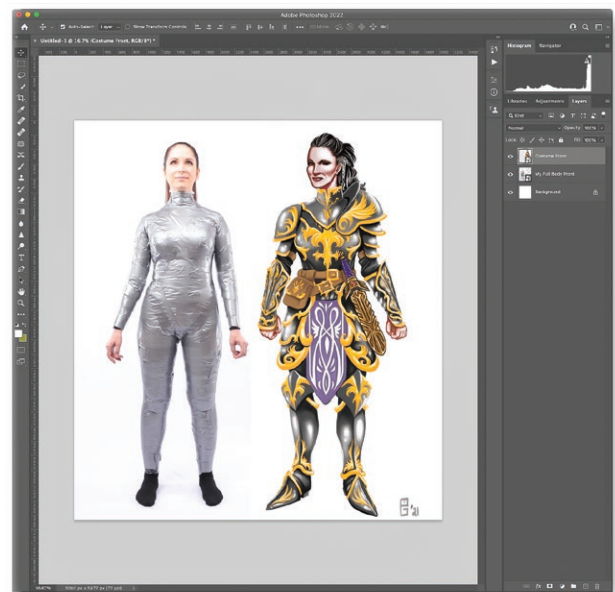
7. You now have a document with both image layers scaled up to full size. You can view one layer at a time by selecting and deselecting the image layers. You can now save each layer view as a PDF file, or if you want to view the layers side by side, continue to the next step.

8. To place the images side by side, select an image layer and use the **Move** tool to reposition it on the canvas. Repeat for the other image layer if needed. You can increase the canvas width if you need more room to position both image layers side by side.

9. Save the document as a PDF file.

PRO TIP

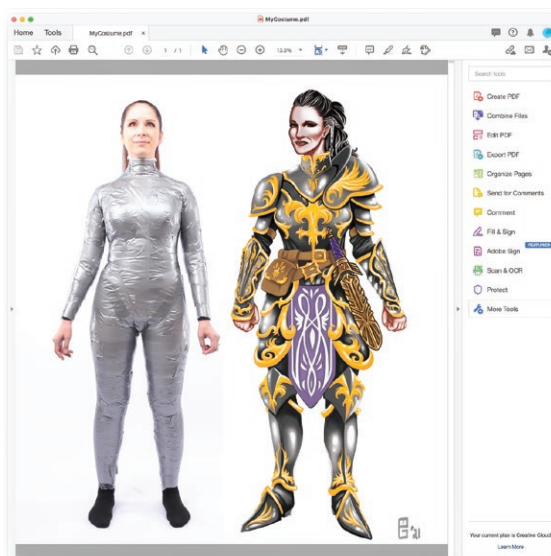
To superimpose the costume image over your full-body image, reposition the image layers so they overlap at the midline. Adjust the transparency of the costume image layer as desired to show the body image layer.



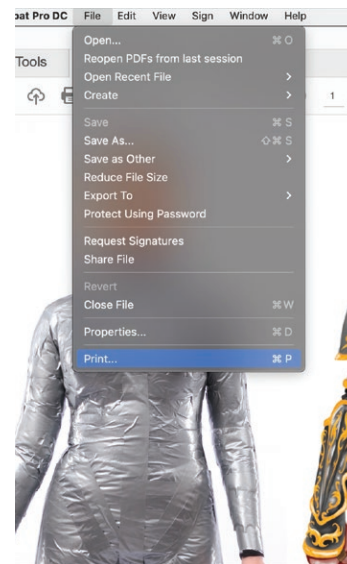
The images have been moved side by side.

Printing Tiled Pages from a PDF File

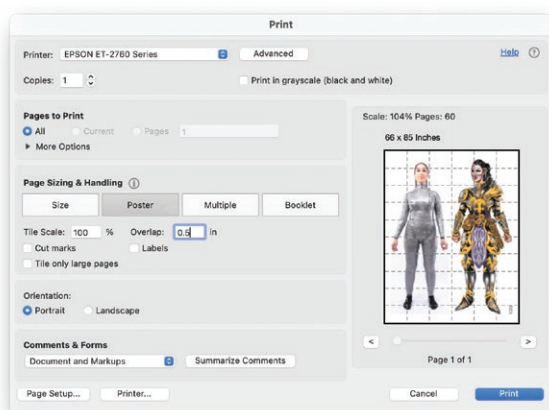
Format a large document so it prints at a 1:1 scale. All printing systems are slightly different, but the general concept here is the same. You may need to play with the settings on your computer to find the right steps for your system.



1. Open the PDF in Adobe Acrobat.



2. Choose File > Print.



3. In *Page Sizing & Handling*, select *Poster* or *Tile Large Pages* or *Tile All Pages*. The exact name of this option will vary depending on your system and printer.

4. Set the scale or proportion to 100%.

5. If there is an option to specify the overlap, input 0.5". This setting is the amount of overlap each page will have and will help make assembly a breeze.

6. Print the pages.

7. Once you have all of the pages printed, you can tape them together using the overlapped edges as an alignment guide.

PRO TIP

Use a large window to help you align the printed pages as you assemble them.



Large-Format Printing Services

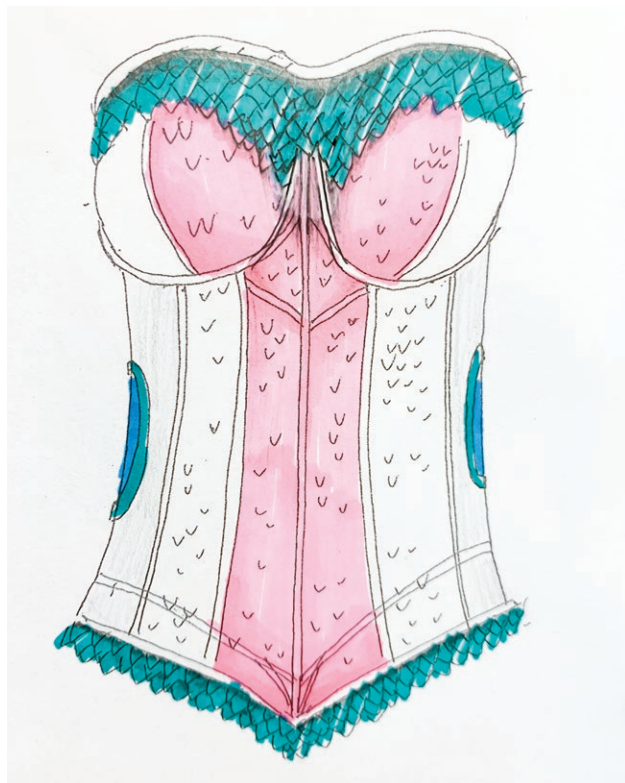
Many local office supply stores and printing shops can print large-scale files and are not very expensive. If you don't have a printer at home, you can look for these services in your area.

Sketching

If you only have an idea of what you want to do, that's okay! Sketching your ideas on paper—even at a smaller scale—is a valuable process to follow before transforming them into a 3D object. Sketching is a quick way to build on an idea or make modifications to a design or a prop without needing to draw a full-scale version. This is especially useful for original designs that you want to create.



When creating an original design or making modifications to an existing design, it can be helpful to sketch several small versions to finalize the overall structure, silhouette, color palette, and details.



This original design was sketched on paper and colored with markers to create a reference image.



Designer: Downen Creative Studios

Costume: Original design

Photo by Downen Photography

The final corset design

PATTERNING 101

Patterning with EVA foam is the art of transforming a flat sheet of foam into a 3D shape that can be worn on your body.

Patterning on your body or on a body form that matches your proportions and measurements is key to making sure your costume will fit correctly and that all the pieces will come together well. This section will show you how to use duct tape and your body or body form to create pattern pieces that you can then transfer to EVA foam.

The overall concept of patterning with these steps is to make a copy of the surface of the existing form—for example, your shoulder, leg, or chest—and then modify those shapes, lines, and proportions to create the final shape you want.

Terminology

There are a few common patterning terms you will want to know before you begin.

Seam: Two or more edges joined together to create a curve or shape

Center seam: The center axis of the piece you are patterning

Labels: Notes added to each pattern piece to indicate left, right, front, and back to help you keep track of where each of your pattern pieces goes

Registration marks: Small marks made perpendicular to seams to guide you as you glue seams back together again

Darts: Additional cuts perpendicular to a curved edge of a pattern to allow it to lie flat for tracing and, once transferred to foam, glued together to form a curve

FOAM RULERS

EVA foam thickness will matter when you are designing. Have your foam rulers handy for making adjustments to your final pattern mock-up. For more information, see Foam Rulers (page 39).

Creating Your Pattern Pieces

This is a simple method for creating pattern pieces. Follow these steps to create armor, props, and everything in between.

Base Wrapping

If you are patterning on an existing shape, like a body form or an object, apply plastic wrap or Glad Press'n Seal plastic wrap over the area that you want to pattern. This allows you to add shaping materials, sketch, and sculpt without damaging the body form. If you are wrapping directly on your body, use plastic wrap instead of Glad Press'n Seal for easy removal.



It Is Far Easier to Remove Material than to Add It

If you are using EVA foam that is thicker than 1mm, doing one of these two things to help add bulk during patterning will get the size a little closer to what is ultimately needed:

1. Add a layer of padding to the shape before covering it with plastic wrap.
2. Increase the final template pattern by at least a few millimeters on all seams. Increase to a centimeter if you will use thicker EVA foam.

Adding Shape

Any kind of material can be used to sculpt a shape! Bubble wrap, padded envelopes, batting, and even old clothing and fabric scraps are great fillers for any shape you need to create. Foil is a favorite sculpting medium because it will hold its shape well and is easy to use. Foil can be folded into a flat shape or scrunched together to create a 3D shape, which is incredibly handy for creating custom armor and costume design pieces. Add more foil strips to extend the shapes and curves of your design. Continue adding and trimming until you're happy with the result.

PRO TIP

You can add more foil, padding, and tape at any time during the patterning process.

Finally, add a thin layer of plastic wrap to help lock in the shape and provide a removable base for your pattern piece that will be easy to remove. This is a helpful step if you have added lots of padding material.

PRO TIP

Use double-sided tape when adding layers of foil to sculpt a shape.



You can utilize unconventional materials to create the shapes you want! Many materials can be used to create shapes, including duct tape, plastic wrap, bubble wrap, packaging materials, batting, and chipboard. This pauldron shape was created with scrap packing materials.

Taping

Whether you have added shape to your base form or not, taping is your next step. Once the final wrap is secured, apply strips of tape to cover the entire shape. Use duct tape, masking tape, clear tape, or any tape that is easy to apply smoothly across your full piece. Use smaller pieces around curves for a smooth surface.



Drawing

With a contrasting marker or pen, begin drawing your design on the tape. Your goal here is to create a rough sketch that covers the area you want and to begin flushing out the design shape and lines. Don't be afraid of this part being messy! Think of this step as a blank canvas for you to draw and redraw as much as you want. Use rubbing alcohol to remove Sharpie marks if you want to redraw or refine your design, or use thin strips of contrasting tape to create lines. Remember that you can alter the shape with more foil or padding if you want to revise your design.



Drawing the Centerline

Like when creating a sewn garment, connecting two pieces of EVA foam at the edges will create a seam. The centerline of an object is the most important seam line to create and should be the first seam line that you draw. When cut, this line will divide your design into two pieces that are similar in size and shape, which can be useful for patterning symmetrical shapes.

Placing Seams

Deciding where to place seams on a 3D object can be a little tricky and will take some practice to master. Seams can be placed anywhere, but they are most useful in areas that are curved or will need to open for you to wear the costume. If you aren't sure about where to place a seam, don't worry. After you create a mock-up, you can always revise where your seams are placed if needed. If your design has overlays, try placing seams and darts so they will be hidden under the additional layers to save time filling gaps and minimizing visible seams later.

SEAM HELP

If you are struggling to decide where to place a seam, think about how other garments are constructed and where those seams are placed. For close-fitting costumes, it can be helpful to look at how complex garments like fabric corsets and other undergarments are created to find inspiration for where to place your seams.

Flexibility and Elasticity in EVA Foam



Flexibility is the ability of a material to move easily. Elasticity is the ability of a material to be stretched and then return to its original shape. The cotton T-shirt you are wearing right now is an example of a material that has both flexibility *and* elasticity. It was most likely created with a stretchy fabric and assembled using a special kind of stretch stitch that is designed to expand and contract so you can easily pull it on and off your body without it losing its shape.

Although EVA foam is flexible, it does not have elastic properties like cotton fabric does. This means that it cannot return to its original shape if overly stretched. In addition, because you will use contact cement to connect seams together, care must be taken to design the costume piece so seams will not be overly stressed when worn on your body. Glued seams will be flexible, but they cannot be stretched without risking compromising the glue.



Labeling

Once you have finished your sketched outlines and placed a centerline and any seams you want to include, add directional labels so that when the pattern is cut apart, you can tell which pattern piece represents the left, right, bottom, and top, and add the registration marks and anything else you might want to remember. It is better to add too many notes than too few.



Drawing Registration Marks

Registration marks and other kinds of pattern markings are visual guides that will help you align your foam pieces during assembly.

A registration mark is a short straight line that is drawn perpendicular to a seamline that will be cut and later reassembled. Draw a mark every few centimeters or so along the seamline. Add as many registration marks as you wish to a seamline before you cut it apart. Use a pattern notcher or scissors to add the registration marks to your pattern pieces so they are easy to transfer to your foam pieces.

Double lines and triangles are other common visual guides to help you remember the top and bottom of a seam. Use one or two of these other shapes at the upper or lower parts of a seam line. If you will be using a pattern notcher to cut out the registration marks, a double line is easiest to use. If you will be using scissors, it is easiest to use a triangle shape.

TAKE PHOTOS

Take a few photos from a few angles before removing the tape. Visual references can be a big help when reassembling, particularly with complex patterns!

Removing and Trimming

Gently remove your tape design from the form. It should come right off if you used a layer of plastic wrap at the beginning. Trim off any excess material around the outline.

Next, cut along each seam line of the tape form with heavy-duty scissors or medical scissors.

Use a pattern notcher or scissors to cut out the registration marks.



KEEP YOUR ORIGINAL PATTERNS

Don't throw out the original tape patterns once you've transferred them to chipboard! Being able to refer back to the original pattern set is a valuable backup resource for double checking seams and shapes, pattern alignments, and any other details you may want to check.

Flattening and Adding Darts

Next, you'll need to flatten any pattern pieces that are curved so they can be easily traced onto your foam. To end up with flat, usable pattern piece templates, you may need to add some darts to areas with deeper curves or cut the pattern piece into smaller sections. Darts are great because they allow you to flatten parts of the pattern that are curved while keeping your pattern piece as a single shape.

PRO TIP →

Remember that EVA foam can be curved slightly with heat forming, so very shallow curves most likely won't need deep darts.





To determine the best place to add a dart, find the edge of the curved pattern piece and flatten it with your hands.

Continue to flatten the pattern with your hands until you are stopped by a curve in the pattern.



At this point, you have two options to flatten this part of the pattern: (1) cut into the curve to create a dart, or (2) cut along the curves to create separate pieces. Don't forget to draw registration marks before cutting so you can align the edges together again.



An example of several approaches to creating darts on the same curved shape

Flatten the pattern again. This time the pattern should lie mostly flat. Make the cut a little deeper or add more darts if needed. With a little practice, you'll get very good at this!

PRO TIP

Cutting into your pattern can be intimidating, but don't worry! You can always retape if you make a mistake or want to change the position of a dart.

Stabilizing

Once your tape patterns are trimmed and all registration marks are cut, trace the pattern to chipboard, brown paper, or thin cardboard. This will provide you with a stable pattern that can be easily traced onto EVA foam.



PRO TIP

Glad Press'n Seal plastic wrap is tacky enough to hold your pattern pieces in place while you trace.

Mirroring

Mirroring is a great way to make sure that both halves of your pattern are symmetrical. As a bonus, only one side will be needed for the final pattern. Mirroring can be done on any pattern piece that will have matching right and left sides and a straight midline center seam.

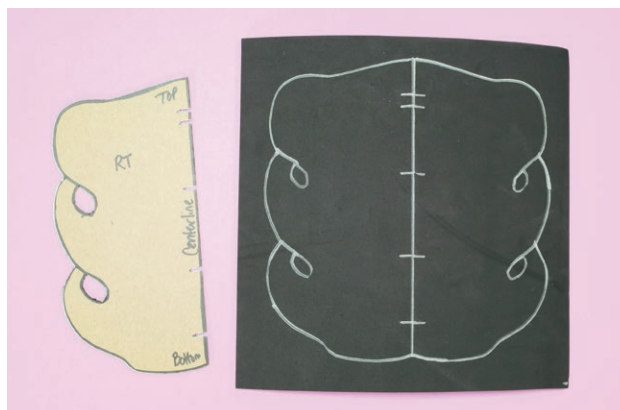
1. Fold the pattern design in half along the centerline.

2. Compare the two halves as they are folded together. If they are mostly the same, draw a centerline along the fold or crease the edge. Unfold and cut along the centerline. Discard your least favorite half.



3. Add a few registration marks and labels and transfer the pattern to chipboard. Trace the pattern and registration marks on your foam.

4. Flip the pattern piece over, align the registration marks, and trace the other half on the foam.



Cutting and Tracing

Cut out your pattern and registration marks. Be sure to add all of the pattern labels too! Trace the pattern on your foam and include all labels. If your piece is symmetrical, flip over the pattern and trace, being sure to label these pieces as right or left sides.

Congratulations! You've just created a template and you are ready to make a mock-up!

PRO TIPS

- Cut on the inside of your Sharpie or pen lines to maintain the most accuracy. Cut outside of your lines to expand a shape and cut on the inside of the lines to reduce a shape.
- Use the two-Sharpie technique! Use two Sharpies or pens taped together to increase or decrease margins evenly around your pattern piece. This is a quick way to add or reduce a size evenly along all edges while maintaining the template outlines.



Patterning with Paper

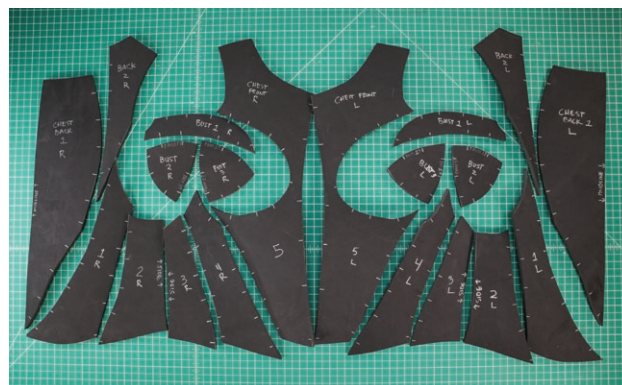
You'll find that sometimes it's easier to use sheets of paper than tape or foil to pattern pieces that are flatter and don't have compound curves. There are several ways to shape paper into 3D curves: Make darts with scissors, fold and tape in place, snip an edge to add ease, or make room to insert an additional paper strip to create a flared edge. Like you would with foil, add more pieces of paper to widen or lengthen a pattern or fold in small increments to reduce width or length. Paper is a great tool to make templates for belts, tabards, and props.



CREATING A MOCK-UP

A *mock-up* is a rough draft version of your costume piece that you can confidently cut apart and edit to help you on the journey to the final form. This can help you properly fit your costume, figure out where attachments should go, and more. Mock-ups don't have to be glued together, painted, or pretty—they are raw, unfinished versions of your final piece. You can even use these to test paints and materials.

To make and refine a mock-up, follow these steps.



