THE BOOK
OF PLASTIC REPAIR

A comprehensive guide to identifying, repairing and refinishing virtually any plastic.

COMPLIMENTS OF

Polyvance®

ADVANCING POLYMER REPAIR

12th Edition

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Polyvance - Helping People Repair Plastic since 1981

Born as Urethane Supply Company in 1981, Polyvance has been at the forefront of automotive plastic repair technology ever since. We introduced the industry's first and most popular airless plastic welder back in 1983. Since then, our list of plastic repair innovations have continued to grow. In 1999, we developed FiberFlex®; a universal rod that eliminates the need to identify plastic while being very strong with its fiber reinforcement. In 2000, we introduced the PlastiFix® Rigid Plastic Repair Kit, a strong and fast method for repairing rigid plastics like ABS and polycarbonate. In 2002 we introduced the revolutionary line of Bumper and Cladding Coat paints and in 2006 we introduced the world to welding plastic with nitrogen gas, a quantum leap in plastic repair. Polyvance is the only company in the world 100% devoted to making plastic repair easier, stronger and more profitable for the user, year after year!

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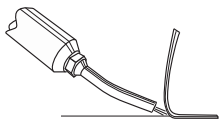
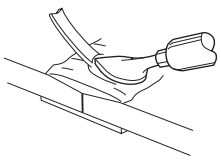
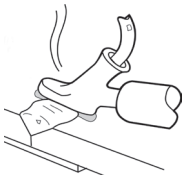
PLASTIC REPAIR QUICK REFERENCE CHART

Repair Step		Repair Method A (Page 5)	Repair Method B (Page 7)	Repair Method C (Page 8)	Repair Method D (Page 9)	Repair Method E (Page 10)
1	Identify Plastic	Thermoplastics: ABS, HDPE, LDPE, PA, PBT, PC, PP, PVC, TEO, TPE, TPO	Thermoplastics: ABS, HDPE, LDPE, PA, PBT, PC, PP, PVC, TEO, TPE, TPO	Olefinic Thermoplastics: PP, TPO, TEO, TPE, LDPE	Thermoset Polyurethane (PUR)	Primarily thermosets: SMC, UP, FRP, Fiberglass. But may be used on any rigid plastic.
2	Clean	**Clean part with soap & water and plastic cleaner**				
3	Repair	**Nitrogen / Hot Air Welding**  Strongest, fastest repair method for welding thermoplastics.	**Thermoplastic Airless Fusion Welding**  Lowest cost way to fusion weld thermoplastics. Slower and not as strong as nitrogen/hot air welding.	**FiberFlex® Universal Rod**  Intended mainly for bumper cover repair. Not a fusion welding process. Don't use on fuel or radiator tanks.	**Thermoset Urethane Repair**  PUR is mainly found on older bumper covers, often (but not always) yellow in color.	**Two-Part Adhesives and PlastiFix®**  PlastiFix is a great choice for acrylic (Plexiglas) and ABS. Two-part adhesives on virtually all other plastics.
4	Fill	**Grind, then apply sandable filler that matches the hardness of the substrate**				
5	Prime	**Prime with high-build primer surfacer**				
6	Paint	**Apply top coat of your choice**				

"New" GTO Judge image courtesy of Trans Am Worldwide. www.transamworldwide.com

Identifying the type of plastic you are working on is important, especially if you are plastic welding. Just as it is impossible to weld steel with an aluminum rod, it is also impossible to weld ABS with a nylon rod. It is essential that you select the proper welding rod to match the plastic you are working on.

The repair method you choose depends on two things: 1.) The material of the plastic itself, and 2.) The tools and materials you have available to make the repair. The information on these two pages will give you some guidance about how to identify the plastic you want to repair.

Below is a brief discussion of the various repair tools and materials.

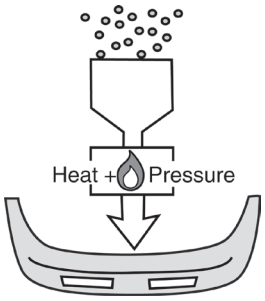
Adhesives:
- No equipment cost
- Versatile, can be used on virtually any type of plastic (except polyethylene)
- Essential for repair of thermoset plastics
- Often not as strong as welding
- Consumable cost is higher than welding

Airless Plastic Welding:
- Versatile, use on thermoplastics and on thermoset PUR
- Equipment is inexpensive
- Welding process is slower & weld strength is not as great as nitrogen/hot air welding
- The choice for DIY'ers and occasional users

Nitrogen/Hot Air Welding
- Fastest, strongest fusion repair method
- Can use ribbon rods for greatest strength
- Consumable cost is low
- Equipment cost is relatively high
- Can't be used on thermoset plastics
- The choice for professionals and frequent users

TWO MAJOR FAMILIES OF PLASTICS

Thermo*plastic*

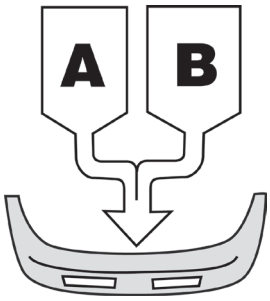


Thermoplastics CAN be fusion welded. Thermoplastics can be melted and resolidified. The carbon molecule chains that make up the plastic do not have crosslinks, so the molecule chains can slip by one another when the material is heated.

