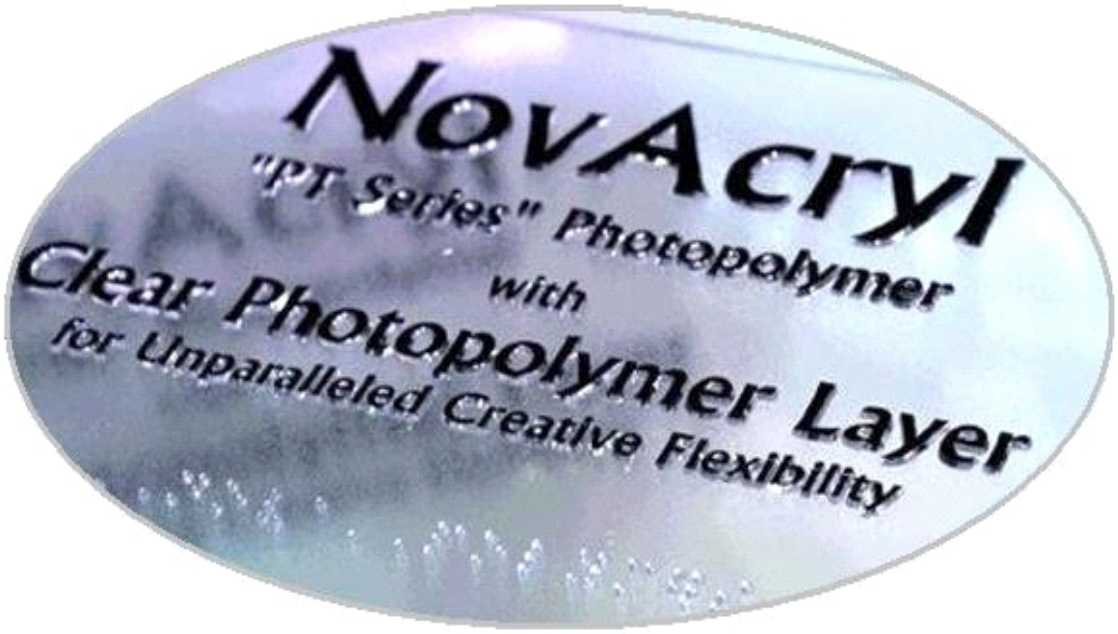
Fabricating Raised Graphic & ADA Compliant Signage using Photopolymer



What You Will Need.....

Manufacturing the highest quality ADA compliant and raised graphic signs with **NovAcryl** and other Nova photopolymers requires a few basic shop elements. The following checklist will help determine the capital investment needed to begin fabricating photopolymer signs in-house.

1) Means to generate artwork and **Film Negative** with Grade II Braille.
   - Laser Printer, Camera and Darkroom
   - Plotter to cut Rubylith or Vinyl
   - **EcoPRO Dry Film Imager** (Nova Polymers)
   - EPSON 7600 ink jet with special software and film media
2) **Shear** (Nova Polymers) or **Saw** for cutting photopolymer materials before or after processing.
3) **Novapress 70** Photopolymer Processing Unit (Nova Polymers)
4) Shop equipment for fabricating and finishing.
5) Paint Booth for applying automotive grade acrylic polyurethane paints.
6) **Hot Stamp** unit (Nova Polymers) or silk screen capabilities for finishing.

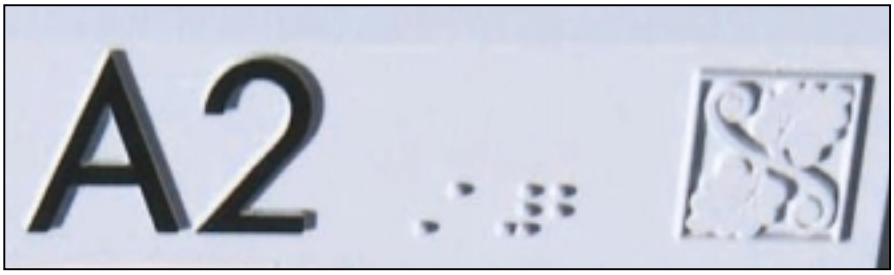
With the right tools in place, you are ready to begin. Photopolymer signs represent the pinnacle of high end fabrication for raised graphics. We hope the following pages offer insight to our years of research and hands-on experience.