1. Trace your pattern to EVA foam. Use scrap foam or material of a similar thickness if possible.



2. Glue or tape the pieces together and check your work.

If you aren't happy with the shape, silhouette, or fit, don't worry! This is why a mock-up is so useful. The next step is making alterations to the mock-up where you can add or subtract material to get a perfect fit.

PRO TIP

I've noted this before, but it bears repeating. It's always easier to remove material than to add it. When in doubt, add extra room.

Story Time

Back in the dark ages when I made my first armor piece, I designed directly on the adjustable dress form instead of on my own form or a duct tape body form (I didn't know what those were yet). I painted the piece and added some hardware before I put it on for a fit test, and, of course, it didn't fit at all! I was heartbroken—this was a hard lesson about the importance of making a mock-up and trying it on multiple times throughout the building process.

Adjusting for Foam Thickness

If you will be using 8mm or 10mm EVA foam, do not forget that you will need to adjust your pattern pieces to accommodate the foam's thickness. To make this adjustment, use the following steps.

1. Make a mock-up of the piece you are working on with paper or scrap material. Place your mock-up on your duct tape body form.

2. For this example, I used 10mm foam. Place your 10mm foam ruler over the paper mock-up and make a note of the overall dimensions while it is curved on the form.



3. Compare the dimensions of your flat pattern piece to the dimensions you measured using your foam ruler. You'll see the dimensions of the mock-up need to be scaled up to match the dimensions of the foam ruler. In this case my mock-up has an upper width of 30cm and a lower width of 24cm. The foam ruler has an upper width of 34cm and a lower width of 27cm.

4. Estimate how much bigger your pattern needs to be. In this case, 4cm must be added to the upper edge and 3cm must be added to the lower edge. In this example I increased the pattern piece by 2cm along the upper edges and 1.5cm along the lower edges.

REFINING

If your mock-up is too small or too large, slight alterations are easy to do by adding or removing material. This is especially useful if you need to alter a premade pattern.

Altering a Pattern Before Printing

Are you printing your pattern but want to increase or decrease the size first? Change the scale or zoom factor in your printer settings in small increments, around 5%–10%, for smaller adjustments such as increasing a helmet size so it will fit well when you're wearing a thick wig. Larger percentage adjustments are useful for making oversize props or reducing a large adult-size prop for a child.

Altering a Mock-Up

When you put on the mock-up, is it too small or too large? Can you feel any pressure points or edges? Can you move well in it? Making small changes can make a big impact on how comfortable your costume will be and are always worth the time it takes to make alterations. Don't be afraid to cut a seam to remove or add material in the mock-up stage of your project. Here are a few tips to keep in mind while making adjustments to a mock-up.

Making Small Alterations

It's always best to make small adjustments to maintain the overall silhouette of the build. Small changes spread across the entire build can make a big impact on overall fit. Making one large adjustment instead of a few smaller ones can lead to frustration if, for example, you cut too much material away and make the piece too small.

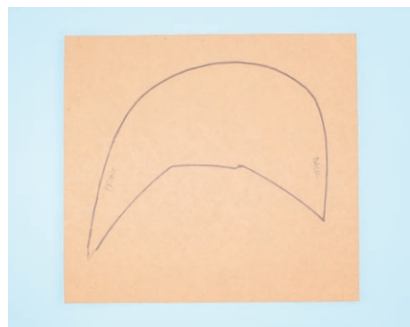
Maintaining Symmetry

Take the time to add or remove from both sides of a mock-up that needs to be symmetrical. This step will help ensure that you make alterations to the entire pattern so the final piece will fit you as well as possible.

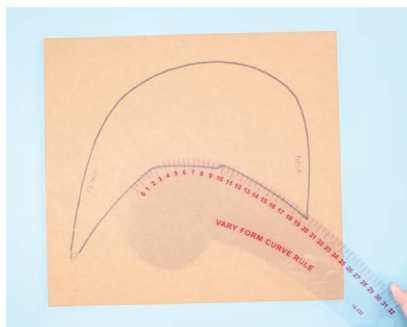
Refining Contours with French Curves

French curves are inexpensive, clear plastic rulers that are fantastic pattern refining tools. French curves are available in many sizes and styles and are essential tools to have on hand to clean up sketched edges for refined, professional-looking results.

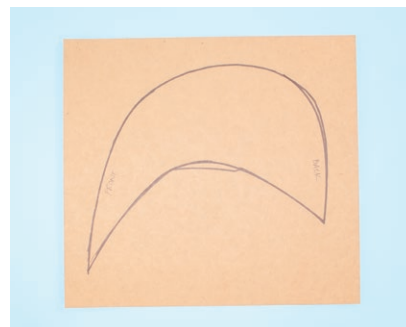
To use a French curve, position it over the area that you want to refine. Reposition until it creates the contour that you need, and trace. You can use either side of the French curve to find the best contour.



This line has a jagged, uneven bottom curve.



The French curve helped refine the line and created a perfect contour.



Transferring Alterations

If your mock-up is altered, your chipboard pattern should also be altered. This is a necessary step for making a final version of your project. You can also reuse a well-tailored pattern again and again for other builds that utilize a similar base. Editing an existing pattern in your own pattern library will save you patterning time on a future build.

Adding or Removing Material

If your costume piece is too big or too small, figuring out where to add or remove material on your mock-up to make fit adjustments can be daunting. Not to worry! Here are a few suggestions to help guide you through this process. Remember that a mock-up is for you to cut, carve, shape, and alter as much as you need.

To add material, use tape or foil as you did when you created the first pattern. To remove material, trim a little away at a time. Be sure to trim from both sides of the piece if it is symmetrical, like a chestpiece.

As you practice these alterations, a good tip is to save edges that are trimmed until you are absolutely sure that you don't need to reattach them. You can also trace the trimmings on your cardboard pattern to keep them updated with alterations.

When you are done making alterations, don't forget to transfer the changes to your chipboard pattern pieces so you can create a final version or another mock-up.

Terminology

Centerline: The center of the long axis of the pattern piece; for example, the centerline of your torso is from your sternum to your belly button.

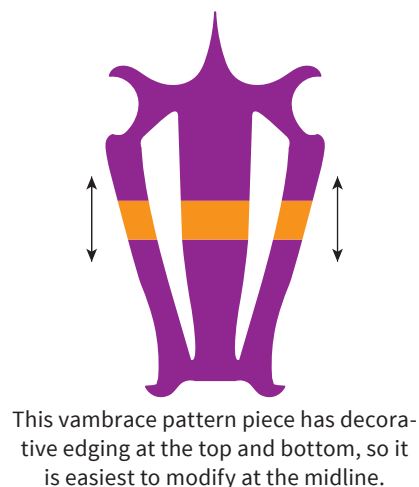
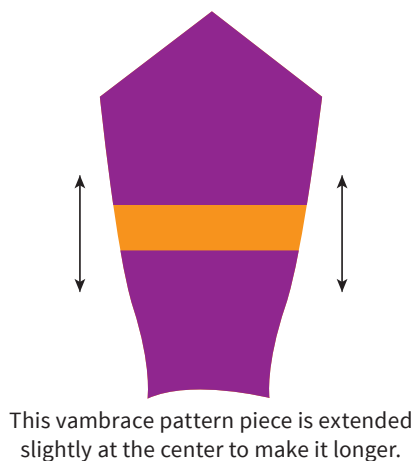
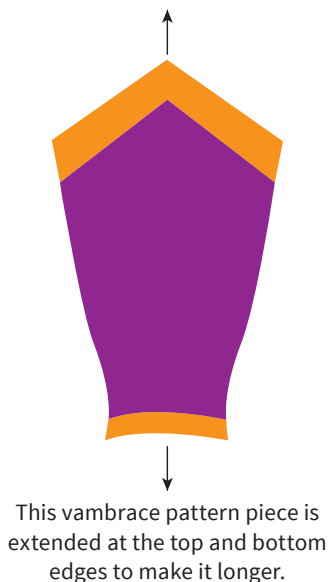
Midline: The center of the short axis of the pattern piece; for example, the midline of your torso is your natural waistline.

PRO TIP

Make a copy before cutting into your original pattern.

Making Length Adjustments

Adjusting length on EVA foam is a fairly simple process. If you are familiar with sewing, you'll know that you can change the top, bottom, or middle of a garment to add or remove material. EVA foam is similar, but be cautious about removing too much at once.



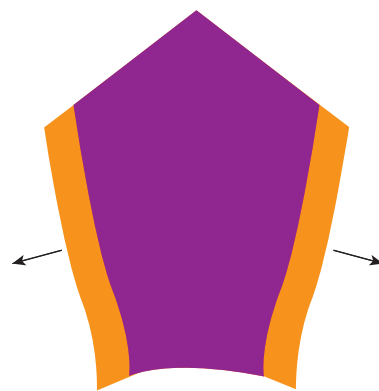
Method 1: *Revise at the top and bottom edges.* If your costume piece is too long or too short, a simple way to adjust the length is to add or remove material at the top or bottom edges, or both. Use this method to make minor adjustments on patterns with few pieces, like to extend the length of a vambrace or a pauldron.

Method 2: *Revise at the midline.* You can also add or remove material from the midline of the pattern piece as shown in this illustration. This method is highly recommended if the top and bottom edges of the pattern pieces will be glued to other pieces, like on a chestpiece or a corset, or if there are details or decorative edging that should be avoided.

Making Width Adjustments

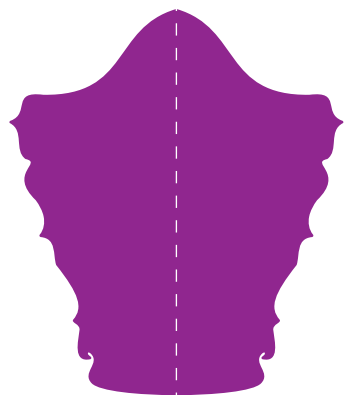
The width of a costume piece can be adjusted using a few methods. Modifying width can be slightly more challenging because a costume piece that fits around the human body will need contours and shaping (like a body tends to have). It can also be composed of multiple pieces, like on a torso or around a leg, making it a little more difficult to increase or decrease since there can be many parts and connecting seams to consider. Making width adjustments can be approached in a few ways. Like when you change length, choose the best method according to the design of the piece that needs to be altered.

Method 1: *Modify the side edges.* If the adjustment you need is just a few millimeters and the edges are free of elaborate detailing and do not need to be glued to another piece using registration marks, you can simply extend or reduce the edges slightly. In this basic vambrace pattern example, the edges don't have detailing and can easily be modified.

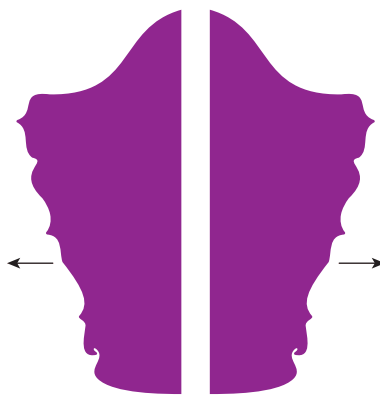


Method 2: Adjust the centerline. This method works well for pieces that have detailed edging that cannot be modified as well as for symmetrical pieces like vambraces, which typically consist of two similar or identical pieces connected to each other at the centerline. Because of the symmetry, it is possible to add width to the center without penalty or worrying about registration lines not lining up during assembly.

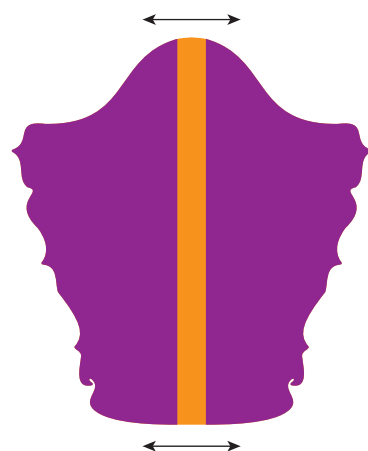
To adjust the width at the centerline, use the following steps.



Adjusting the width of this vambrace pattern should be done at the centerline because of the decorative edging.



The two halves are separated to add width.



The new vambrace is wider and the decorative edging has not been affected.

1. Find the center of the long axis and draw a centerline. Cut along the centerline to create two sides. If you have a center seam, cut along the seam to make two identical sides.

2. Separate the halves and use scrap material or strips of foil to increase the width. To reduce the width, overlap the halves.

3. Trace the new shape to chipboard and create a new mock-up.

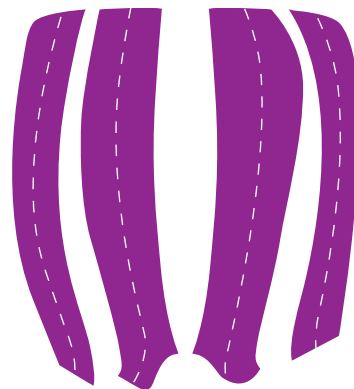
Method 3: Extend multiple centerlines. When adjusting the width of a piece that has multiple sections, like on a torso piece or a greave, try making several small adjustments to a few pieces instead of one large adjustment. This method can help maintain the overall silhouette and avoid issues with fit.

AVOID ALTERING SEAMS WITH REGISTRATION MARKS

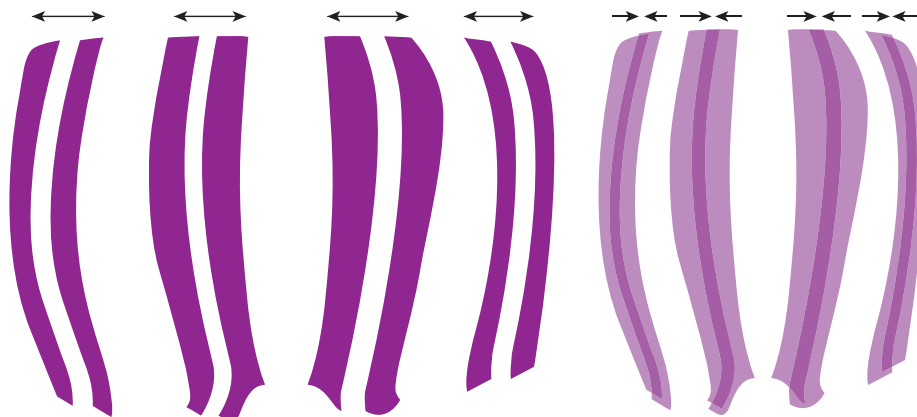
Seams with registration marks should be left unaltered whenever possible. Reducing or widening the edges of these seams will cause alignment problems when you try to match registration marks later during assembly.

To illustrate this process, these greaves are widened slightly across all pieces with just a few simple steps.

1. Find the centerline of the long axis of each pattern piece.



2. Cut each piece into two halves along the centerline. Be sure to label each piece. Registration marks are not needed. Separate the halves to add width using scrap material, tape, or foil. To reduce the width, overlap the halves.



Separate the pieces to add width.

Overlap the pieces to reduce width.

3. Trace the altered pieces to chipboard. It may be necessary to smooth uneven edges with a French curve.



The new wider shape



The new narrower shape

Because the seams weren't modified at all, the registration marks will still align perfectly when they are assembled. Create another mock-up to check your work, and continue making modifications until you are happy with the result.

Screen Accuracy and Body Types ←

You'll hear a lot about a costume being "screen accurate," which means that it looks exactly like the one that was created for a movie or other media. There are many issues involved in designing with screen accuracy in mind. One of those issues is that you are just one person making the costume. The movie costume was designed and created by an entire team with a budget and years of experience, and sometimes even just with CGI. Cosplayers constantly push the limits, placing a lot of stress on themselves to be pattern maker, designer, tailor, leather worker, research team, 3D modeler, textile artist, wood worker, mold maker, and more. You will likely wear a lot of creative hats to get your costume done, and that is an accomplishment to be proud of.

The other important factor is that everyone's body is different. The costume you're seeing on the screen was most likely designed specifically for that actor's proportions. Your proportions are different, and that's okay! You don't have to look like the character or have a similar body type or gender to cosplay that character.

Example Alteration

Let's walk through adjusting our chestpiece mock-up. The goal of this alteration is to remove and flatten warping seen along the center seam (indicated by the yellow dotted line curving outward between the cups).

Warping can frequently be corrected by a simple alteration: adding or removing material between seams. When I put the mock-up on my duct tape body form, I had to force the front shoulder straps to connect to the backpiece shoulder straps. Stretching and manipulating the straps caused the chestpiece and the backpiece to align poorly, causing warping in the center front.

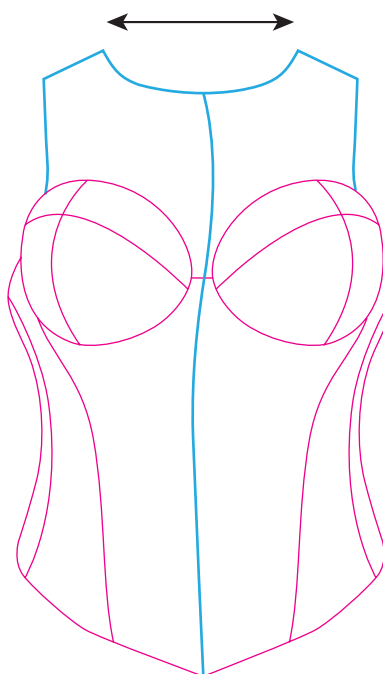


Before



After

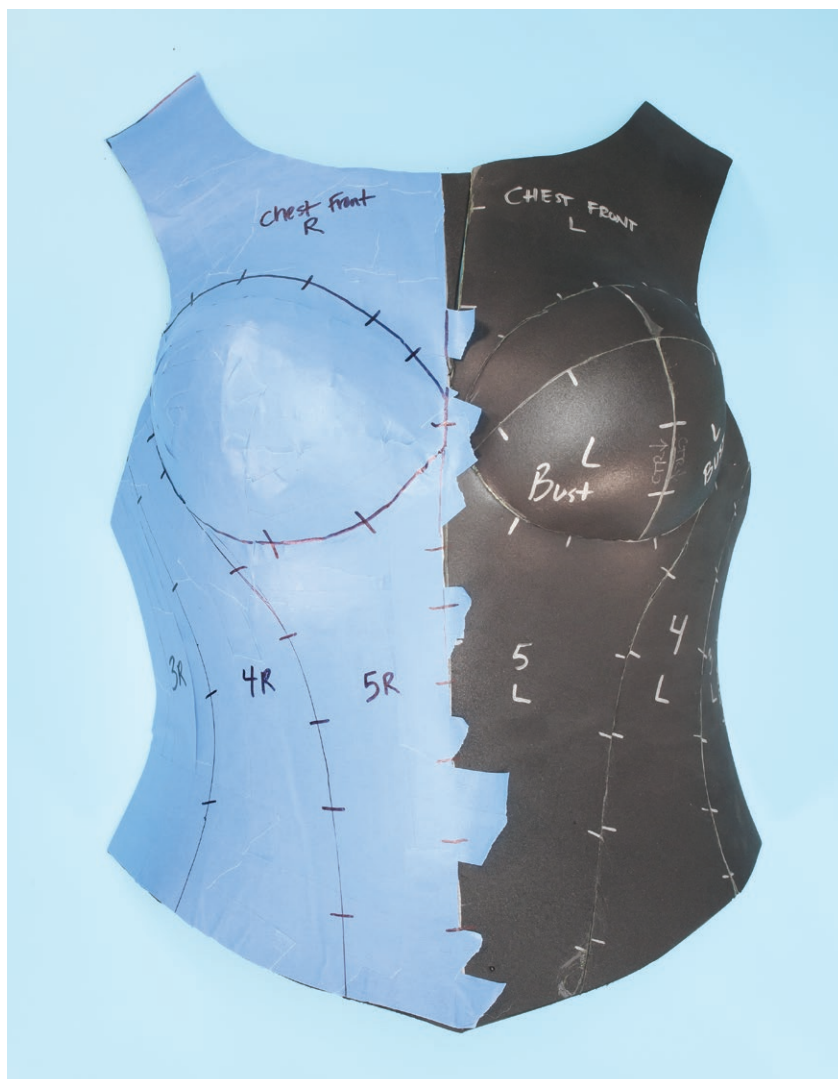
In summary, the front shoulder straps needed to be set further apart, and more space was needed in the center to accomplish this. To do this, I considered two methods. I could repattern and remake the upper piece to add width, or I could insert a wedge of material into the center seam by cutting the seam open. I decided to try the wedge technique first because it was a quick solution that didn't require removing foam or repatterning. Thankfully, when I inserted the wedge, the upper chestpiece flattened significantly, the warping decreased in the front, and it was no longer difficult to connect the shoulder straps together.