Most car bumper covers today are made of PP blends (PP+EPM, TPO, TEO). To make a PP bumper, pellets of plastic are melted and injected into the mold. The melted plastic then resolidifies as it cools. The preferred method of repair is by Nitrogen/ Hot Air welding (Method A) or airless fusion welding (Method B).

Most materials that you would identify as "plastic" are thermoplastic -- kayak hulls, port-a-potties, garbage cans, playground slides, milk jugs, etc. There are many different types of thermoplastics, so if you are going to do a weld repair, you need to identify the type of plastic using the ID chart on the next page or using one of the methods below.

Thermo*set*

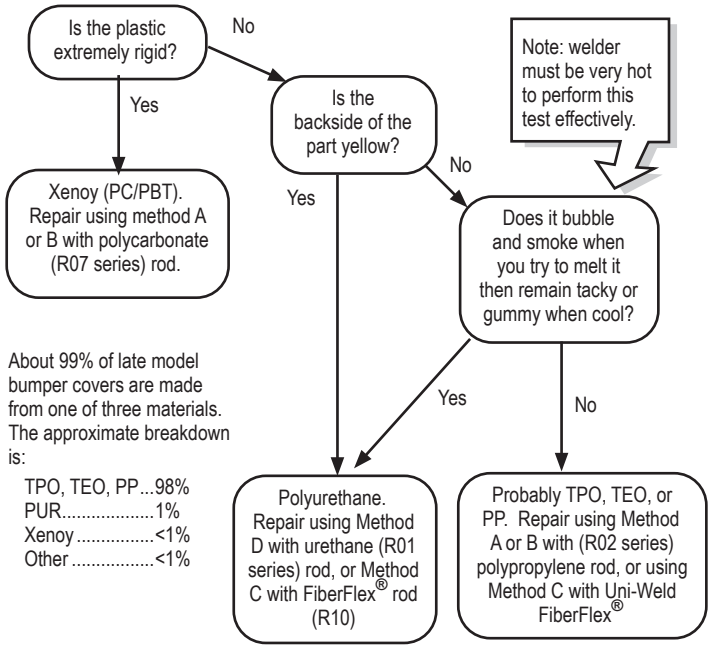


Thermosets CANNOT be melted or fusion welded. They are formed via a chemical reaction between two components. This forms crosslinks between the molecules of the plastics which keeps it from melting. If you try to melt a thermoset material, you will destroy the material.

Polyurethane (PUR) is a common type of thermoset plastic used for car bumper covers and some truck bedsides. Most of the time it is yellow in color (but not always… look for the ID symbol if in doubt). Polyurethane can be repaired, but not with the nitrogen/ hot air welding process. Since the plastic does not melt, an adhesive repair must be done using either R01 urethane welding rod (Method D) or two-part adhesives (Method E).

Thermoset materials are common on large parts like heavy truck hoods. Examples of thermosets commonly used on automobiles are fiberglass, SMC, Metton,and carbon fiber reinforced plastic.

IDENTIFICATION OF BUMPER PLASTICS IF NO ID SYMBOL CAN BE FOUND



About 99% of late model bumper covers are made from one of three materials. The approximate breakdown is:

TPO, TEO, PP...98%
PUR.....1%
Xenoy .....<1%
Other .....<1%

IDENTIFICATION OF GENERAL PLASTICS IF NO ID SYMBOL CAN BE FOUND

1. Is the part very rigid with lots of glass fibers in the broken area?
   - If yes, then it's probably SMC or Fiberglass. Repair using Method E with 2020 SMC Hardset Epoxy Filler.
   - If no, go to Step 2.
2. **Perform a melt test** - try to melt the surface with a hot airless welder. Does it melt cleanly and resolidfy?
   - If yes, go to Step 3.
   - If no, then you have a thermoset material. See chart on Page 4 for repair guidance.
3. **Perform a weld test** - Judging from the feel and appearance of the plastic, pick some rods that match best. Clean and sand the part in an inconspicuous area. Make a spot weld by melting the rod together with the base material. Allow the weld to cool completely. Pull on or pick at the weld; if it is not a proper match, it should pop off easily. Weld with the rod that sticks best.
4. If none of the rods stick, then perform an adhesive repair using Method E

Identify the type of plastic by looking for the plastic ID symbol on the backside of the part. Match the symbol on the part with the table below. The recommended repair method is listed first. See the information on Page 3 for tips when the identification symbol or abbreviation is missing.