Generating Proper Film Negatives

Since photopolymer graphics are created through photographic exposure, generating consistent film negatives is perhaps the most critical first step in manufacturing photopolymer signage. Why? Because, in many cases, improperly processed photopolymer becomes costly waste. Successful processing is dependent almost entirely on the initial exposure.

There are THREE general types of film negatives; Film, rubylith and velum. There are also several ways to generate each general type and each can deliver acceptable results. Photopolymer processing is customized around the type of processing equipment and film output you use. Customizing involves Braille diameter and exposure. The primary consideration when choosing a film type should always be the potential effect on the photopolymer's durability. No film source, no matter how economical, is worth the cost of reduced durability and raw material waste.

The following information describes the most common methods of producing film and what you need to be aware of when translating design into film. You need to alter Braille Diameter in your software package. This adjustment is needed to create the rounded effect being emphasized in the new ANSI standards.



Braille Translation Software

Grade II Braille translation software is available from a variety of sources. DUXBURY SYSTEMS is perhaps the most popular. Their technical support team can guide you through the necessary adjustments. With the variety of film types available, you need to adjust Braille diameter to achieve optimum results. With the emphasis on "**rounded or domed**" Braille, customizing diameter is almost mandatory.

Braille software generally starts with the diameter measurement of a dot's base. When translated to film without adjustment, the .060” base diameter becomes the surface diameter after processing. The readable surface diameter of Raster Braille (domed) is between .028” and .042”. Modifying the surface diameter of photopolymer Braille to between .035” and .040” will produce a similar readable surface (rounded).

Generating Proper Film Negatives (cont.)

Film Negative

Film negatives can be produced through a variety of methods. The most commonly used are listed below along with some of the advantages and disadvantages of each:

1) **Processed Film with Stat Camera** - Photographing your laser printed art onto film negative with a darkroom camera and processing with activator and fixer chemicals. Generally inexpensive if you already have a stat camera and film processor. Density problems arise with changes in the activator such as age and temperature. When activator is cold or weak, the emulsion of this type of film will allow blue spectrum UV to penetrate and contaminate the photopolymer. There is also the added responsibility of spent processing chemical disposal.

2) **Processed Film direct to Linotronic** - Similar processing to stat camera method without the camera. The film is imaged through a digital unit and transferred by canister to a processor. The processor uses activator and fixer. The results are generally more consistent and not as messy. However, the same problems of UV penetration exist with this type of film emulsion. Disposing of spent chemicals must also be addressed.

3) **Ink Jet Film** - A relatively new and effective method of generating wide format film. Using an EPSON Stylus PRO 7600 ink jet along with special film and rip software will allow you to print opaque film up to 24" in width. This method also gives you other options, providing you with high quality four color output. The advantages are somewhat offset by slower speed printing and ink usage.

4) **Thermal Imaging Film** - The use of thermal imaging media for producing photopolymer film has grown over the past few years. The opacity is superior and there are no chemicals, toners or other expensive ancillary items to manage. The **EcoPRO Dry Film Imager** is a popular printer within the sign industry. It will produce films up to 12" wide by a variety of lengths up to 25" or more. When you compare the disproportionately high cost of thermal imagers producing wider films, it becomes an extremely useful tool for the established or start-up photopolymer fabricator.

When using any of the previously described methods for making film, we recommend you reduce Braille diameter to between .040"-.035". Be certain to maintain the distance between dot centers for proper separation**.**

Generating Proper Film Negatives (cont.)

Rubylith (Amberlith) Negative

Cutting rubylith is an easy way to get started when other film systems are not an immediate option. "Ruby" is easily cut on your plotter and has almost unlimited photo-latitude. Many shops already cut ruby for screen printing positives. If you choose this method, remember that unlike screen printing, you are weeding only the image you wish to have raised. Braille can be weeded with a small piece of masking tape wrapped around your finger. It is very difficult to overexpose standard photopolymers when using ruby or amberlith since blue UV light can not penetrate the red tint.

You will expose the raw photopolymer through the back (carrier) of the rubylith. The rubylith emulsion MUST maintain intimate contact with the photopolymer surface throughout the exposure. You should cut the ruby in mirror image. Problems may arise when a plotter cuts too deep into the ruby's clear Mylar carrier. Deep blade cuts make drawing a good vacuum extremely difficult and may cause light distortion during exposure. To test if your blade pressure is acceptable, flip the ruby upside down after it comes off the plotter and before you spend time weeding it. If you can see the blade impression through the back, you have probably cut too deep. Be sure you use a sharp blade and minimal pressure.