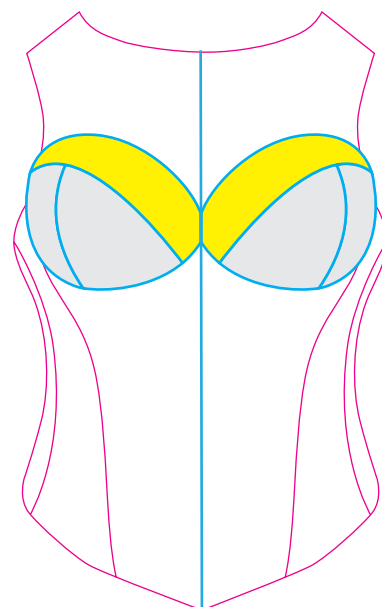
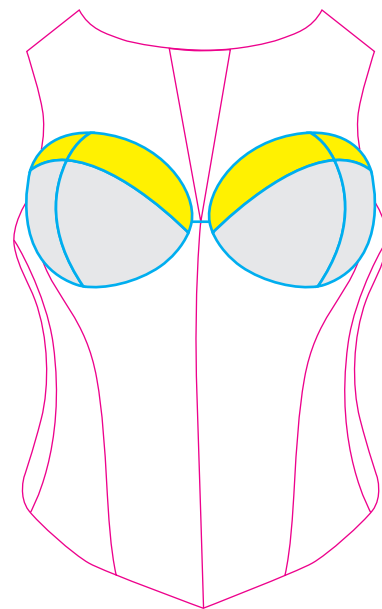
A wedge of foam was inserted into the centerline, which helped flatten the chestpiece by widening the space between the shoulders.

After inserting the wedge of foam into the centerline, the midline between the cups was still warping slightly so I simplified seams to try to make everything lie flatter. Instead of cutting the mock-up apart to do this, I decided to draw on the existing mock-up to create a new and updated pattern.

After covering one side of the mock-up with tape, I used a Sharpie to redraw the seams, making a few alterations to the seams. First, I extended the inner margins of the cups to connect together at the midline instead of being separated by a thin strip of foam. This simple pattern alteration eliminated the space between the cups, removed the remaining warping, and resulted in a more natural look.



The cups were redrawn to connect together at the centerline to simplify the pattern.



Before and after alterations to the center seam and the cups

TOO MANY SEAMS?

If your project has a lot of seams and you're having difficulty getting all of the pieces to align and form correctly on your mock-up, try combining smaller parts together to simplify the pattern. Remember that you can heat form EVA foam into curves, which can often help eliminate the need for multiple small pattern pieces.

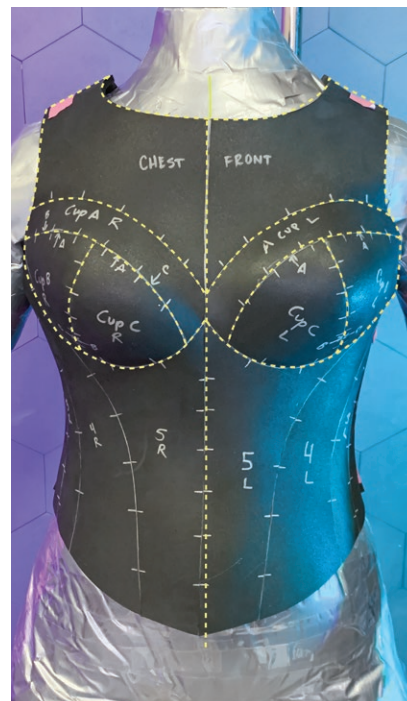
During this stage, I also found that one of the vertical seams on the upper part of the cup could be removed because the curve could be achieved by heat forming one piece rather than requiring two pieces to be glued together. This reduced the number of pattern pieces for the final build, which is always great!



I drew the new and improved seams on the tape and added labels and registration marks to create a fresh pattern. Next, I transferred this new pattern to chipboard, cut it out, and traced it on EVA foam for a second mock-up. In this example, you can see that I added a seam to divide piece 3 into smaller parts so it would lie flatter.



After assembling and creating a new version with the updated pattern, the new mock-up fit well and was used as a final version. The upper width adjustment allowed the chestpiece to connect without issue to the back-piece, the cup pieces and midline were simplified, and the warping was eliminated.



The finished result!

If You Can Cover It with Painter's Tape, You Can Make a Pattern! ←

A great way to start making your own patterns and getting used to the process is to start by patterning objects that are already in your home or workshop. The process of patterning objects is the same as patterning on your body: wrap, tape, mark up, label, and remove. This is very useful in situations where you may want to copy something that you own already and modify the pattern from there. Objects like hats, belts, bags, spheres, and odd shapes can be great foundation pieces for costumes and props that you want to create from scratch.

There's nothing quite like wearing a costume that fits you perfectly. Patterning wearable body armor can be challenging but it can also be a lot of fun! The patterning stage of any project can feel a little overwhelming, especially if you are making multiple pieces. In this chapter, you'll learn all about how to pattern for different parts of your body as well as tips for making the seemingly endless puzzle pieces of a pattern set come together neatly. With these skills in hand, there's nothing you can't create!

TORSO ARMOR

Most upper bodies are anatomically similar in many ways, but with some key differences. If you are struggling with patterning chestpieces and backpieces, look at male and female anatomy structure and use musculature to inspire your design lines.

You can also check out a predesigned chest or corset pattern from designers like Evil Ted Smith and Downen Creative Studios (that's me!) and use it to make alterations to your mock-up.



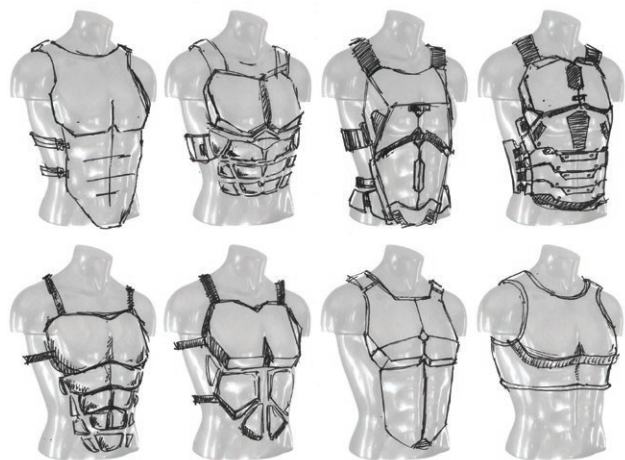
Male armor pattern by Evil Ted Smith



Basic corset pattern by Downen Creative Studios

Masculine Chests

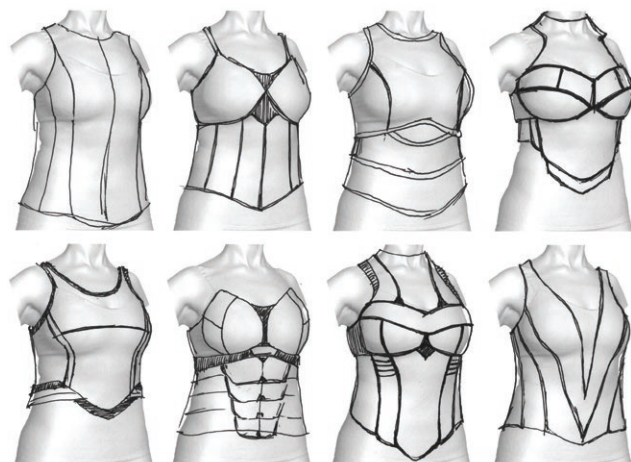
Most masculine chest designs tend to be more muscular and angular, with an overall broad shoulder structure that tapers to a waist much narrower than the shoulders. When designing a typical masculine chest, the angles will be shallow and broad with fewer soft, round lines and edges.



A few examples of possible designs for a masculine-inspired chestpiece design

Feminine Chests

Women's bodies are all very different. That, combined with seemingly endless styles of corset-type costumes and chestpiece designs, can present designing and patterning challenges. Typical chestpiece and chest designs for feminine silhouettes incorporate softer lines and rounded curves under the breast.



A few examples of possible designs for a feminine-inspired chestpiece and cup designs

Patterning a flattering and custom cup shape doesn't have to be a difficult process. There are many methods you can use to achieve a great-looking cup. These methods will help you develop a design that is specifically made for your own proportions. Take some time to create your own base pattern, and keep it in your pattern library for future costumes.

Use Your Own Bra as a Base Pattern

Patterning over a bra that you have in your closet can be a great starting point for creating a flattering design that is proportional to your own body, and it will ensure that the cup size will fit you well. This is a great method for patterning directly on your body because it captures your silhouette exactly using the cup shape and size that you'll need for that specific bra style. You can then wear the same bra or a similar one with your final costume without any sizing issues.

If you are designing and patterning on a duct tape body form, remember that you were probably wearing a bra when you made your duct tape body form. Placing a bra over the duct tape body form can increase the cup size. This can come in handy if you want to increase the bust size of a design or when you are altering a mock-up, but it can also make the cup size too large if that is not your intention.



An old favorite bra was sacrificed to create a better silhouette for patterning.

PRO TIPS

- To maintain the same bust size that your duct tape body form was created with, pattern over an unlined, unpadded bra.
- To easily increase the bust size of your duct tape body form, place one or more padded bras over your duct tape body form and pattern directly on the new shape.
- Use a thin layer of plastic wrap before adding tape and markings to protect your bra from damage.
- Permanently glue a bra that you've patterned over to the inside of your costume. This is a great way to add additional support and comfort for larger cup sizes.
- If you regularly wear a bra everyday, wear a bra under your costume for sweat management and comfort.

Shape Over an Acrylic Dome

If you are struggling to create a breast cup with EVA foam, try patterning an existing rounded object to get started with a base shape that you can then alter. Pattern on an acrylic dome or another round object and then modify using darts and foil or tape to create a mock-up.



CHESTPIECES AND BACKPIECES

If you are creating a costume that has a chestpiece, the chestpiece is a good place to start. Once you have the base piece constructed, you can pattern all of the other pieces on top of the base and feel confident that they will all fit together perfectly.

To begin, you can pattern on a duct tape body form or directly on your own body. Here is an example of patterning a torso on a duct tape body form using the Fantasy Armor design as an example.



1. Wrap the duct tape body form with a layer of plastic wrap and then a layer of duct tape.

PRO TIP →

Only one side needs to be patterned if your design is symmetrical.



2. Use a Sharpie or contrasting tape to mark the center midline, collar, and shoulder area. Make an additional line at the waist to remind you where your body needs to bend while you are designing and placing overlays. You can also tape any image references to the form to help you draw the overall proportions.



3. Draw or attach any overlays to review proportions and overall shapes. If you've printed a full-size version of your design you can trace overlays and then use them as mock-up patterns.



4. Trace overlays to the duct tape pattern to use as a reference guide for where you will cut the pattern apart. If your goal is to hide as many seams as possible, this is a great place to make small design adjustments to nudge seams around to place them under other layers and details. Add labels and any other notes to the duct tape.



5. Once you are done, cut the template off the body form, trim, and add registration marks to the seams.

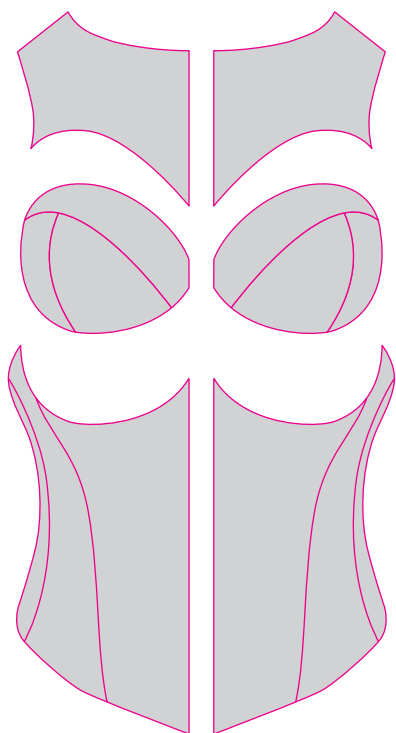
6. For this female bust design, the cup is divided into three parts: an upper strip and two lower halves.

PRO TIP

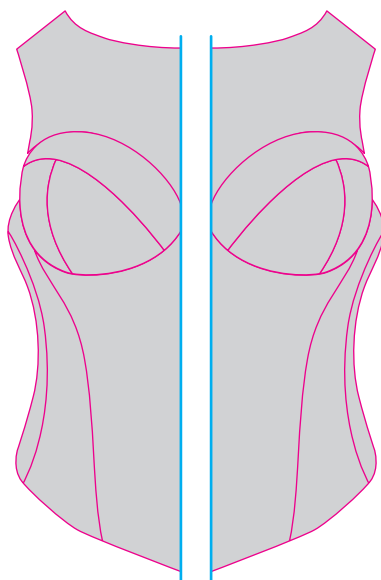
There are many different ways to pattern a bust. Even the smallest adjustment can make a big difference in the overall shape and silhouette. Take your time with this step, and refine as much as needed to get the shape that you want.

7. Transfer the pattern to chipboard and then to EVA foam.

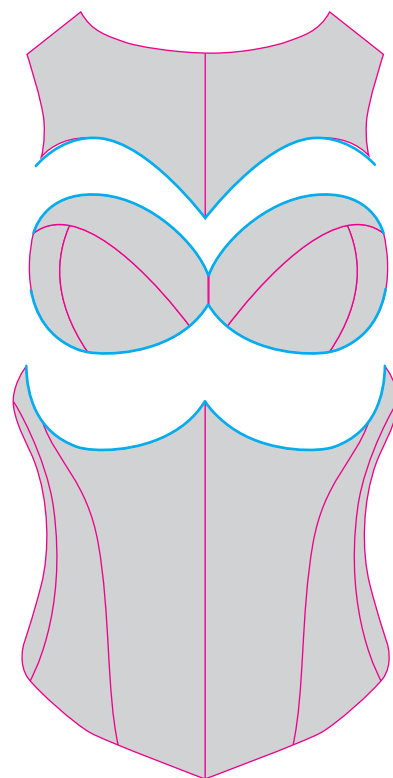
8. Assemble the cup pieces and the lower torso halves as separate right and left sides, reserving the center seam for last. You'll often find that chestpieces with many curves like this one are far easier to assemble using this method. When you have many parts coming together, like in this example, it can be challenging to glue pieces together if there are multiple curved edges. You'll have a far easier time if the last line that you are gluing is straight. This can take some practice, but it will help your projects look clean and professional.



The individual pieces are glued together in parts: right and left cups and lower torso and upper chest.



The blue lines demonstrate one suggested assembly technique.



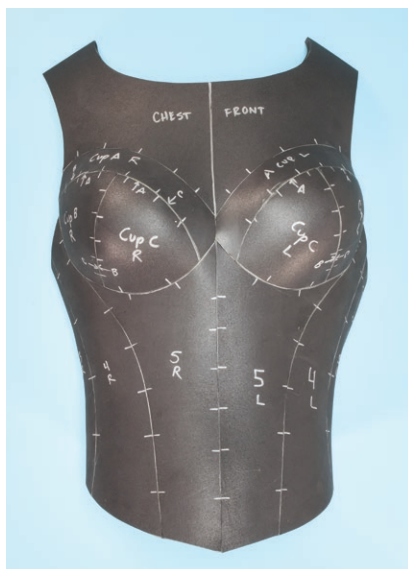
The blue lines demonstrate another suggested assembly technique.



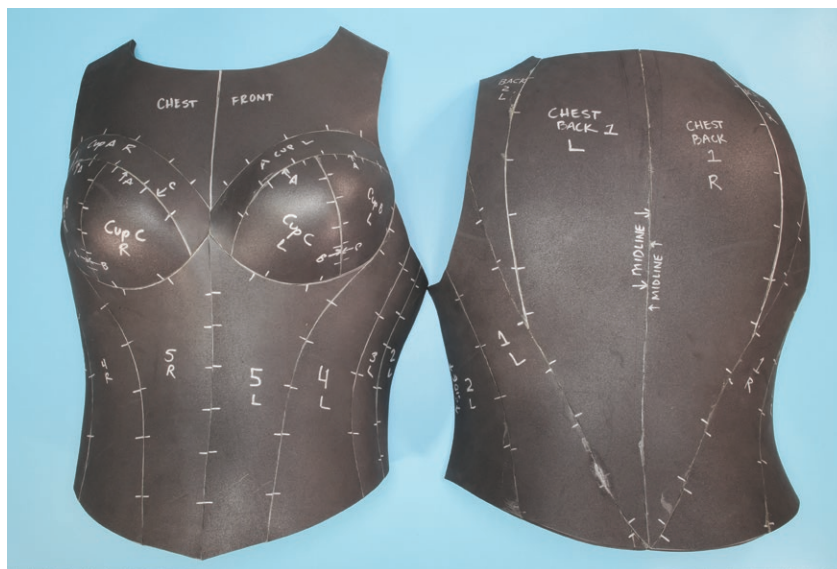
9. Glue all of the pieces together to create right and left halves.



10. These pieces are fairly curved, which can make it slightly more challenging to glue them together without the contact cement accidentally sticking where it shouldn't. To avoid unwanted connections between two glued seams, press the edges together lightly at the top and the bottom of the seam. Next, gently press the edges together with your thumbs as a guide, working your way to the center.



11. The finished result!



Repeat these steps to create the backpiece. Once the chestpiece and the backpiece are done, make any necessary alterations and begin thinking about where and how you'd like the two pieces to attach together.

Next, you can either start working on overlays or pattern more pieces.

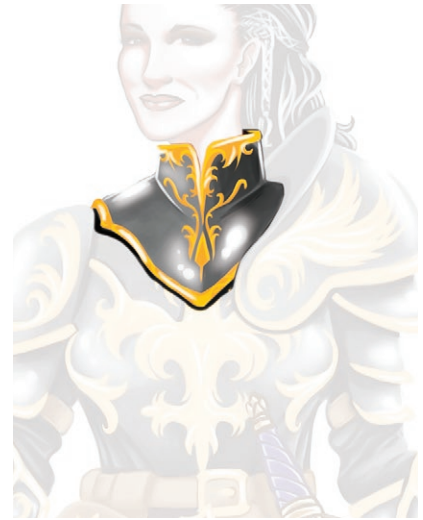
GORGETS

Patterning neck pieces like gorgets and collars is a snap compared to the complex process of patterning a chestpiece. Create a pattern using similar methods, using plastic wrap and duct tape to create a pattern that is flush against the body or another piece.

PRO TIP

Patterning on top of a base layer is highly recommended to make sure the two pieces will fit together perfectly. Pattern collars after creating a mock-up for the chestpiece that will be underneath the collar to make sure the two pieces will fit together well.

In the following example, a gorget is designed directly on top of the chestpiece to create a flush design. To design a piece that does not sit flush, use foil, paper, or other material to build up the shapes and create a rough mock-up.



1. Cover the area with plastic wrap and duct tape.



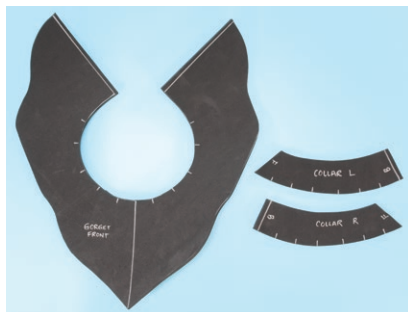
2. Add design lines with a Sharpie or contrasting tape. Place overlays to check placement and adjust if needed. In this example, the overlay will need to be designed to be flatter at the top to fit underneath the gorget. While it isn't necessary to create the overlay at this stage, it's good to have this detail in mind when building and making design decisions to put all the pieces together.

3. Remove the duct tape pattern and trim. Add registration marks and labels.



4. This particular design has a defined collar line. Draw the curve and add registration marks. Transfer to sturdy paper.





5. The large gorget piece has a straight centerline, so it's possible to mirror the template to create one pattern piece instead of two.



6. Heat form the gorget pieces before gluing them together.



7. This is the finished piece! This particular design will need help maintaining the curved shapes that extend over the chestpiece and backpiece. Hook-and-loop tape or magnets can help secure the collar in place. You could even glue on a layer of thermoplastic that has been molded to the curvature of the chest to help maintain the shape.

SPAULDERS AND PAULDRONS

This design includes spaulders, which are armored plates that protect the upper arm and are positioned under the pauldrons, which protect the shoulders. Typical armor designs can include a combination of one or more spaulders and pauldrons. Some designs omit spaulders completely or might only have one pauldron. If your design requires spaulders, it's best to pattern these before the shoulders so you know where everything needs to align.



Spaulders

Spaulders



1. First, wrap your arm with plastic wrap.

2. Padded material like bubble wrap is great to use to pattern shapes like spaulders that will lie flat against your arm. The bubble wrap will add a small amount of lift that will help accommodate the 6mm EVA foam that will be used for this pattern. If you are using thinner foam, use less padding.



3. Wrap with duct tape and begin drawing the design outlines with a Sharpie or thin strips of a contrasting tape color. The spaulder can be left in this state while patterning and designing the pauldron.

Pauldrons



Pauldrons



1. For this pauldron design, the shoulder will need to have a bit more bulk than a natural shoulder. To achieve this, add a few layers of bubble wrap or any other kind of material to add bulk. In this example, bubble wrap and thin batting were used to create a soft rounded shape.



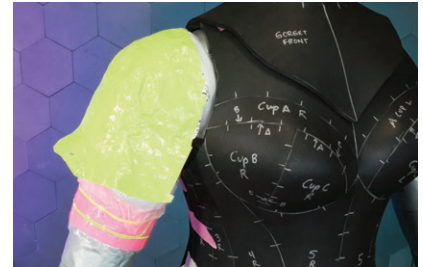
2. Add strips of plastic wrap or Glad Press'n Seal to compress the form and tailor the shape a bit more.



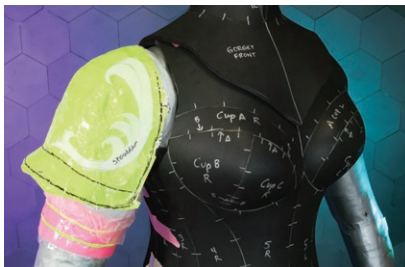
3. To add the complex curves and dimension to the shoulder, use aluminum foil to sculpt a flared edge. Use double-sided tape to help secure the foil in place as you design.



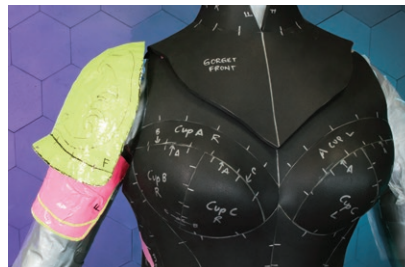
4. For this pauldron, we need a flared edge that a single layer of foil can't achieve. Snip the edges in a few places to help exaggerate the flared edge. Use more foil to fill in the spaces between the darts.



5. Shape the foil until you are happy with the amount of curve. Add more foil to fill out the pauldron shape and cover it with a thin layer of duct tape.



6. Draw the centerline, edge lines, registration marks and labels. If you have overlays, tape them to the duct tape shape to check proportion and placement and trace them.



7. Remove the duct tape patterns and trim. Position the duct tape pauldron on the shoulder with strips of EVA foam inside the pauldron to lift the template away from the shoulder. Make any adjustments before cutting the pattern apart to create templates.

8. Next, transfer the pattern to sturdy paper and trace on foam. Glue the pieces together and check the fit and overall relationships of each piece as they sit together.

VAMBRACES

Vambraces are fun to make! Vambraces are armor pieces designed to protect your forearms. They can be on both right and left sides or on just one side. These costume parts are small and usually have fewer pieces to pattern. For this reason, they are typically one of the first parts you will make. Pattern them on a duct tape body form or on your own arm. In our example, I chose to pattern this piece directly onto my own arm to illustrate how to pattern around the elbow and wrist joints.

PRO TIP

When you are patterning on your own arm, Glad Press'n Seal is *not* recommended, as the tackiness of the plastic makes it very difficult to remove from bare skin when you're ready to cut it off.



1. Wrap your arm in plastic wrap. For bulkier vambraces or if you are using thick 8mm or 10mm EVA foam, add a layer or two of bubble wrap or batting to expand the shape. Cover with tape.



2. Bend your wrist forward and backward and bend your arm at the elbow. Mark where your elbow and wrist create creases in the tape. This will help you design a better fitting and more comfortable vambrace.



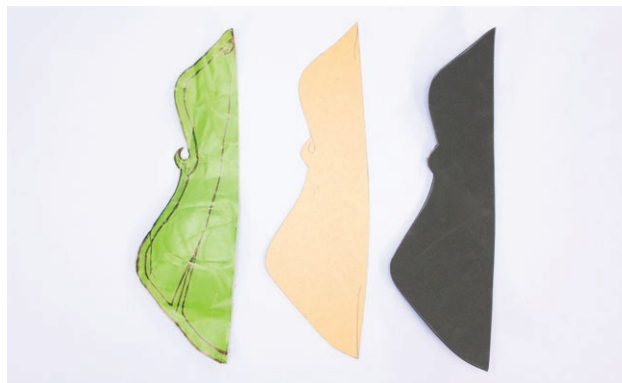
3. Next, draw a centerline along the inside of your forearm, and mark the sides of your wrist. Extend the wrist lines to your elbow.



4. You can begin sketching the design on the tape, either while it is on your arm or on a flatter surface after you remove the tape template. Whenever you remove the pattern from your arm—and any time you remove tape templates from your body—be sure to use medical scissors to protect your skin.



5. Finish sketching the vambrace design with the tape template on a flat surface, using the centerline as a guide. Because both sides of the vambrace are the same on this design, I only needed to sketch out one half of the design.



6. Next, trim the template, transfer it to sturdy paper, and trace it on to EVA foam.



7. Glue it together to create a mock-up. Try it on, using tape where straps will eventually be placed.



8. Check the fit—especially the mobility of your wrist. Trim or heat form the foam to add a gentle curve to the edge if it is rubbing your wrist.



9. If your design also has hand armor, wrap your hand in plastic wrap and tape, and position the vambrace on your arm.



10. Trim and trace, then transfer the hand armor pattern to EVA foam and tape in place on the vambrace. It can help to use a thinner EVA foam for your hand armor than for your vambrace to reduce bulk in the wrist area.

Finished! The vambrace is ready for overlays, details, and straps.

TASSETS

Tassets are armor plates that are positioned on the side of the hips and upper thighs. These can be single pieces or segmented. In this example, I used paper instead of duct tape and plastic wrap to pattern these larger pieces that hang from the waist. This is a form of draping, a common technique used for garment patterning, that works extremely well with paper and foam for these types of pieces.



1. Begin by taping a large piece of paper to the general area that the tasset will be positioned.



2. Next, begin loosely sketching the outline on the paper. Don't worry about making lots of mistakes because this shape will be refined later! For now, focus on overall shape and proportions.



3. Next, cut out the shape and tape it back on the duct tape body form.



4. Repeat these steps for the remaining segments and add labels to all pieces.



5. Transfer the paper sketches to chipboard and check your work.



6. Refine the templates with a French curve, draw the labels and center-lines on all pieces (if applicable), and transfer the patterns to EVA foam.



7. Tape the pieces together and place on the duct tape body form to check the overall shape. Make any adjustments needed.

The tassets are patterned and ready for details and attachments!

GREAVES AND KNEE ARMOR

Patterning greaves (lower leg armor) can be a little challenging, but with a little practice, creating these pieces will be simple. If you are patterning directly on your leg, pattern lower leg pieces while wearing the footwear you plan to use for the costume.



1. Cover your lower leg and shoe with plastic wrap. Use short strips of tape to cover the plastic wrap.



2. Mark the center front, center back, outer seam, inner seam, and ankle, taking note of where your knee and ankle will bend naturally. Try to position the lines around those joints so you can bend and walk in your costume.

PRO TIP

If the design has any parts that are flared or exaggerated, use foil and double-sided tape to sculpt those shapes into place. Cover the shapes with tape and label.



3. Carefully remove the tape using medical scissors and trim. Straighten the center front and center back lines if needed.



4. Transfer the pattern to sturdy paper and trace on 6mm EVA foam to create a mock-up. To upsize this pattern slightly to account for using 6mm EVA foam, an additional 5mm was added to each edge.



5. Decide if you want a front, side, or back opening. Heat form the pieces and glue them together.



You are now ready to add details, layers, and attachments.

Use the same steps to create knee armor, being sure to pattern over the lower leg pieces while they are in place.

Unlike those in my Fantasy Armor, this set of greaves uses zipper enclosures instead of straps and buckles, creating a curvy silhouette.

Costumes have very different designs, components, and parts, but they all need footwear! When starting a new costume, you'll need to decide how you would like to approach designing around shoes and other kinds of footwear.

PRO TIPS →

- Uncomfortable footwear can ruin an entire event day, so invest in good-quality, comfortable shoes.
- If you must wear uncomfortable shoes, take several breaks to sit down and take off your shoes.
- Bring backup shoes to events, if possible, for emergency shoe changes.
- Break in new shoes before wearing them to a long event.
- For some incredible tips and tutorials about designing and creating boot covers, shoes, and tights, be sure to check out *Fabulous Cosplay Footwear* by Regan Cerato and Kelley Kullman of Cowbutt Crunchies Cosplay.



CHOOSING THE RIGHT SHOE

Extra Room

It's not a bad idea to use shoes that are a half size larger than your size. After a few hours you'll most likely have achy, tired, swollen feet that will appreciate the extra room. Shoes that are a bit larger also allow room for insoles and extra socks if needed. Some cosplayers even insert more than one insole for extra comfort.

Easy On, Easy Off

Being able to slip a shoe on and off without lacing will be appreciated when you need to take a break. There's nothing better than taking off your shoes after wearing them for a while at an event! That being said, some people benefit from having support around their ankles and lower legs. If this is the case for you, consider choosing boots that have a zipper on the side or the back for easy on and off.

Heels

Heeled shoes and boots allow you to wrap a strap under your shoe that will stay in place if you're using slipcovers or are building a shell around your shoes. If you need to be taller for your costume, think about using a platform shoe or boot instead of a tall heel so you will be more comfortable.

Bringing Life to Old Sneakers

Building on an old pair of sneakers is a good way to ensure that your build is going to be as comfortable as possible. Use hot glue and contact cement to add layers and textures with fabric, foam, and padding to transform a pair of old sneakers into the perfect costume component.



1. Wrap the shoe entirely in plastic wrap and tape.



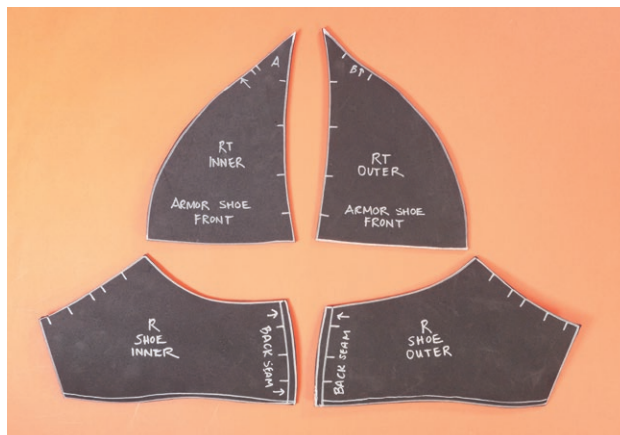
2. Trace the shapes of the lower leg armor if needed.



3. Mark the area where the shoe will flex. When patterning and designing, allowing space between EVA foam pieces at this crease line can avoid issues caused by pieces rubbing together when you walk and will allow your foot to move naturally.



4. Sculpt the design using foil and Glad Press'n Seal, and cover it with tape.



5. Carefully remove the taped pattern pieces you just made and flatten them. Add a few millimeters of extra room around the edges to account for the added thickness if you'll be using foam that is 4mm or thicker. Remember that it is much easier to trim than to add material! Transfer your pattern to paper, then to EVA foam, and cut it out.



6. The foot armor is ready for details, layers, and attachments.

There are several methods for attaching the pieces to footwear, each with pros and cons. Removable pieces allow the same footwear to be used for many builds and repairs are easier, but more time and materials are needed to create straps, slipcovers, and other attachments. Permanently attaching EVA foam to footwear is a faster method and requires fewer hardware attachments and materials, but repairs are much harder and the shoes can only be used for that costume.



ATTACHING WITH GLUE



While wearing your costume, you'll be moving your feet more than any other body part. Because of this, anything that is glued or placed on your shoes will be subjected to stress and wear and tear more than anything else on your costume. For this reason, it is important, whenever possible, to use glues that are flexible. But what kind of glue do you use to attach foam and fabric to shoes?

One great resource for researching what glues are best for a particular application is the website thistothat.com. Some of the tried-and-true adhesives for footwear are contact cement, Aleene's Super Fabric Adhesive, 3-in-1 by Beacon, hot glue, and Gorilla Super Glue. Be sure to experiment to find what will work best on the materials you are using.

My favorite glues are Barge Contact Cement and 3-in-1 by Beacon. Both of these glues remain flexible when fully cured, but they both also require adequate ventilation and safety precautions.

Attaching Foam to Fabric or Leather

If your footwear is made of fabric or leather, use contact cement or 3-in-1. Barge Contact Cement is perfect for gluing porous fiber to porous fiber. Contact cement will be absorbed into fabric and leather, so be sure to use two layers or more for extra strength. Aleene's Super Fabric Adhesive is another flexible adhesive that will glue foam to fabric and is great for gluing fabric to fabric.

Attaching Foam to Faux Leather

Faux leather is typically vinyl with a plastic film applied on top. That film needs to be removed before applying any kind of adhesive or paint. Removing this film from the surface of the vinyl is called *deglazing*. Solvents like acetone or Angelus Leather Preparer and Deglazer (my personal favorite) can be used to deglaze faux leather and vinyl. Be aware that these solvents will most likely remove some or all of the color, as well as change the sheen of the material, so only apply them where needed or be sure to apply evenly across the entire surface.

To attach EVA foam to leather, first deglaze the surface to be glued (or the entire surface). Lightly scuff the surface with fine-grit sandpaper and then glue your foam to the vinyl surface with contact cement.

ATTACHING WITHOUT GLUE

If you don't want to buy a new pair of shoes for every costume, you can reuse the same pair of shoes for your projects by using hardware, straps, and elastic to attach your foam costume pieces.

Use a variety of attachments to keep your pieces in place. Use elastic, hook-and-loop tape straps or nylon straps anchored with D-rings, small buckles, or hook-and-loop tape to secure the foam pieces in place around the heel, under the arch, and under the toe. Elastic will stretch slightly as your foot moves, making it a great choice for straps on footwear. Most magnet closures are prone to slipping out of place or disconnecting entirely when stressed, so avoid using these on footwear.



Fantasy Armor costume concept art by Mathew Grigsby

These shoe covers are held in place with elastic and nylon straps.

You can employ the duct tape patterning method we've used on the body armor to create just about anything, including headpieces. Having a clean base pattern is essential to having a great-fitting and comfortable helmet and is a starting point for adding details and additional design elements.

In this section, we will design and pattern my Champion Helmet. Step-by-step instructions and a downloadable finished pattern for my Champion Helmet (page 219) can be found in the projects section.



1. I used a 3D-printed head form, but you can pattern using your own head or with a head form. Wrap plastic wrap around your head or head form, covering your scalp, ears, and forehead, but be sure not to cover your face. Plastic wrap is highly recommended as Glad Press'n Seal may be difficult to remove. Cover the plastic wrap with tape, being sure not to wrap too tightly.

2. Draw a centerline from forehead to nape, and add any other lines you might need to help you design around your features, such as eyebrows, ears, cheeks, or the base of your head. Label each section: *front* and *back* and *right* and *left* sides.

3. Remove the tape and trim. You now have a basic shape to work from! Place this shell on a foam head, 3D-printed head, or whatever you have available to work on.



4. Use aluminum foil or paper to build the helmet to the desired shape.



5. Draw a visor shape and trim.



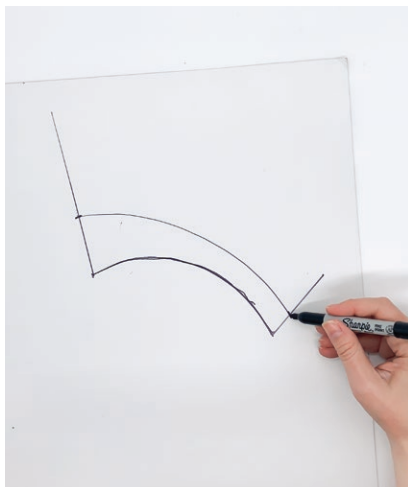
6. To create the crest, use a contour gauge to establish the shape.



7. Mark the crest *front* and *back* positions.



8. Trace the contour you measured in Step 6 onto sturdy paper.



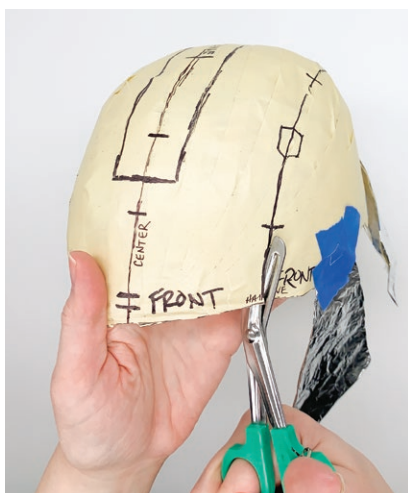
9. Create the plume and crest base shape.



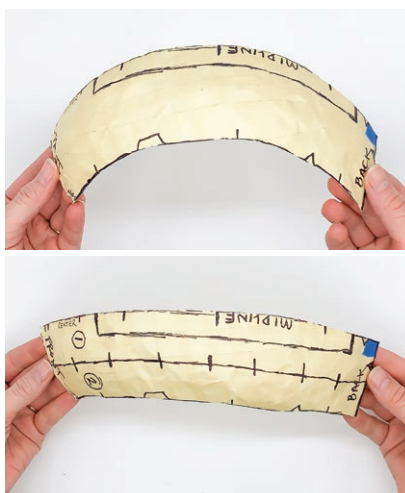
10. Test the fit and overall shape of the plume and crest. Make adjustments if needed.