For this film method, Braille diameter reduction is identical to processed film. Be sure your plotter can cut small dots without distorting them or leaving tears where the blade lifts. Small imperfections are usually covered when the photopolymer is painted.

Velum Negative

Although producing film with laser printed velum paper is fast and relatively inexpensive, we do not recommend it simply because of overall poor quality and raw material waste when using it. Velum generally filters and distorts UV as it penetrates the photopolymer, reducing shoulder draft. There is little photo latitude and it gets worse when toner quality drops by a fraction. Combine that with low angle shoulder draft and you lose durability. You will likely see several bad exposures with each job. The cost of raw material waste should discourage anyone from maintaining this type of film system for long.

However, if you have no alternative, generate the velum film from a good quality laser printer. Be certain to print in mirror image since you will be exposing through the back of the velum. Before you begin processing the photopolymer, spray the toner side of the velum with KRYLON 1311 CLEAR MATTE spray paint (usually available at any hardware or paint store). The coating will increase toner density and dramatically increase your photo-latitude. Braille diameter should be reduced only slightly from original size. This will help produce more durable results but not truly acceptable rounded Braille.

Example of Nova **YA-125** Aluminum backed photopolymer.
Clear photopolymer for brushed aluminum appearance.
Hot stamp raised elements.
Matthews Polyurethane satin clear coat for ADA compliance.

Processing Photopolymer Sheets

NovAcryl™

Clear Photopolymers for the creative mind

Novapress 70
Photopolymer processor

After you have produced a film negative, the next step in sign fabrication is to process the photopolymer sheet. It is a very simple process requiring only about 30 minutes using a **Novapress 70** processing unit. The **Novapress 70** is a complete four stage unit and can process up to **70 flats** of photopolymer each day.

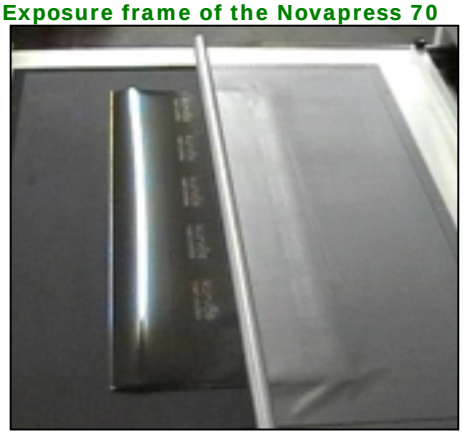
Step One

Exposing the Photopolymer

Layout of the sign artwork size should be 1/32" to 1/8" larger around the finished size. This allows for proper finishing using whatever technique you prefer. The most common indicators are registration marks or a border around the entire outer area. If you intend to rout to finished size, use a small 2 point border.

It is most efficient to format a sheet of material in advance. Do this by laying out a piece of white acrylic across a work table. Draw out a 19" x 25" grid using permanent marker, marking every inch horizontal and vertical. Use this grid to arrange your films for optimum yield. You can format a full day's work for convenience. You will also find that having a way to cut material near the process area will help tremendously. We recommend 19" table top guillotine shears to cut **NovAcryl** and thin aluminum. Rough cutting capabilities will increase efficiency and cut down on costly waste.

Exposure frame of the Novapress 70



- Place the photopolymer sheet on the exposure frame, FACE UP.
- TURN ON VACUUM and peel away clear protective cover film.
- Place your artwork EMULSION DOWN on the photopolymer sheet.
- Roll the VINYL COVER SHEET over both.
- Achieve vacuum pressure.
- Gently rub out any air pockets with hand or cloth covered block.
- Push exposure tray in and UV light will expose the photopolymer.

Processing Photopolymer Sheets (cont.)

Step Two

Washout (Etch)

Photopolymer washout is performed in plain tap water at room temperature using a soft nylon brush system submerged in water. The photopolymer will rotate in both directions to ensure a clean washout. Aside from the raised elements, there should be no remaining photopolymer on the base plate. Waste water is EPA approved and biodegradable. Since most processing units are self contained, you should change the water in the washout tank every 8-10 sheets.

- After exposure, remove photopolymer and negative.
- Mount photopolymer to adhesive mat on the lid of washout tank.
- Set washout timer to recommended duration (5:00-6:00 min).
- Lower the lid so photopolymer is face down in water and in contact with brush section.
- Washout unexposed photopolymer.