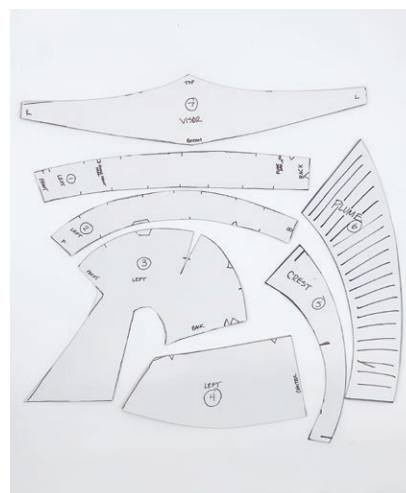
11. Create a cheek guard shape with foil and tape it to the side of the helmet. Trim and reshape the cheek guard until you are happy with the overall proportions and placement.



12. When the basic shapes are complete, cut the helmet template along the pattern lines and label every part with directional labels and registration marks.



13. Continue to subdivide the pattern sections. Add darts or additional seams where needed to flatten the pieces. In this example, a seam was added to this piece to help flatten the curve.



14. Trace the pattern on sturdy paper or thin cardboard.

15. Create a mock-up to check for fit and comfort, and adjust it as needed. You are now ready to create your helmet base and add details, layers, and attachments.

PRO TIP ➔

Making design decisions to hide seams under details and layers during the patterning and mock-up phases will push your projects to the next level!

To pattern any helmet you might imagine, just follow these same basic steps.

When patterning props, you'll use many of the steps that are used for patterning body armor, but there are a few key differences. This section will walk you through the basics of designing and patterning pieces that can be held and are viewed from all angles, rather than worn on the body.

Terminology

The terms **pattern**, **template**, and **blueprint** are often used interchangeably in the cosplay world, although **blueprint** and **template** are seen more often when referring to props and accessories.

BEFORE YOU BEGIN

Before you start cutting foam and making a shield, sword, or a cool space gun, there are a few things that you should figure out first.

How Is It Held?

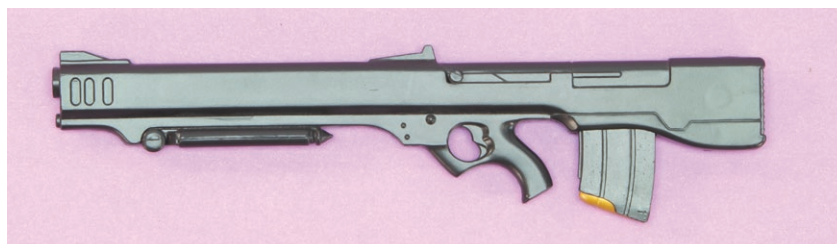
Props are subject to more wear and tear in the areas where they are held. These areas will often need a stronger core support as well as a sealed paint surface that can withstand being handled often. If your prop will be held in a sheath or holster, held by a gloved hand, or attached to your costume, begin to consider those details as you design your project.

Will It Need to Fit in a Suitcase for Travel?

When you are planning your props, make note of the estimated dimensions of the final prop. If the dimensions exceed the size of your suitcase, car trunk, or closet, now is the time to plan. Make long props shorter by nesting pieces using PVC or PEX pipe or by adding screws or other hardware that will allow you to disassemble them to more easily store or pack them.

Reference Photos

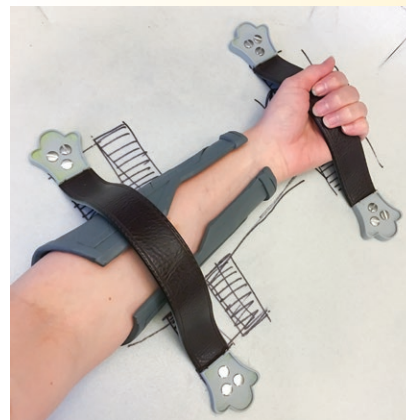
Start by gathering all reference photos that you can find. Many props from popular video games and movie characters have 3D models that can be found online or within the game that can be rotated, enabling you to see the them from all angles. Miniatures and toys are also excellent references. If you do not have access to true 3D models that you can manipulate, try searching online for 3D images of the prop or type of prop you're making. Look for images of the item from the front, side, top, and bottom. If you have these three views, you can create a highly detailed pattern. If you don't have a 3D model or orthogonal views, you can sketch and design the views that you need to create a custom design.



A side view of a miniature rifle toy from *Appleseed*.

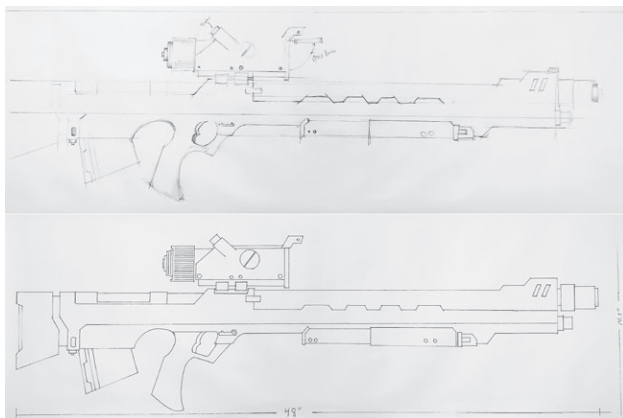
PRO TIP

It is helpful to wear any costume parts, like vambraces or gloves, as you are designing and test-fitting mock-ups to make sure they will fit and function correctly.



Sketching and Tracing

Sketch the overall shapes and details on paper, and then refine the lines with a ruler to create a clear outline of the design. Using the toy rifle as a reference, I sketched the rifle in pencil, then traced and refined the lines and added design elements with a pen and a ruler.



The final rifle prop build follows the same lines as the reference piece, with additional details that were added from reference photos from the film.



Prop Maker: Downen Creative Studios
Prop: Rifle from *Appleseed*

Checking for Scale

Print or copy a full-size paper version of your prop. Include front, side, and top or bottom views. A 1:1 printed version will help you see exactly where the details should be placed and allow you to make size adjustments if needed. To learn how to create full-scale printed versions of your reference images, see *Designing, Patterning, Creating a Mock-up, and Refining* (page 148). For props, it can be very helpful to attach the printed paper version to cardboard and hold it to see if any additional changes to size or proportion need to be made before starting the build.



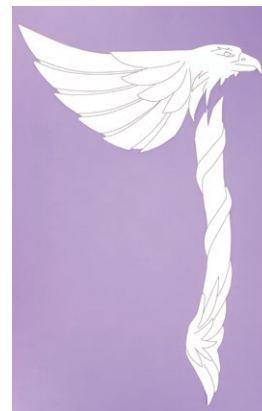
Model: Brett Downen

DESIGNING

Taking a small amount of time before you begin patterning to make some important design decisions is a crucial first step in making a great prop! For instance, planning ahead for travel or installation of electronic components can have a big impact on your build, and it is far better to plan for these types of design elements during the beginning stages than after you've started to build.

Dividing the Prop into Sections

Most handheld prop weapons have at least two parts: for example, a handle and a blade or a handle and a barrel. Decide where the prop will divide if it has multiple parts or sections. Determining these dividing points will help you decide how to plan different portions of the build. These dividing points can be where the prop might need to come apart for travel and storage or where different portions of the prop need to be made differently or with varying materials.



This axe has two sections: the blade and the handle.

Planning Ahead for Lights and Electronics

If you are installing lights, fans, or anything that might need a battery pack, it's best to have these items (or at least their approximate measurements) in hand so you can design them directly into the prop. Designing around these elements as you start the build is far easier than trying to find a place for them to fit after your prop is mostly finished.

When your prop will include LED lights or other electronics, consider:

- Including a hollow core or chamber to insert and hide a battery pack
- Adding channels to hold wiring
- Including access to the on/off switch
- Incorporating removable panels for changing batteries
- Allowing appropriate ventilation for small fans

BUILDING

Prop building is an incredibly fun artform! In this section, you'll see how even the largest, most seemingly complicated props can be tackled for easy planning, prototyping, and building.

Planning Layers

Similar to how costumes are made, props are made in layers. The base layer will be the largest layer and will establish the overall shape of your finished prop. You then will plan and add layers, each layer adding the next-largest area of detail, repeating until you have a finished 3D prop with all the desired details.

Making a Prototype

Creating a quick prototype can help you understand the relationships of the pieces and parts and give you an idea of how they will be assembled. Prototypes are especially helpful for complex builds that have many parts. The 3D study can then be disassembled to create the final pattern.



Many versions of this Baby Yoda Pod from *The Mandalorian* were created to perfect a pattern used for a live build-along workshop for SiliCon with Adam Savage.



The final version!

Creating the Base Shape

Once you have the general shapes and sections figured out, trace these to foam and create a base shape that you will build on. Large prop pieces will most likely need thicker EVA foam with a PVC pipe core to be stable enough to hold in your hand.



The base shape for the full-size rifle prop



Models: Brett Downen and Coregeek Creations

Costumes: Briareos from *Appleseed* and Sergeant Calhoun from *Wreck-It Ralph*

This is the final Briareos costume with the finished rifle. Coregeek (right) used a combination of materials with EVA foam to create his rifle for his Sergeant Calhoun costume.

Installing Inner Supports and Cores

Long props like shafts, handles, and prop gun barrels will benefit from a core made of PEX B, PVC, or a wooden dowel to support the length and help keep the prop rigid. Start with the inner core and build around it, or embed the core into the base once you have the overall size and shape figured out.

Lightweight wire embedded in each horn coupled with PVC allowed the foam to be positioned to add dimension to each horn.



Cosplayer: Downen Creative Studios

Costume: Hela from *Thor: Ragnarok*

Photo by Downen Photography

Each horn on this EVA foam headdress is removable!



Installing a Core Handle

Installation of a core is quick and easy! This Eagle Axe designed by Mathew Grigsby will need to be built so that the wide blade is firmly embedded into the shaft. Use a rotary tool, hacksaw, scroll saw, or PVC pipe cutter to cut piping to length.



1. Cut a length of pipe and bend it to match the curve of the prop. This axe has a PEX B core that was shaped with only a small amount of force—no heat gun needed!



2. Flatten the pipe with a vise or heavy-duty clamps to better fit inside the layers of EVA foam if needed.



3. Trace the pipe shape on the EVA foam.



4. Remove the material to create a channel.



5. Insert the pipe in the channel and secure it in place with a generous amount of hot glue.



6. Wrap the handle with 2mm EVA foam and secure it with hot glue or contact cement.

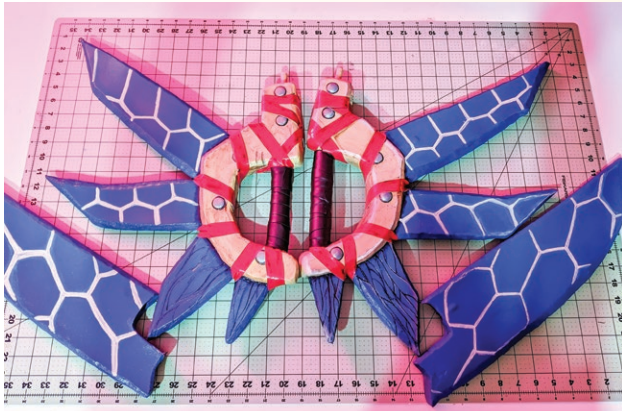
7. Done! The core is installed and the prop is ready for additional layers.

Commonly Used Core Materials

- PVC pipes
- Wooden dowels
- Coat hanger wire or armature wire
- Thick, ultrahigh-density EVA foam
- EVA foam wrapped with thermoplastic
- Thick chipboard or cardboard

PRO TIPS

- Make a long prop into two or more parts with hardware attachments, wooden dowel pegs, or telescoping PVC pipe secured with screws or embedded magnets.
- Cut away a channel to embed a core or build your layers around a core.
- Use contact cement or hot glue to secure a core in place.



Prop Maker: Akakioga Cosplay
Prop: Night Wings from Monster Hunter World

Akakioga Cosplay designed these Night Wing props to disassemble for easy transport using wooden dowel pegs.

Photo by Akakioga Cosplay



Cosplayer: Akakioga Cosplay
Costume: Nargacuga from Monster Hunter World

Photo by World of Gwendana

PVC and PEX B



PVC is technically a thermoplastic and will soften when heated above approximately 80°C (176°F). Be warned! Heating PVC can release very dangerous toxins, and the material can even ignite when exposed to temperatures above 427°C (800°F). If you must heat PVC, be sure to always wear a respirator, use low heat, and work in a very well-ventilated area!

PEX B can be formed without heat. It is very lightweight and strong but struggles to form extreme curves as well as PVC. Curves can relax if exposed to high heat from a very hot car, for instance. For most purposes, PEX B is a safer choice for adding a strong core to your props.

SEALING AND PAINTING

Before deciding on a sealer and paints, decide if your prop needs to be flexible, and figure out where most of the wear and tear might happen. For example, the grip of a blaster will have more wear and tear than the barrel. Using a clear coat or adding a fabric grip on areas that will be handled can add durability and protect your precious work!

ADDING DETAIL LAYERS AND SHAPES

Once you have created a base piece, you can begin adding details, layers, and other design elements that will really make a costume come to life! The techniques are similar to those for patterning general shapes with a few extra steps and attention to detail.

MULTIPLE DETAIL OVERLAYS

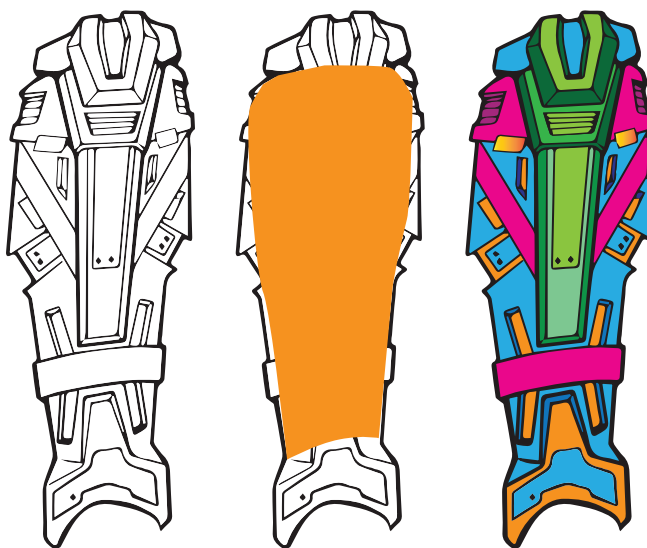
A complicated and layered design may seem overwhelming at first, but as you begin breaking down the design into multiple layers, it will quickly transform into a fun, creative process as you add layers, details, and shapes and begin to see the project coming to life. Sketch or use design software to create overlay patterns, and begin assembling.

It is helpful to figure out how many detail layers there are in the design. Think about these multiple overlay layers as sections. Begin patterning the base first and finish with the smallest details. There are many ways to pattern overlays. Once you try a few methods, you'll find a way that works best for you!

Patterning Method 1

One way to pattern complex designs—like this lower leg armor—is to sketch the design on the assembled EVA foam base, using tape as a drawing surface. The tape pattern can then be removed and cut apart to be used as a template as you build the design layer by layer.

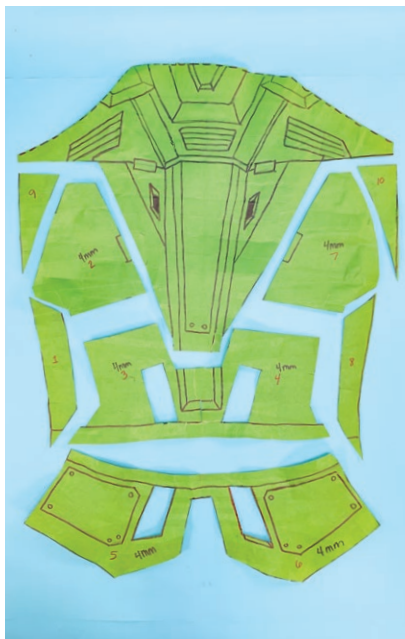
1. Use color coding to identify layers on complex pieces. In the drawing on the right, the orange layer is the base layer, followed by blue, pink, and finally, green.



Concept design and illustration by
Mathew Grigsby



2. Wrap your armor piece in plastic wrap and add a layer of tape. Draw the layers on the tape to provide a pattering map.



3. The pattern is now ready to cut and transfer to EVA foam.



4. Begin by adding the base layer. Continue adding layers, making any pattern adjustments needed if you are layering with thicker pieces of EVA foam.

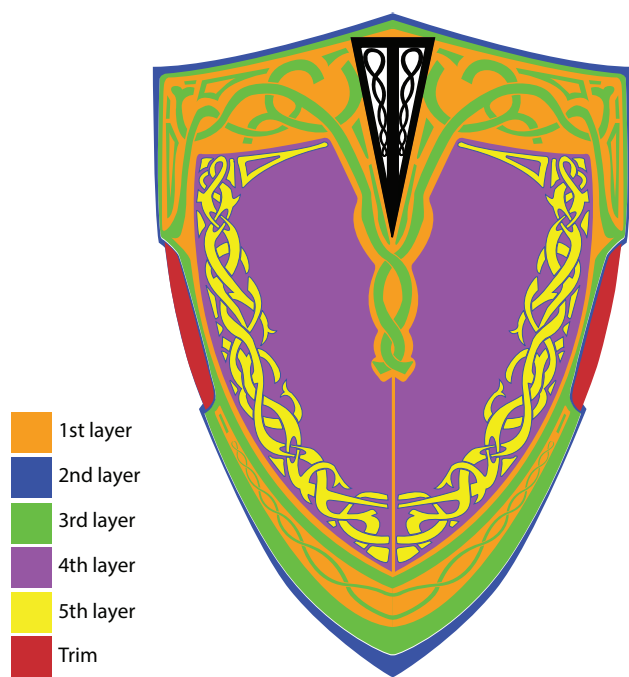


5. Several layers later, the finished leg piece looks amazing!

Patterning Method 2

A similar method to pattern complex layered pieces—like this shield—is to create a vector illustration template using a program like Inkscape or Adobe Illustrator.

The files can then be used in a die-cutting machine to make quick work of highly detailed and intricate patterns.



Prop Maker: Downen Creative Studios
Prop: Lady Sif Shield from *Thor: The Dark World*

PATTERNING RAISED LAYERS

Regardless of whether you pattern your detail layers by hand or on the computer, there will be some larger 3D elements that need to be handled differently. In this example, the vambrace base has been created with 6mm EVA foam and the finished piece will have two layers: the raised center peak and decorative edging. The raised center overlay needs to be added before the edging is placed to ensure that every part will fit together perfectly.



Fantasy Armor costume concept art by Mathew Grigsby



1. Cover the foam piece with Glad Press'n Seal and then tape.



2. Find the centerline and mark it with tape or a contrasting pen.



3. Begin sketching the overall shape of the center peak and the edging.



4. Once the design is finished, remove from the EVA foam and trim. Cut in half at the midline to create a symmetrical pattern. Use this template to create a pattern for the raised center peak.



5. Transfer to paper and position on the foam to check fit and proportion. This design has a slight peak at the centerline, so the paper has been creased to simulate that detail.



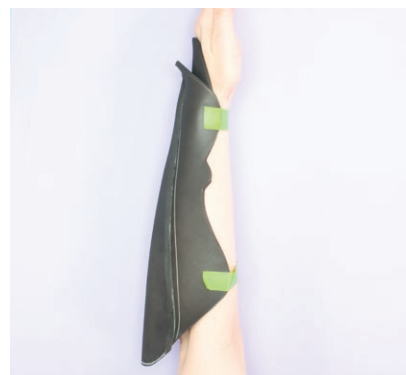
6. Trace on foam and cut out. Use an undercut to create a soft crease on the centerline. Add hot glue to anchor the crease in place.



7. Trace the shape on the main piece to create glue guides for the layers.



8. Glue in place.



9. Attach to your arm using tape where straps will eventually be placed.

10. The vambrace is now ready for decorative edging and details. You can pattern again following these same steps to redesign the edging template so it follows the new dimensional shape perfectly.

ADDING CARVED DECORATIVE EDGING

Edging can add clean lines and visual interest to any piece, and it can be added easily with some quick patterning steps.

In this example, a base tasset piece needs carved decorative edging on all three segments. Alternately, you could use a beveled dowel to create dimension, but this method allows you to customize the design for a more organic-looking effect.

The tasset design was roughly sketched out during the patterning process.



Fantasy Armor costume concept art by Mathew Grigsby



1. Cover the foam piece with Glad Press'n Seal. Cover the edges of the foam with tape and sketch the design.



2. Once the design is complete, remove the plastic and cut out the design. Transfer to chipboard, then trace on foam and cut out.



3. Repeat this process for each segment. Tape together to check the fit and make any adjustments you might need.



4. Next, think about how to clean up the edges of the overlay. To help find peaks, draw a centerline to help guide the rotary tool as you are working to carve bevels and curves.



5. Save some time by carving away as much material from the edges as you can with a sharpened utility knife.



6. Shape the edges with a rotary tool and sanding drum. Use a grinding stone tip to smooth the surface and soften edges.



7. Heat seal and glue the edging in place with contact cement.

ADDING OVERLAYS FROM A PATTERN

To add detail layers from a pattern, simply cut the sections, trace, and attach! Reassemble the pattern to continue making overlays if more layers of detail are needed. In this example, the template was cut apart to create scoring lines, bevel guides, layered overlays, and glue guides.

These steps can be repeated many times to add several layers to any EVA foam project.



1. Start with a full-size paper print.



2. Separate and label the wing portions to create the axe head details.



3. Trace the wings to the EVA foam and score into the foam.



4. Trace the eagle head onto 8mm EVA foam and cut out.



5. Use a rotary tool and sanding drum to carve the details and, finally, a polishing stone bit to smooth the surface.



6. Attach the overlay to the foam axe blade with contact cement.

BUILDING SHAPES FROM SCRATCH

PATTERNING OVERSIZED SHAPES

To make something larger than your body form, like a large pauldron, build up the body part size with scrap EVA foam, upholstery foam, packing material, bubble wrap, or anything that will add bulk. Add a layer of Glad Press'n Seal plastic wrap over the padding to secure the shape in place, and follow the steps below to continue creating the pattern.



1. Put all of the costume pieces that will be worn underneath the piece you are sculpting in their proper places.



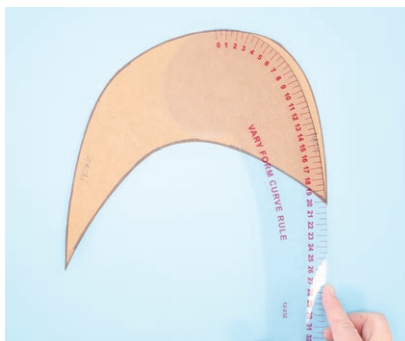
2. Add a layer of plastic wrap over the shoulder. Add a layer of duct tape and begin drawing the shape. Refine the shapes with a French curve if needed.



3. Begin building up the shape with layers of bubble wrap, batting, or anything else you have available. Secure layers in place with double-sided tape. Once you have the general shape you need, cover with another layer of plastic wrap.



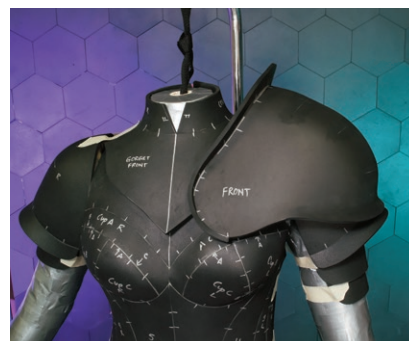
4. The neck guard design has an oversized detail that is too large to capture with a contour gauge. Add a strip of cardboard to create a base for the neck guard and use additional cardboard strips to support the curved shape.



5. Remove the neck guard and create a new template.

6. Refine the shape with a French curve if necessary.

7. Place the new cardboard template on the mannequin and continue building the oversized pauldron shape.



8. Cover the shape with tape; draw the outline, centerline, and registration marks; and add labels.

9. Remove, trim, transfer to paper, and create a mock-up! For large pieces like this, it will be necessary to add padding underneath the piece to help fill the space and keep it in place.

SCULPTING WITH OTHER MATERIALS

In addition to adding larger 3D details to a costume piece, you can create unique shapes to make custom patterns that you can duplicate for your projects. If you can sculpt it and cover it with a layer of paper, plastic, or tape, it can be patterned!



1. Begin by using any lightweight material that can be molded or cut with scissors or a utility knife. Use aluminum foil, bubble wrap, paper, or even clay to create a unique shape that you want to convert to an EVA foam piece. Sketch a general shape on your material and cut out the shape with scissors or a knife.

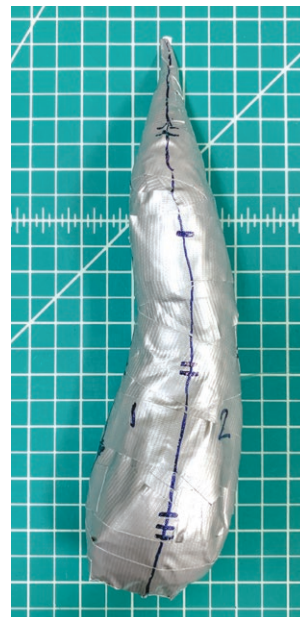


2. Refine the shape by carving with a blade, molding, and adding more material until you are happy with the overall silhouette.



3. Cover the entire piece with plastic wrap or Glad Press'n Seal. Then, cover the entire piece with short, thinner strips of duct tape or masking tape, which are easier to manage and control on smaller or curved pieces.

4. Determine how many segments you will need to create your finished shape. Complex curved shapes like this will need several segments, usually 4 or more. Draw directly on your shape to maintain an even centerline on all segments.



5. Add registration marks to the lines, and label the faces with numbers to easily keep track of the pieces. For complex shapes, taking a photo can also help you remember which pieces are lined up next to each other.



6. Once all the lines are drawn and labeled, cut the pattern apart. Remember, EVA foam can be manipulated with heat to account for slight curves, so only a small dart on piece 2 was necessary to further flatten these pattern pieces, but you can add as many darts as you want! Transfer your designs to paper to create templates, then transfer your patterns to EVA foam. For heavily curved designs use thinner 2mm, 3mm, or 4mm foam.



7. To make it easier to glue heavily shaped pieces, heat form them prior to gluing. If you have sharp points or acutely angled joints—such as at the tips of the pieces for this horn pattern—remove some of the bulk with a rotary tool.

8. To glue complex shapes together, you'll need at least two layers of contact cement for a strong bond. Attach the pieces together, working slowly. Once you have only one remaining seam, press the seam from top to base.

9. Evaluate to determine if you want to add expanding foam or other lightweight material to add structure and support if your piece is hollow like these horns. Then finish as desired!

Follow these steps to make any complex structure you can imagine.



Here are just a few of my favorite tips for working with EVA foam on costumes and props that can save you precious designing and building time, add functionality, and keep your costumes organized and smelling fresh!

USING A PREDESIGNED PATTERN

Short on time, or just want to try someone else's pattern? There are many small shops and cosplayers that sell patterns that you can purchase, download, and print to get you started creating everything from overall shapes to exact costume parts for specific cosplays. Some pattern companies like McCalls have a growing collection of great cosplay patterns designed by cosplayers like Yaya Han and Becka Noel that are easy to create and modify.

ADDING POCKETS

Add pockets and places to hold your belongings inside your props. Shields are perfect places to add space for a cell phone, and some props are large enough to even store snacks, extra batteries, and more!

CREATING A PATTERN LIBRARY

Don't toss that duct tape and foil pattern and mock-up away just yet. You might need to make more modifications, make notes, or go back to double check your measurements. You never know when you might need to access your original design. Place patterns in envelopes or Ziplock bags and label for easy reference later. Build a pattern library to use over and over again for many different costumes by adding small changes or building on top of earlier designs.



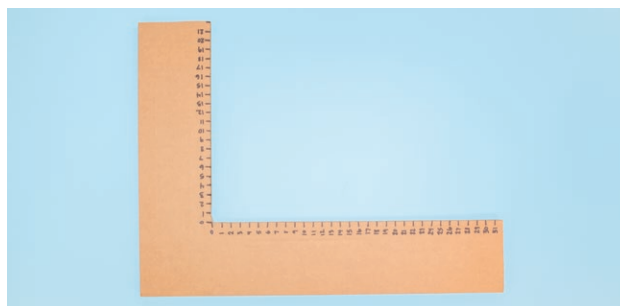
MAKING CARDBOARD CALIPERS

Calipers are a great tool to help you find the width and length of something that is hard to measure, like a round object, your head, or the width of a body part. To make your own calipers, use sturdy, thicker cardboard that won't bend easily when held. This is a perfect way to recycle cardboard boxes!

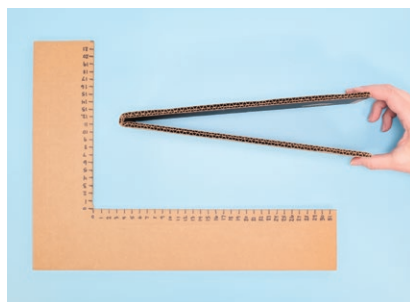


1. Cut 2 pieces of cardboard. Cut the first piece into an L shape. The shorter leg should be 8cm × 30cm (3.15" × 11.80") and the longer leg should be 8cm × 40cm (3.15" × 15.75").

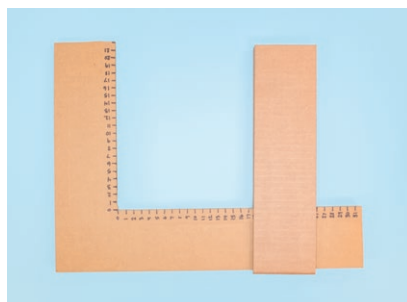
The second piece should be 8cm × 60cm (3.15" × 23.60") and should be cut perpendicular to the corrugation pattern so it will bend easily.



2. Label the inside corner of the L-shaped piece 0 and begin adding measurement hash marks (in inches or centimeters) from that position along both legs.



3. Fold the long strip (the second piece) in half and secure the ends together with hot glue, leaving enough room to slide the piece over the longer end of the L shape. It should be snug but easy to slide.



Your calipers are finished! You can now easily find the width of your head and other objects. Make bigger and smaller versions for your tool collection.

CARING FOR YOUR COSTUME AFTER WEARING

Cleaning

There's nothing worse than a smelly EVA foam costume! Unfortunately, EVA foam cannot be washed or dry cleaned. However, you can still keep your costume smelling its best. Wipe the inside of an EVA foam costume with a damp sponge and mild soap and allow it to completely air-dry after every use. You can also use a deodorizer like Febreze or place a dryer sheet in your costume's garment bag or storage tote to help combat odors.

Storing

Keeping a master list of components in your costume's storage container is a really handy way to make sure you have everything you need for an event or photo shoot. List everything you need from head to toe including wigs, safety pins, backup emergency glue, undergarments, and accessories.

PART 4

PROJECTS



Prop Maker: Downen Creative Studios
Prop: Original Champion Helmet design

Photo by Downen Photography



Concept design by Mathew Grigsby

BUILD NOTES



In this project, you'll create one pauldron and one spaulder. Make a second set for the other shoulder, add more spaulders for a segmented look, or use this pattern for your own custom designs. You'll use several techniques to create this project, including heat forming, tracing, gap filling, sanding edges smooth, and installing Chicago screws and D-rings. Be sure to add this pattern set to your cosplay pattern library to reuse for future builds! To resize this pattern, follow the steps in Refining (page 161).

Materials

Printed Pauldron and Spaulder patterns

6mm EVA foam: 15" × 15"
(38.1cm × 38.1cm)

2mm EVA foam: 8" × 6"
(20.32cm × 15.24cm)

12mm or 10mm EVA foam half
dowel: 13" (33.02cm)

2 Chicago screws: at least 12mm
long

3 D-rings: 1"

1"-wide nylon strapping: 9"

Your favorite gap filler

Sandpaper or a rotary tool with
sanding drum tip

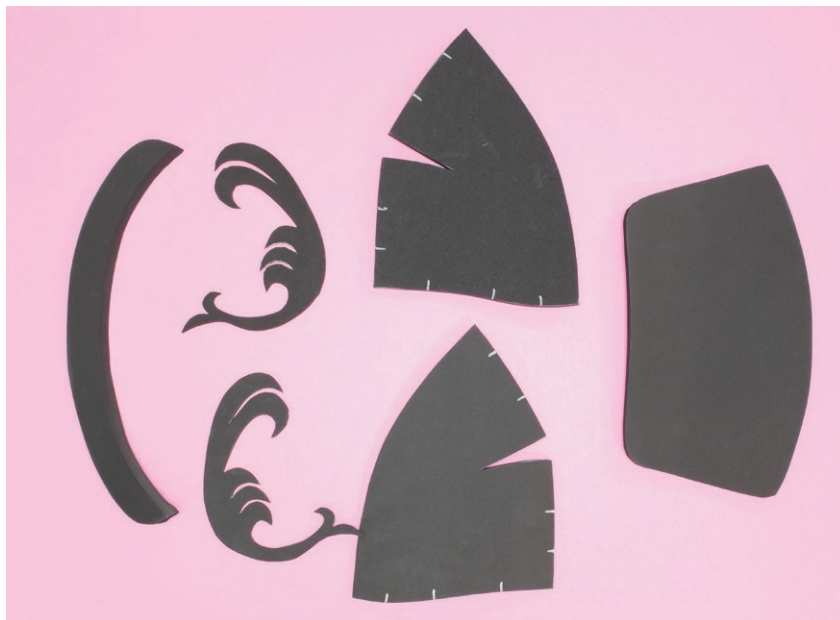
Pauldron Patterns

To access the pauldron pattern pieces through the QR code below, open the camera app on your phone, aim the camera at the QR code, and click the link that pops up on the screen.



To access the pattern through the tiny url, type the web address provided into your browser window.

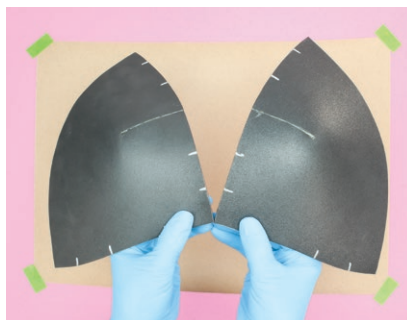
tinyurl.com/11486-pattern1-download



1. Cut out the pieces of the printed pattern and trace the Pauldron, Pauldron Edging, and Spaulder on 6mm EVA foam. Trace the Pauldron Detail on 2mm EVA foam. Be sure to cut 2 pieces where indicated, remembering to flip the pattern piece over before tracing your second shape. Bevel the edges of the Pauldron Edging where indicated on the pattern piece.



2. Heat form the pauldrons using a wooden ball or another sturdy round object.



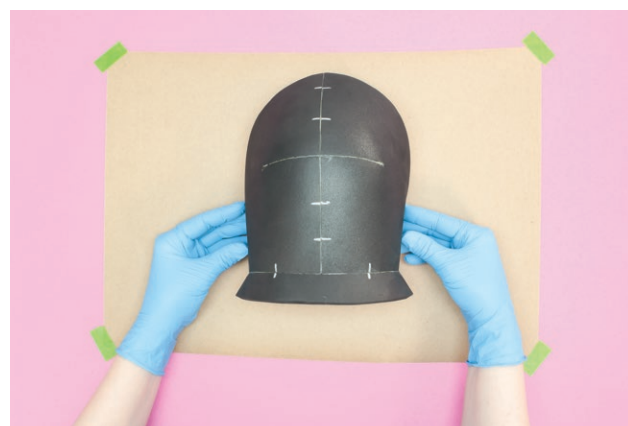
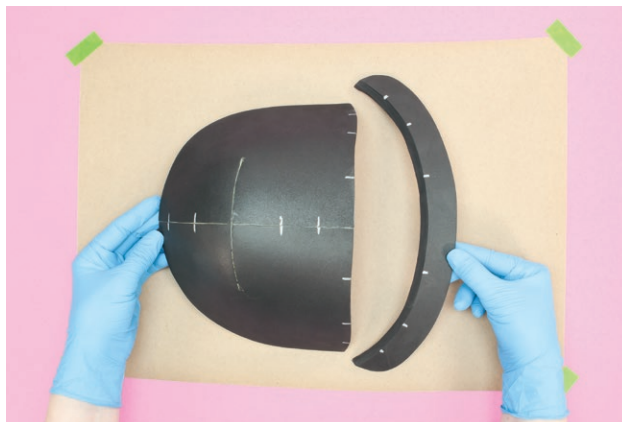
3. Protect your work surface with scrap paper. Using two layers of contact cement, glue the darts together, then glue the pauldron centerlines together.



4. Heat form the pauldron to soften and round out the shape. If the contact cement begins to pull apart, press the seam together again and use a lower temperature to continue heat forming.



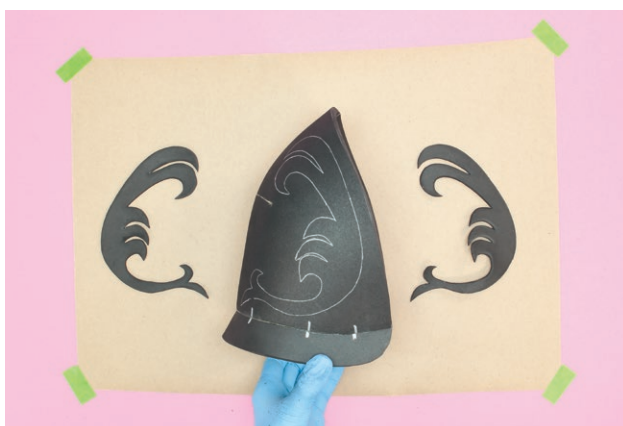
5. Transfer the registration marks to the opposite side of the pauldron edging. This is the side you'll line up with the pauldron.



6. Apply two layers of contact cement and connect the pauldron to the pauldron edging.



7. (Optional) Use a rotary tool to soften the edges of the pauldron details and heat seal.



8. Trace the shapes on the pauldron.



9. Secure the details upside down on your work surface and apply a layer of contact cement.



10. Apply a layer of contact cement inside the detail outlines you just traced, being careful to stay inside the traced lines.



11. When the glue is tacky, apply a slight amount of heat to activate the glue and warm up the details.



12. Press together, following the traced shape. Repeat for the other detail.



13. Clean up the seams with a rotary tool and grinding stone bit. Heat seal when done.



14. Fill any gaps with your favorite gap filler. In this example, Gap Filla was applied with a spatula and smoothed with water and a finger.



15. When completely dry, sand smooth with 320-grit sandpaper.



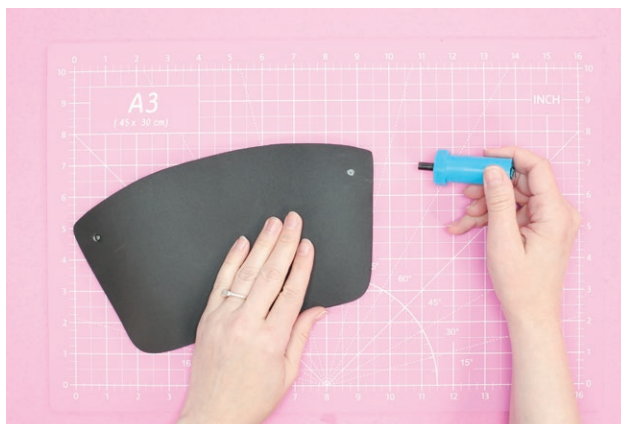
16. Glue the half dowel along the seam between the pauldron and the edging. Clean up the edging with a rotary tool if needed.