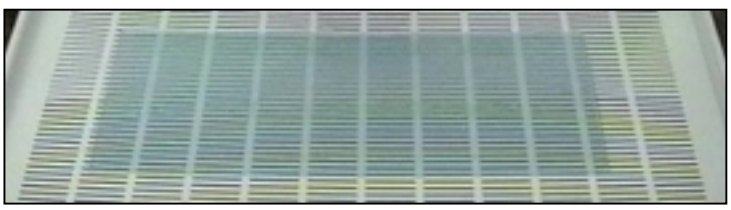
No additional hand washing should be needed. If material is not etching properly within the factory set time, revisit your initial exposure or call tech support.

Step Three

Dry

To minimize potential problems with dirt and dust prior to painting, it is important that the photopolymer material leave the process area rinsed and dried properly. If the material is not rinsed properly, residue from the washout tank water will remain on the face. Residue will attract dust and dirt and make cleaning difficult. Be sure the material is given a proper dry cycle as well. The exposure to heat serves to set the adhesive layer and allow for out gassing of residual moisture absorbed during washout.

- After washout is complete, remove the photopolymer sheet.
- Rinse the sheet thoroughly with fresh, cool water. Garden hose type pressure or power washing is acceptable.
- Use compressed air to remove all remaining water from the sheet prior to dry cycle.
- Once the sheet is free of water, place it face up in the dryer.
- Dry as factory specified.



Processing Photopolymer Sheets (cont.)

Step Four

Post Exposure

Post exposure is the fourth and final step of processing. The "flood exposu
to help harden the photopolymer shoulder and base. Without a final post
and become more susceptible to damage.

- Place dried photopolymer sheet in the post exposure section of m
  If your processor is not equipped with a separate post exposure se
  You will need to place the material on top of the vinyl cover sheet
  Main exposure tray. No vacuum is required.
- Push the tray back in and post expose for 2:00.

PHOTOPOLYMER PROCESSING IS NOW COMPLETE

Fabricating

Preparing processed photopolymer sheets for finishing

After the photopolymer material has been fully processed, separate the parts as needed leaving no more than 1/4" over. (unless you are planning to put full sheets on a router table).

There are several different ways to machine your processed photopolymer material to finished size. We will use **NovAcryl** for examples since it is a solid backed photopolymer sign material. All other types, such as aluminum or polyester will require lamination to a base prior to beginning final fabrication.

Fabricating (cont.)

Shear Cutting and Radius Corners

NovAcryl is the one material that allows you to apply a finished edge with a shear. The quality of the cut is suitable for painting. Shear cutting also keeps the material clean for painting and reduces the need to use motorized shop tools. Fabrication areas will be cleaner and free of unhealthy phenol dust generated by older phenolic backed polymers. The time needed to send a "shear cut" **NovAcryl** project to paint versus tooling a phenolic or aluminum backed material is reduced by as much as 70%.

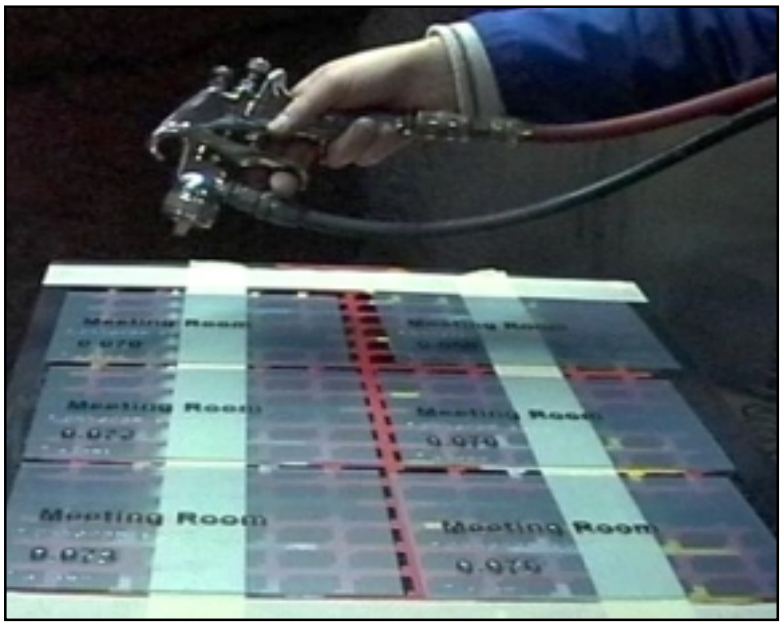
Signs can be shear cut if they are single piece, square, and rectangle or have radius corners. Shear cutting is done using customized finishing shears available from Nova Polymers. This method works on all **NovAcryl** gauges up to 1/8" **(PT-118)**. To do multiples of exact size, use apply magnetic strips or clamps to the shear's work table. Generally, only cuts 3 and 4 require stops. A simple corner rounder applies an array of radius corners. You will find finishing shears and corner rounder information in the equipment section of the Nova Polymers brochures.

Routing to finished size

Routing with a template, secured by vacuum or double faced tape is the most common method for tooling custom shapes. Use the registration marks or outside border originally printed in your film to help line up your template. Routing phenolic is quite easy since the machining characteristics are better than other sign materials. Be prepared for a lot of dust and to sand the edges to remove cellulose fibers left behind. The PETG base of NovAcryl will rout like a polycarbonate, so extra care should be taken to be sure bits are sharp (recommendations are made on processing guideline page). There is generally no dust affiliated with routing **NovAcryl**, only shavings. Sanding the edges may be needed if the router bit begins to dull.

Painting Photopolymer Signs

You should have a factory approved **paint booth** with proper filtering to reduce airborne contaminates. Use automotive grade ACRYLIC POLYURETHANE for all top coating. Specifications for Nova materials have been written by MATTHEWS and CARBIT. Applying a primer coat depends on the sign. Using an epoxy based primer is effective when surface painting with different brands of paint. The most common epoxy primers are manufactured by PPG, models DP-40 or DP-50. A primer coat also serves to help protect the photopolymer to excessive exposure to moisture or other elements that could make vandalizing easier.



The following pages include painting specifications from MATTHEWS and CARBIT. You should consult your supplier when attempting to use a system other than what is specified. Contact Nova for additional information.

Paint Manufacturer's Specifications

Matthews Paint Company
Recommended painting procedures for NovAcryl photopolymers

When coating **NovAcryl** or Nova Polymers, with MATTHEWS ACRYLIC POLYURETHANE, the first step is to clean the polymer. It must be free of any dirt, grease, etc.... You may use any of our reducers or isopropyl alcohol.

When using MATTHEWS ACRYLIC POLYURETHANE, make sure the surface is clean. Apply one coat of 74-777 TIE BOND and allow to tack up approximately 20 minutes at 70 degrees Fahrenheit. Then topcoat with MAP. It is NOT necessary to use TIE BOND for good adhesion.

When using VOC compliant MAP, our compliant coating for air regulations, be sure the photopolymer is clean. Then apply our VOC compliant material directly to the PHOTOPOLYMER. No TIE BOND is necessary for good adhesion.

Top coating of MAP and VOC MAP should be done within 72 HOURS. After 72 hours a light scuff sanding with 400 grit sandpaper is required for good adhesion of any top coating.

Painting Photopolymer Signs (cont.)

Carbit Paint Company

Recommended painting procedures for NovAcryl photopolymers

Tech support: **312-280-2300**
www.carbit.com

When coating **NovAcryl** or Nova Polymers, with CARBIT ACRYLIC POLYURETHANE, the first step is to clean the polymer (if saw cut or routed).

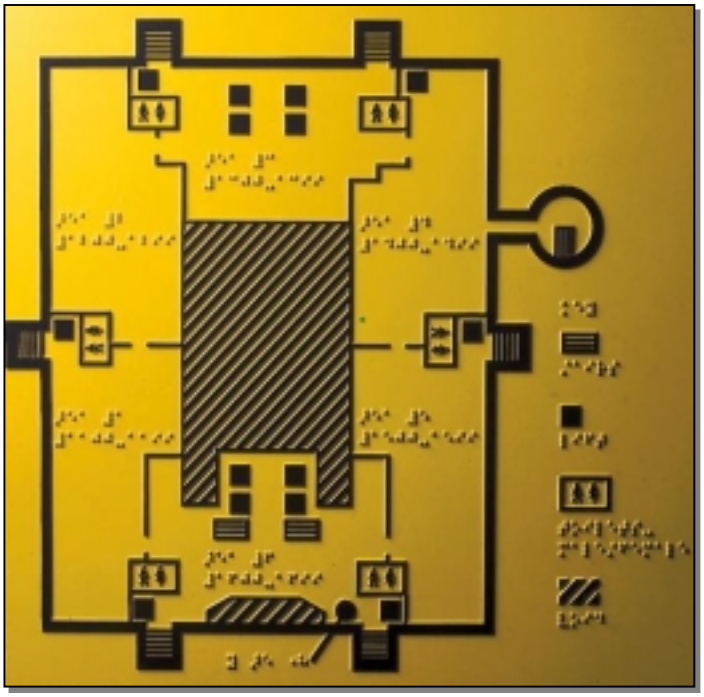
The surface must be free of any surface contaminants such as dirt, grease, oil, etc. Clean surface with a 50/50 solution of isopropyl alcohol and water. Polyurethane reducers may also be used if isopropyl alcohol is not available.