17. Smooth the edges of the spaulder piece, heat seal, and shape into a curve.



18. Position the paper Pauldron pattern over the pauldron and use a pen to mark where the Chicago screws are indicated. Repeat with the Spaulder pattern.



19. On the pauldron and spaulder, punch holes where you just marked. The holes should be just wide enough to fit the Chicago screws.



20. Position the spaulder and pauldron together and line up the holes. Insert the Chicago screws.



21. Divide the nylon strap into 3 equal lengths and combine with the 3 D-rings to create strap attachments as shown in the photo. Use hot glue to secure the straps in place on the EVA foam.



All done! You can continue adding straps and details or begin priming and painting your pauldron! Create arm straps with elastic, fabric, or hook-and-loop tape.



Concept design by Mathew Grigsby



This dagger design was created to include many of the skills you've learned throughout this book. In this project, you'll trace, score, and carve details into EVA foam and use PVC piping to create a sturdy handle. If you don't have 8mm and 12mm EVA foam dowels, you can use EVA foam clay formed into dowels, or strips of 4mm and 6mm EVA foam instead and sand the edges with a rotary tool to make your own rounded half dowel.

Materials

Printed Dagger pattern pieces

2mm EVA foam: 20" × 2" (50.8cm × 5.08cm)

4mm EVA foam: 15" × 5" (38.1cm × 12.7cm)

10mm or 12mm EVA foam dowel: 4½" (11.43cm)

8mm EVA foam half dowel: 10" (25.4cm)

12mm EVA foam half dowel: 10" (25.4cm)

½" PVC pipe: 5" (12.7cm)

Chipboard or mat board: 11" × 1.5"
(27.94cm × 3.81cm)

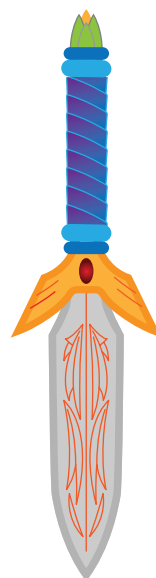
Dagger Patterns

To access the Dagger pattern pieces through the QR code below, open the camera app on your phone, aim the camera at the QR code, and click the link that pops up on the screen.

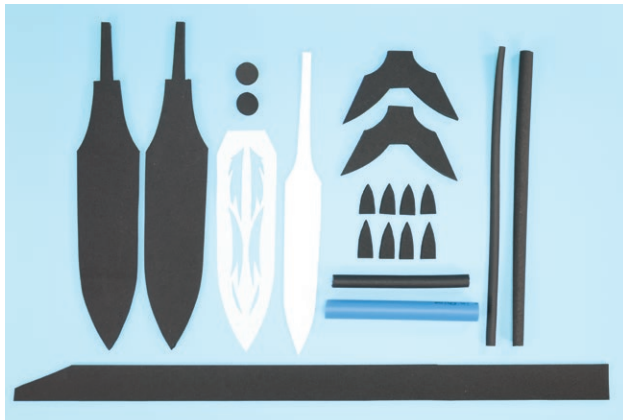


To access the pattern through the tiny url, type the web address provided into your browser window.

tinyurl.com/11486-pattern2-download



Concept design
and illustration by
Mathew Grigsby



1. Cut out the paper pieces labeled Blade and Cross-Guard. Trace on 4mm EVA foam and cut out. Trace bevel guidelines on the blade and cross-guard foam pieces. In this example, the blade support chipboard piece is used to trace the bevel line.



2. Trace the details onto the blades using the Blade Details stencil. Draw a centerline through the long axis of the blade to the tip.



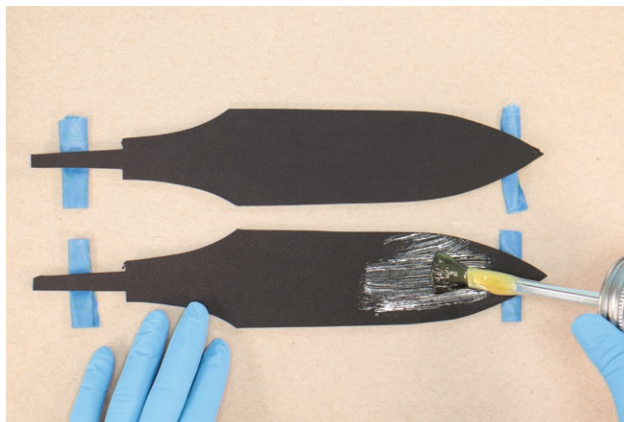
3. Use a rotary tool to sand the edges of the blade and cross-guard pieces, following the bevel guides that you drew in Step 1.



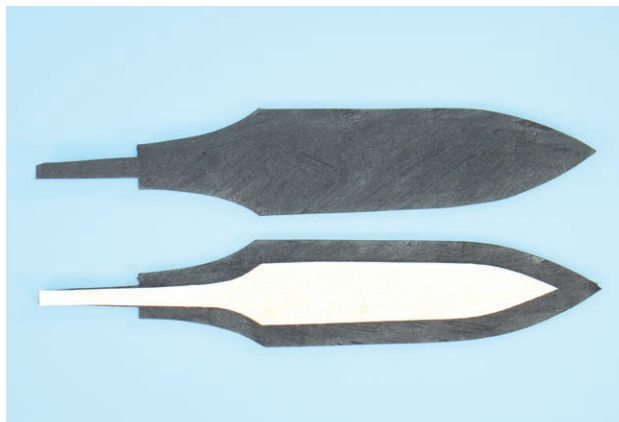
4. Score along the detail guidelines and centerline on the blade and cross-guard pieces. Use the Blade Details Scoring Guide as a visual aid to help you score the lines along the contours.



5. Use a rotary tool to carve the details on the cross-guard.



6. Glue the chipboard between the two blades. Align the chipboard to the edge of the blades as shown.



PRO TIP

Use a clamp to allow you to apply glue to both sides of the chipboard.



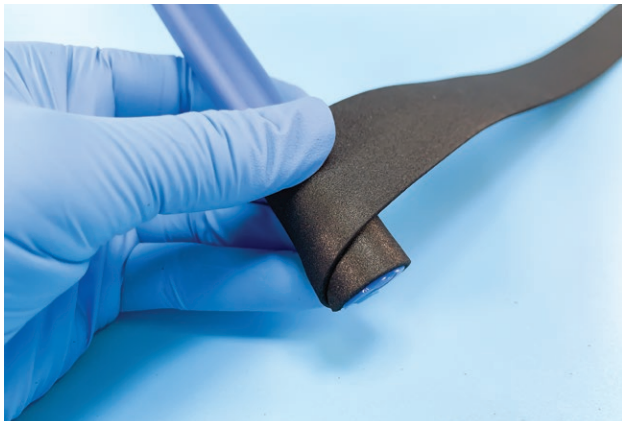
7. Polish the blade bevels, cross-guard bevels, and cross-guard details with a grinding stone bit.



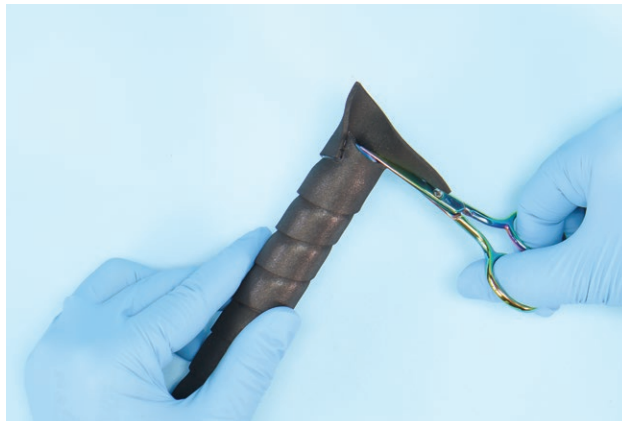
8. Heat seal the blade and cross-guard pieces. This will open and accentuate the scored lines you created in Step 4. Use a needle file to accentuate and soften the scored lines.



9. Lightly sand the edges of the strap and heat seal.



10. Glue the strap to the PVC pipe, placing the angled edge along the bottom edge of the PVC pipe. Wrap the foam around the pipe to create a spiral. Secure the strap with a few dabs of CA glue or hot glue as you wrap.



11. Trim the excess foam.



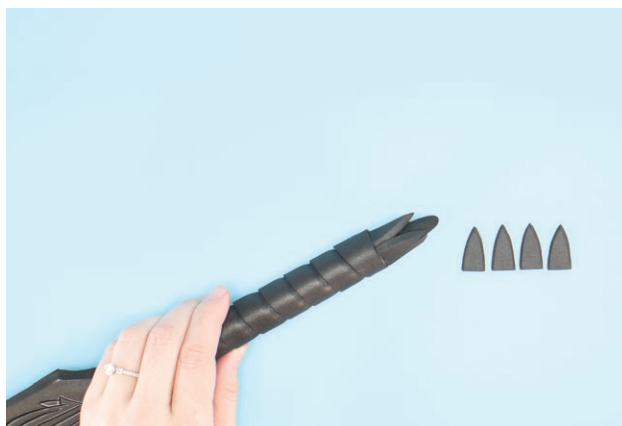
12. Attach the grip to the blade with CA glue.



13. Sand the tip of the dowel to a soft point and heat seal.



14. Insert the dowel inside the PVC pipe and glue in place.



15. Cut out the pommel details using a bevel cut along the curved lines. Attach the pommel details to the dowel.



16. Position the cross-guard pieces at the base of the grip and draw a guideline where the top of the cross-guard meets the blade.



17. Apply two layers of contact cement on the cross-guard pieces and the blade, staying inside the guideline. Attach the cross-guard pieces to the blade and press together. Start with the tips of the wings for best alignment.



18. Carve and shape the cross-guard wings to enhance the details. Smooth with a grinding stone bit and heat seal.



19. Wrap the half-round dowels around the top and bottom of the grip to cover the grip seams and secure them with CA glue.



20. Shape the cross-guard gem with a rotary tool, heat seal, and attach to the cross-guard. Done! You can seal and paint your new dagger!



PRO TIP

You can substitute the cross-guard gem with a sparkly stone or create your own gem using a thermoplastic like Worbla's Crystal Art.

**PRO TIP**

Remember that your helmet will become slightly smaller as you use thicker materials, so plan accordingly.

Materials

Printed Champion Helmet patterns

4mm EVA foam: 23" × 23" (58.42cm × 58.42cm).

Increase to 24" × 24" (60.96cm × 60.96cm) if increasing the pattern size more than 5%.

Helmet Patterns

To access the Champion Helmet pattern pieces through the QR code below, open the camera app on your phone, aim the camera at the QR code, and click the link that pops up on the screen.



To access the pattern through the tiny url, type the web address provided into your browser window.

tinyurl.com/11486-pattern3-download

BUILD NOTES

This is a great basic helmet to have in your pattern library! No hardware is required for this project. This helmet will generously fit a head with a 21" circumference and have room for a wig. To change the size of this helmet design, enlarge or decrease the pattern pieces by increments of 5%–10% when printing the pattern. Create paper mock-ups until you reach the desired size, but remember that paper is much thinner than EVA foam, so you will need to increase the size of your pattern pieces a bit to account for the additional material thickness. When you flip a piece to trace the second side, remember to label the sides *left* and *right*.

1. Print and cut out 2 copies each of the 1, 2, and 3 pieces of the Helmet pattern. The second copy will be the right side of the helmet base. Tape the paper pattern pieces together following the assembly steps and try it on. If adjustments are needed, increase or decrease, cut out, and try on again. As you increase and decrease, note the increment of change. Once you have your final desired size, print out a fresh copy of all of the pattern pieces at that same size.

2. Transfer all of your final pattern pieces with all labels and registration marks to chipboard or thin cardboard and cut out. Trace on 4mm EVA foam and cut out the pieces, being sure to cut 1, 2, or 3 identical pieces as instructed on the pattern piece. Remember to flip the pattern pieces 1, 2, and 3 over before tracing your second set of shapes. Label all pieces with all registration marks, directional labels, and pattern piece numbers.



3. Heat form pieces 1R, 1L, 2R, 2L, 3R, and 3L.



4. Attach 2R to 3R and 2L to 3L with contact cement.



5. Attach 1R to 2R and 1L to 2L with contact cement.



6. Attach 1R and 1L using contact cement.



7. Glue the back piece to the assembled helmet.



8. Assemble the crest box and attach it to the helmet at the crest front placement guide.



9. Cut the plume fringe along the lines to create a fringe, leaving approximately 6mm uncut at the base. Glue the plume pieces together at the base to create one piece.



10. Attach the visor to the front and the plume to the center of the crest top.

All done! You can heat seal the helmet, prime and paint, or add more details!



Concept design by Mathew Grigsby

BUILD NOTES

In this project, you'll get a chance to practice several skills you've learned in this book! This spellbook has lots of fun details and a foam core inner box that can even be used as storage. You'll be cutting a few thicknesses of EVA foam, tracing details, scoring, and cutting bevels to create this project.

The measurements for this project are best done in centimeters and millimeters due to the thickness of the materials that are required for the build.

Materials

Printed Spellbook patterns

5mm EVA foam: 30" × 15"
(75cm × 38cm)

5mm foam core: 23" × 13"
(58cm × 32cm)

2mm EVA foam: 27" × 12"
(68cm × 30cm)

Chipboard: 16" × 4" (40cm × 9cm)

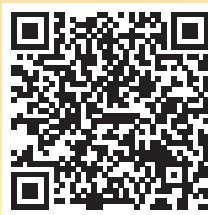
Nonstick silicone mat

Optional

CosBond

Spellbook Patterns

To access the Spellbook pattern pieces through the QR code below, open the camera app on your phone, aim the camera at the QR code, and click the link that pops up on the screen.



To access the pattern through the tiny url, type the web address provided into your browser window.
tinyurl.com/11486-pattern4-download

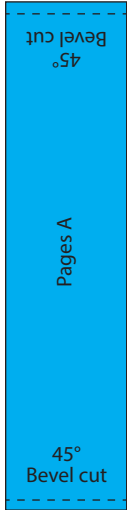
CUTTING YOUR FOAM

Be sure to label your foam pieces as you cut.

5mm Foam

Cut 1 Cover 56cm × 35cm

Cut 1 Pages A 31.5cm × 7.5cm



Cut 2 Pages B 21.5cm × 7.5cm.
Bevel 1 edge as indicated below.



Foam Core

Cut 1 Box Top 21cm × 30cm

Cut 1 Box Base 20cm × 29cm

Cut 2 Box Side A 29cm × 7cm

Cut 2 Box Side B 21cm × 7cm

2mm Foam

Cut out the pattern pieces as labeled

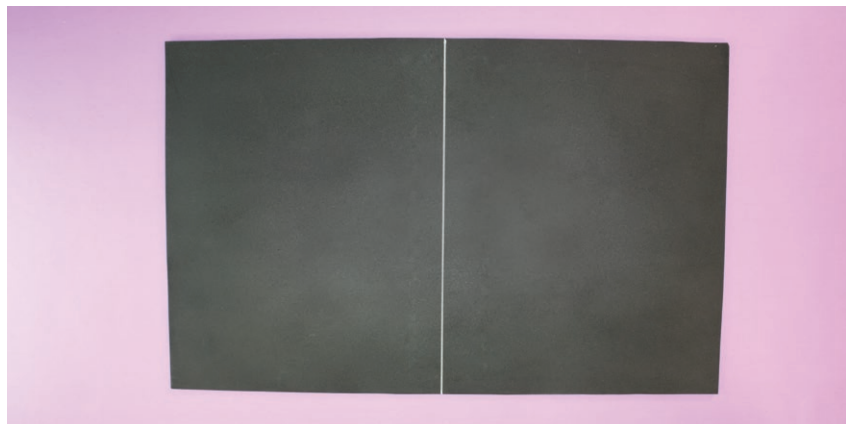


1. Attach foam core pieces box side A (2) and box side B (2) to box base. Use a nonstick silicone mat to protect your work surface from the glue as you press the edges together.

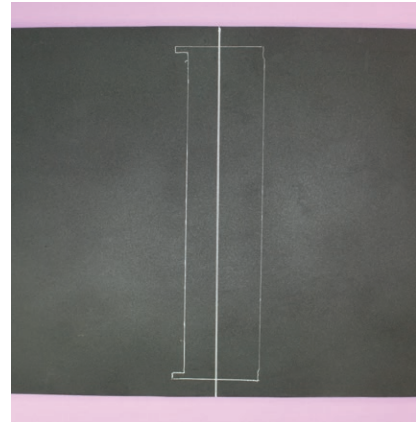


2. Score and heat seal pages A and pages B as shown.

3. Glue pages A and pages B to the foam core box sides with contact cement, aligning the beveled edges at the corners.



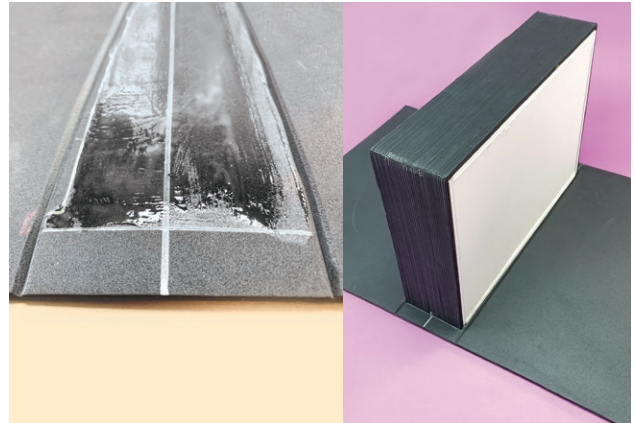
4. Heat seal the cover and mark the centerline.



5. Position the center of the box with the cover and trace.



6. Cut two beveled channels on the outer edge of the box outline. This is to help reduce the bulk of the material so the cover can close easily.



7. Glue the box in place with two layers of contact cement. Be sure to follow the traced outline of the box when applying glue.



8. Fold the box, box bottom side down, over the cover and trace the box outline on the back cover. Use this line as a guideline for applying contact cement. Glue in place.





9. Position the box top inside the box.



10. Use a strong double-sided adhesive tape like CosBond to tack the box top to the cover. Place strips of tape along the edges of the foam core.



11. Next, fold the cover over the box top and press firmly. Open the box cover. The foam core box top should be attached to the cover and is now aligned perfectly.



12. Trace the outline of the box top to create a glue guideline. Glue the box top in place with contact cement.





13. Round the corners of the book with a rotary tool. Referring to the placement diagram, trace and attach corner A to the corners with contact cement or CA glue.



14. Referring to the placement diagram, trace and attach corner B.



15. Referring to the placement diagram, trace and attach the edging strips to the corners.



16. Heat seal front detail layer and back detail layer. Referring to the placement diagram, position on the front and back covers. Trace and glue in place with contact cement.



17. Transfer the stencils to chipboard and cut out. Trace the stencil shapes around the edges and corners as indicated on the placement diagram, which can be found on the spellbook pattern download.



18. Score the traced stenciled details, being sure to cut along the outside of the pen lines. Heat seal to open the scored lines.



19. Referring to the placement diagram on the pattern download, attach the remaining details to the back and the front. Use a ruler to find the center if needed.



20. Score around the edges of the binding straps, as shown, and heat seal. Mark the centers and attach to the spine with contact cement.