When surface is dried, apply one coat of CARBITHANE 12 SERIES STANDARD or 11 SERIES LOW VOC ACRYLIC POLYURETHANE directly to the photopolymer. No tie-coat is necessary for proper adhesion. If an additional top coat is to be applied, it should be done within 72 hours, otherwise, the surface should be lightly scuff sanded to insure adhesion to the base coat.

Applying Color To Raised Elements

Applying color to raised elements of photopolymer remains a delicate phase of manufacturing. It is considered by most to be more art than science. The primary methods used to apply color to painted and unpainted raised text and characters are silk screening or hot stamping.

Internal building directory using surface painted YA-125 Aluminum photopolymer, acrylic polyurethane and hot stamped visual elements



Applying Color to Raised Elements (cont.)

Silk Screen

Silk screening is the most widely used method for tipping. The demand for custom colors mandates that sign companies have a way to efficiently apply mixed silk screen inks. A skilled silk screen artist will adapt to any number of variations of the following method.

- Begin by using a tight, NEWMAN ROLL FRAME self adjusting tension screen.
  (Note: Use a 230 mesh, offset by about 1/4". Use as an open screen and be sure it is tight).
- Create a jig to hold location of signs to be printed.
- Block out area around the raised elements to be printed. (note: Block out the area of the one sign that has the largest copy area to be printed)
- Use a hard durometer squeegee (80 durometer)
- Use rails to keep squeegee from dipping down to the face or shoulder. Rails should be 1/32"thick and can be attached to the blocked out underside of the screen.
- Flood the screen with ink
- Drop the screen and draw the squeegee over the raised elements (this is where individual technique will play a vital role in the end quality)
- Lift the screen, remove the part, and clear the screen prior to repeating the process.
  (Note: Place a sized piece of acrylic covered with newsprint into the jig. The acrylic should be 1/8" thicker than the sign.)

Because of the many ink types and brands available, it is best to consult with your supplier for additional tips and to make sure you address certain key technical areas such as viscosity and opacity prior to testing.

Sample of surface painted / silk screened
NovAcryl PT-375 (3/8") photopolymer
Fabricated by EEC Industries

Applying Color to Raised Elements (cont.)

Hot Stamping

The hot stamping method has become very popular over the years, especially in the wholesale market. It is fast, dry and clean. However, as easy as it looks, there are as many techniques required as screen printing. The first step is being sure you have a good hot stamp unit that can maintain even and consistent temperatures across the entire heating element.

The two primary machines are manual and automatic. A manual unit is less expensive and allows you to make quick adjustments. However, it also requires greater skill level since variations in copy size and base thickness make pressure adjustments more about previous experience and learning by mistake. Automatic units cost about three times as much and don't offer any real advantages that would justify the cost.

You will need a quality hot stamp foil. There are thousands of foils and not many suppliers who can relate to what you are trying to do. Therefore, be sure the foil can be applied to acrylic polyurethane. We recommend you purchase foils from a supplier who also manufactures signs so an additional source of technical support can be accessed.

Cut the foil to a size that covers the raised elements. It is not necessary to be exact, just don't be short.

Turn on the heating elements and set temperature for around 180C. Preheat for 15:00 minutes.

Place the sign on the work table of the hot stamp unit.

Place the foil face down over the raised copy (the dull side of the foil is the face, you will see the true color through the back of the film carrier).

Push the work table back into the machine directly under the heated silicone pad.

Bring the heated silicone pad down onto the foil and sign with minimal pressure for less than a second, or until just after pressure is applied. (Note: Required pressure will increase with larger copy areas)

The thermal activated pigment is transferred melts onto the sign face and the process is complete.

If your first stamp does not give you full coverage, you can correct the problem by simply leaving the foil in place and turning the sign on the work table. There should be no seems caused by multiple impressions, provided the foil is a single piece covering the entire character being stamped.