21. Add foam rivets to corners, straps, and binding.



Done! Your spellbook is ready for textures, paint and more details if you desire!



BUILD NOTES

A duct tape body form is an excellent patterning tool that is a must-have for any cosplayer for patterning, fitting, and even displaying your finished costume! Grab a friend to create a whole-body form, or create a single body part to help your designing and patterning process for projects like arm or leg armor. In the first section, you'll see how to create a whole-body form.

The second section will walk you through creating an optional inner support structure of PVC. An inner structure will allow you to hang your body form for easy accessibility, but the rigid piping will prevent the lower legs from being folded and manipulated into close-fitting forms like a tight body suit. If you aren't sure, you can always add PVC piping at a later time or create more than one body form.

Project time: It takes approximately 2 hours to create the duct tape shell and an additional hour to tape it together again.

SAFETY TIPS

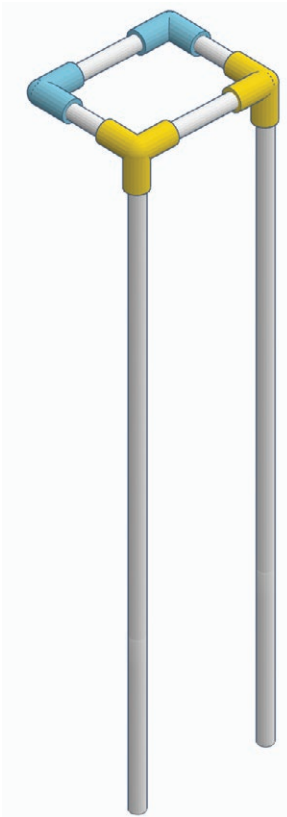
- Always have at least one good friend helping you when creating a full body form. This project involves applying tape directly to the entire body, so choose someone you feel comfortable with and let them know exactly what to expect and what their role will be.
- To speed up the process and reduce the amount of time the model will be standing, precut an entire roll of duct tape into various lengths to have ready for swift application. Include thin, short strips about 3" long.
- Rub the slick side of the duct tape pieces with alcohol to remove the coating slightly. This helps duct tape stick to itself.
- Be sure not to lock your knees as you are being taped.
- Cut taped arms (from wrist to upper arm) and legs (from ankle to upper leg) to release as you are working on another body part. There's no need to keep every taped part fully intact once it is completed.
- Provide a chair with a back for the model to hold on to and stabilize themselves.
- If the model is feeling too hot or uncomfortable, remove the body form right away.
- Have a glass of ice water with a straw nearby to hydrate and cool the model.

Materials

Comfortable, close-fitting clothing
 Medical scissors
 Duct tape
 Plastic wrap
 Sharpie
 Chair with a back
 Polyester fiber fill, scrap fabric, or plastic bags
 Sturdy cardboard

Optional

½" PVC pipe: To calculate how much pipe you will need, skip ahead to Adding the PVC Core (page 235).
 2 PVC ½" side outlet 90° socket × socket × socket elbow (consult the image at right to be sure you are purchasing the correct fittings)
 2 PVC ½" 90° socket × socket elbow
 1" Nylon strap: at least 48" long
 1 PVC reducer bushing: 1" × ¾"



The yellow fittings are side outlet 90° side elbows and the blue fittings are 90° elbows

PRO TIPS

- Wear thin leggings and a long sleeve shirt that you don't mind possibly damaging.
- Wear undergarments like shapewear if you're planning on wearing it under your costumes.

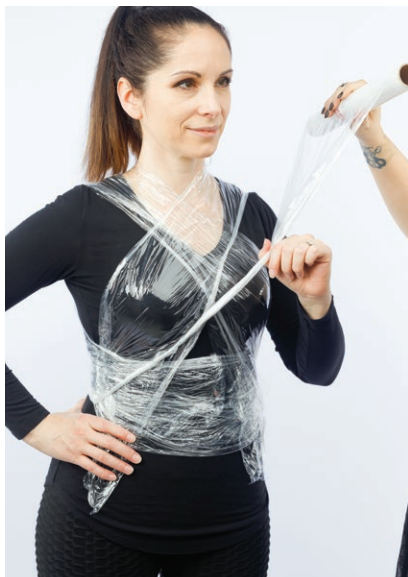
CREATING THE SHELL



1. Wrap a layer of plastic wrap around the torso, under the bust.



2. Wrap a strip over the bust and over the opposite shoulder. Repeat for the other side.



3. If you need to create more bust definition, add another layer of plastic wrap, twisting the roll as you guide the plastic firmly from the waist and over the opposite shoulder. Repeat for the other side. Having an assistant you are comfortable with is key to getting good results on this step.



4. Continue wrapping the lower torso.



5. To cover the crotch area, place a single layer of plastic from the belly button to just below the waist in the back. To do this without touching sensitive areas, hold the end of the plastic at your belly button as your assistant gently guides the plastic through your legs and attaches the plastic to your back.



6. Continue wrapping the lower legs and arms.



7. Place a long strip of tape around your waist, just under the bust. Add strips across the bust as shown and down the torso. The tape should be secure, but not too tight.



8. Once you reach the lower hips, place tape through the crotch, and add pieces at a diagonal along where the underwear line would be in the front and the back. This will add stability.

9. Continue placing strips of tape along the leg. Try to flatten the tape along the curvature of the leg as best as you can, being sure to overlap each piece. Be sure not to wrap too tightly around the knees and ankles.



SAFETY CHECK

This is a great place to do a safety check. Ask if your model (or yourself if you are the model) needs a break, if you are the model) needs a break, is getting too hot, or is becoming fatigued. Pause for a rest, or grab a glass of ice water.



10. Place tape along the sides of the bust, just in front of the armpit.



11. Continue placing shorter pieces of tape along the curvature of the bust.



12. Place tape along the upper chest and upper back.



13. Place shorter strips at each wrist, working your way up to each armpit. Be sure not to wrap wrists too tightly, and stretch the shirt sleeve toward the fingers so it is easily accessible.



14. To cover the armpit, cut a piece of tape into an hourglass shape. Position the tape so the curved cutouts are under the armpit.



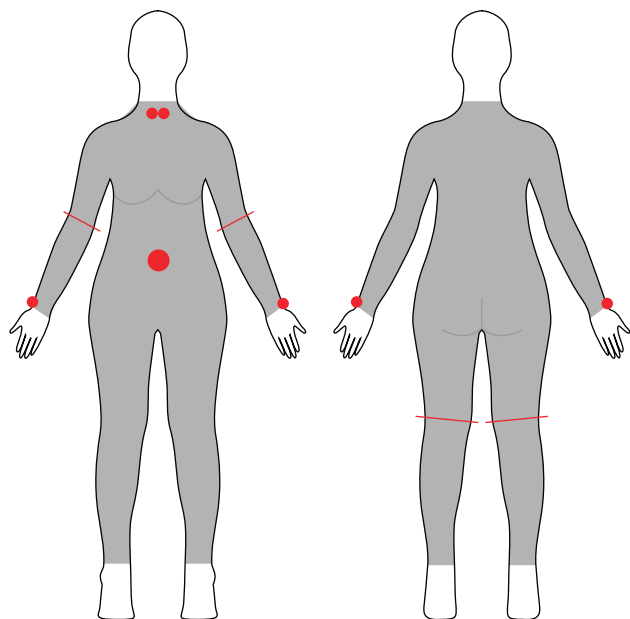
15. Continue adding tape strips for the collar area. Be sure not to wrap the collar too tightly.



16. Add long strips perpendicularly along legs, torso front and back, and arms. This will add stability and prevent tearing when stuffing.

17. Cover all small parts that may have been missed.





18. Once you are done taping, mark the belly button, inside arm creases, wrists, backs of knees, kneecaps, and neckline with a Sharpie.



19. Draw guidelines to help you cut, as shown.



20. Using medical scissors or safety scissors with a blunt tip, start cutting at the center of the upper back and continue down the center of the back of each leg.



21. Continue for arms, starting at the wrists. Cut slowly and carefully through the plastic wrap and tape, through the crease of the elbow and up to the shoulder to release the arms. It is helpful if the model holds the shirt sleeve in place to prevent the scissors from accidentally cutting through the fabric.



The shell is finished!

REASSEMBLING

Once you've recovered a little from making (or modelling for) a duct tape body form, get prepared to reassemble the form!

1. Tape the leg seam together, starting at the ankles. Add stuffing a little at a time, taping the seam together as you move up the leg.



2. Measure the width and the length of your ankle, or use cardboard calipers to find the dimensions. Using cardboard, cut a shape approximately the same size as those proportions and tape securely to the ends of the ankles on your form. Label them front, back, left and right. Using smaller, thinner strips of tape will make this process a bit easier.

3. Continue stuffing and taping the leg seams together using short pieces of tape until you reach the waist.

These next steps are optional. If you don't wish to insert a PVC inner structure or install a strap for hanging, skip ahead to Step 13.

Adding the PVC Core

4. To figure out how much piping you'll need and the lengths you'll need to cut for each piece, note the measurements (in inches or centimeters) of the following areas on this worksheet:



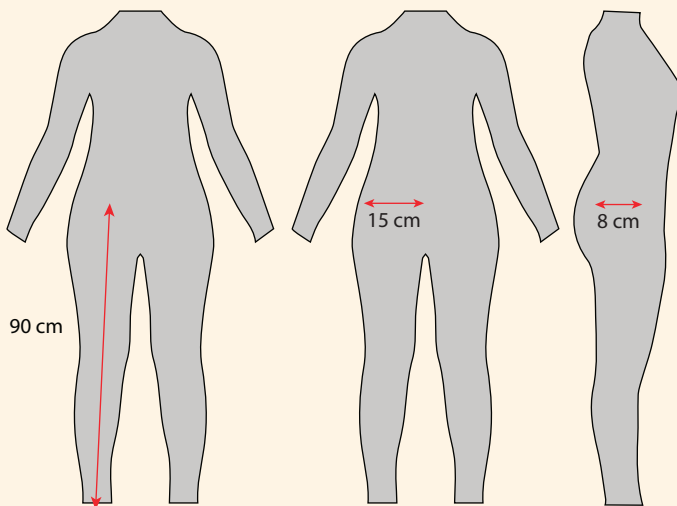
Ankle to belly button =

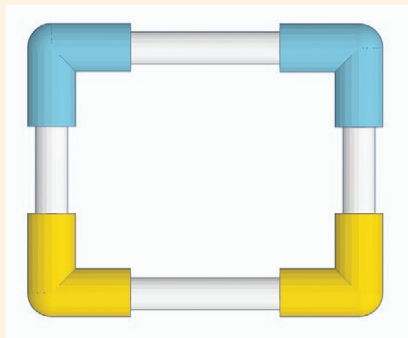
½ depth of waist =

½ width of waist =

Total = $\times 2$ = the total length of PVC pipe needed.

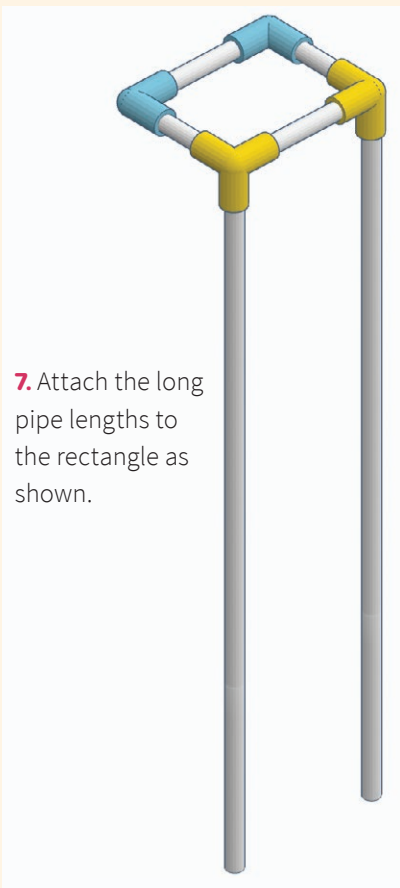
Example: $90\text{cm} + 15\text{cm} + 8\text{cm} = 113\text{cm} \times 2 = 226\text{cm}$



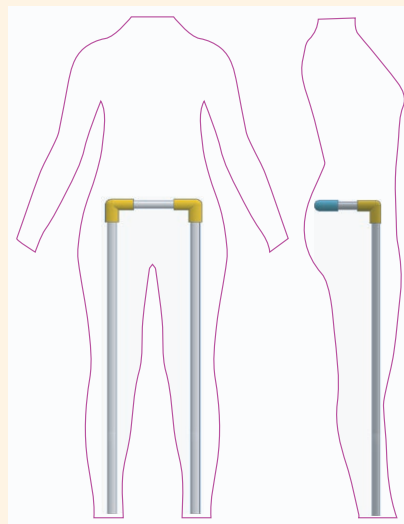


5. Use a hacksaw, scroll saw, or a rotary tool to cut the PVC pipe to the lengths that you measured.

6. Assemble the PVC pipe and connectors. Connect the shorter pipe lengths together as shown to create a rectangle. For extra stability, glue the PVC pipes and connectors in place with hot glue or CA glue.



7. Attach the long pipe lengths to the rectangle as shown.



8. Position the PVC frame inside the duct tape form as shown.



9. Insert the PVC into the legs as far as it will go. Check the fit to ensure the PVC doesn't touch the sides of the body form. Make adjustments if needed.



10. Add stuffing to fill the remainder of the legs and into the lower torso. Be sure to add enough material to completely surround the PVC so that none of the piping is in contact with the duct tape.



11. Cut a length of nylon strapping and securely tie one end to the front of the small rectangular frame.



12. Position the free end of the strap through the upper torso. The strap should be long enough to exit through the neck area with at least an additional 50cm extra length.



13. Continue taping and stuffing the lower torso to the waist.



14. Before taping all the way up the back, begin taping the arms, starting at the wrists. Place a few pieces of tape and stop.



15. Create cardboard end caps for both wrists as you did for both ankles in Step 2.



16. Continue stuffing and taping the arms.



17. Add more stuffing to the shoulders and neck area. If you've added a PVC inner structure, make sure the strap is positioned in the center of the torso. The best way to do this is to make sure to add stuffing to surround the strap evenly on all sides.

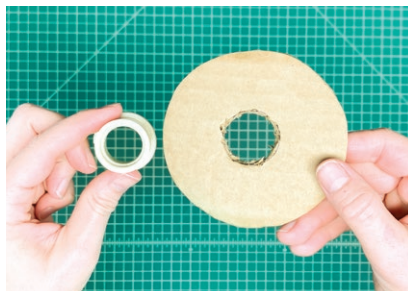


18. Tape the back and add more stuffing if needed to fill out the chest area.





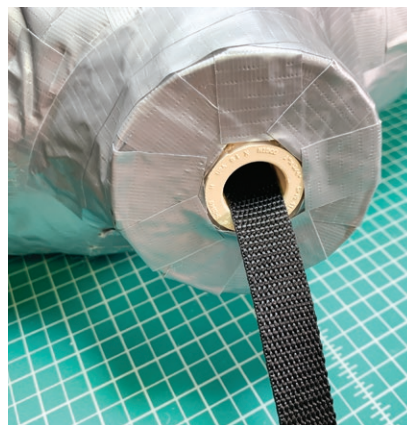
19. Create a neck shape using sturdy cardboard. Cut two identical shapes and hot glue them securely together. If you haven't added a PVC inner structure, tape the cardboard circle into the neck of the body form and you have finished your body form! If you have added a PVC structure, continue to the next step.



20. Place the smaller diameter of the PVC reducer bushing in the center of the neck-shaped cardboard and trace. Cut out the shape and push the reducer bushing through the hole to check the fit. It should fit snugly. If the hole is too large, cut another cardboard circle and try again. Secure the cardboard to the PVC reducer bushing with hot glue on both sides.



21. Thread the strap through the cardboard, and tape the cardboard to the body form with short pieces of tape.



22. Tie the end of the strap in a secure loop for hanging.

All done! Be sure to thoroughly inspect the entire form for areas that may be missing tape, and cover any trouble spots with more tape.

PRO TIPS

- Use cardboard calipers to help maintain the correct proportions. To make your own, skip back to Making Cardboard Calipers (page 206).
- Don't overstuff the form.
- Create removable arms! Detach and add cardboard ends on the arms at the armpit. Attach heavy-duty magnets to each side.



EVA FOAM SUPPLIERS AND COSPLAY SUPPLY RESOURCES

TNT Cosplay Supply (U.S.): tntcosplaysupply.com

Manhattan Wardrobe Supply (U.S.):
wardrobesupplies.com

Micro-Mark (U.S.): micromark.com

JOANN Fabric and Craft (U.S.): joann.com

HD-Foam (U.S.): dickblick.com

What The Foam (U.S.): cosplayapprentice.com

The Foamory (U.S.): thefoamory.com

Cosplay Pros (U.S.): thecosplaypros.com

Michaels (U.S.): michaels.com

Lumin's Workshop (Canada): luminsworkshop.com

Poly-Props Ltd (UK): poly-props.com

Tyges (UK): tyges.co.uk

Coscraft (UK): coscraft.co.uk

CosplayShop (Germany): cosplayshop.be

EVA FOAM PATTERNS

Downen Creative Studios: downencreativestudios.com

Punished Props Academy: punishedprops.com

Evil Ted Smith: eviltedsmith.com

Kamui Cosplay: kamuicosplay.com

Kinpatsu Cosplay: kinpatsucosplay.com

SKS Props LLC: sksprops.com

Mellowmind Cosplay: mellowmind.co.uk

SPECIALTY EVA FOAM

To pick up foam chain maille, visit the Foam Armory.

Foam Armory: foamarmory.com

THERMOPLASTICS

Worbla: worbla.com • cast4art.de

Thibra: thibra.com

Wonderflex: wonderflexworld.com

TerraFlex: tandyleather.com

InstaMorph: instamorph.com

MTP: micromark.com

ADHESIVES, TAPE, AND HOOK-AND-LOOP TAPE

Barge Contact Cement: bargeadhesive.com

CosBond: cos-bond.com

Cosplay Stik: surebonder.com

Tear-Perfect Maker Tape: ctpub.com > *search* Tear-Perfect Maker-Tape

Ultra Thin Hook & Loop: imperialsurfaceshop.com

SPECIALTY TOOLS

Cos-Tools: logangraphic.com

GAP FILLERS AND SURFACE SMOOTHERS

Foam Putty: modeltrainstuff.com

Flexi Filler: wardrobesupplies.com

Gap Filla: tntcosplaysupply.com

Rapid Fill and Fine Finish: tntcosplaysupply.com

PRIMERS

PlaidFX Paint Primer: plaidonline.com/plaidfx

PRIME: tntcosplaysupply.com

Flexbond: worbla.com

Creature Cast: creaturecastrubber.com

PAINT AND PRIMER COMBINATIONS

PlaidFX Smooth Satin: plaidonline.com/plaidfx

Flexi Paint: wardrobesupplies.com

Hexflex: tntcosplaysupply.com

ABOUT THE AUTHOR



Photo by Downen Photography

BEVERLY DOWNEN (Downen Creative Studios) is a master-level, award-winning cosplayer with a degree in industrial design and a passion for educating other creators and builders. She is especially known for her incredibly detailed, screen-accurate builds and extensive write-ups and tutorials. Her primary goal is to share her in-depth, hands-on knowledge with makers around the world, encourage them to try new techniques, and provide them with the skills and confidence to stride beyond their comfort zone—all while having fun!

Visit Downen Creative Studios online and follow on social media!

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In this comprehensive guide to making and patterning with foam, Beverly brings her vast knowledge of building processes, research, and techniques in a single resource, to give you the tools to create, learn and be inspired!

Cosplayer's Ultimate Guide to EVA Foam Download

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