	Symbol & Type	Description/ How to Identify	Typical Applications	Suggested Repair Method	Repair Tips
Thermosets	PUR, RIM, RRIM Thermoset Polyurethane	Usually flexible, may be yellow or gray, bubbles & smokes when attempting to melt.	Flexible bumper covers, dually fenders, stepside truck beds, rocker panel covers, snowmobile cowls.	Method D w/ urethane (R01) rod or Method C with FiberFlex (R10)	Don't melt base material! Melt rod into v-groove like a hot melt glue.
	SMC, UP, FRP Fiberglass	Rigid, polyester matrix reinforced with glass fibers, sands finely.	Rigid body panels, fenders, hoods, deck lids, header panels, spoilers.	Method E Two-part adhesive repair with fiberglass reinforcement	Use backing plate over holes, layer in fiberglass cloth for extra strength.
	DCPD, Metton®	Rigid material, no fibers, gray in color.	Large truck and tractor panels and hoods.	Method E w/ 2510 Plasti-Fix two-part methacrylate adhesive	Use backing plate over holes, layer in fiberglass cloth for extra strength.
	XPE, XLPE, PE-Xb, PEX, Crosslinked Polyethylene	Semi-flexible, waxy or greasy feel, softens when heated but does not melt.	Gas tanks, kayaks, canoes, trash cans, use is declining	Method D with polyethylene (R04) rod, use as hot melt adhesive	Applying filler or painting is difficult or impossible. Browns when heated.
Thermoplastics	ABS Acrylonitrile Butadiene Styrene	Rigid, often white but may be molded in any color, sands finely.	Instrument panels, grilles, trim moldings, consoles, street bike fairings, canoes, interior parts.	Method A or B w/ ABS (R03 series) rod or Method E with PlastiFix.	Adhesives bond well, espcially PlastiFix. No adhesion promoter required.
	ASA Acrylonitrile styrene acrylate	Rigid, may be molded in any color, sands finely. Very similar to ABS.	Trim parts, underhood and interior parts.	Method A or B w/ ASA (R14 series) rod or Method E with PlastiFix.	Adhesives bond well, espcially PlastiFix. No adhesion promoter required.
	PBT Polybutylene terephthalate (polyester)	Semi-rigid or rigid, sands finely.	Automotive panels, electrical connectors, under-hood parts	Method A or B with PBT (R11) rod or Method E.	Has low coefficient of friction. Use heavy pressure and reinforce with 2045 mesh.
	PA, PA-6, PA+GF Polyamide (Nylon)	Semi-rigid or rigid, sands finely. Usually glass fiber reinforced (GF in ID symbol)	Radiator tanks, head lamp bezels, exterior trim parts, mirrors, plastic engine parts.	Method A or B w/ nylon (R06) rod or PA+GF15 (R21) rod	Preheat plastic with heat gun before welding, mix completely with base mat'l.
	PC + ABS Pulse	Rigid, sands finely, usually dark in color.	Door skins, instrument panels, street bike fairings.	Method A or B w/ PC+ABS (R20 series) rod or Method E	
	PC + PBT Xenoy	Very rigid, sands finely, usually dark in color.	Bumper covers, fenders, trim parts	Method A or B w/ PC (R07) rod or Method E	
	PE-HD, HDPE High Density Polyethylene	Semi-flexible, melts & smears when grinding, waxy feel.	Overflow tanks, inner fender liners, ATV fenders, RV water storage tanks, gas tanks, kayaks	Method A or B with high density polyethylene (R12 series) rod	Adhesives won't stick. Applying filler or painting is impossible.
	PE, LDPE Low Density Polyethylene	Semi-flexible, melts & smears when grinding, usually semi-translucent, waxy feel.	Overflow tanks, inner fender liners, ATV fenders, RV water storage tanks, gas tanks, kayaks	Method A or B with low density polyethylene (R04 series) rod	Adhesives won't stick. Applying filler or painting is impossible.
	PET Polyethylene terephthalate (polyester)	Semi-rigid or rigid, Similar to PBT.	Trim parts, electrical connectors, under-hood parts, fabrics, soda bottles	Method A or B with PET (R13) rod	
	POM Polyoxymethylene (acetal)	Very rigid, opaque, high strength and surface hardness	Electrical connectors and parts, window regulators, ski bindings, knife handles, gun parts	Method A or B with POM (R16) rod	
	PP, PP+EPM, PP+EPDM Polypropylene Blends	Semi-flexible, melts & smears when grinding, waxy feel, usually a bit stiffer than PEs.	Bumper covers, headlight housings, motorcycle fairings, fan shrouds, fender liners	Method A or B w/ PP or TPO rod (R02 or R05) or Method C with (R10) FiberFlex rod	Use 1060FP Filler Prep before applying two-part epoxy filler.
	PPE, PPE+PS Polyphenylene Ether	Semi-rigid, sands finely, usually off-white or black in color.	Fenders, exterior trim, rear hatch panels.	Method A or B w/PPE+PS (R08) rod or Method E	Preheat plastic with heat gun before welding.
	PPX (PPE+PP+GF30) Noryl PPX	Very rigid, high surface hardness	Support structures, replaces metal components	Method A or B w/PPX (R22) rod or Method E	
	TPO, TEO, TPE, TSOP Thermoplastic Olefin PP Blends	Semi-flexible, usually black or gray, melts & smears when grinding.	Bumper covers, air dams, grilles, interior parts, instrument panels, snowmobile cowls.	Method A or B w/ PP or TPO rod (R02 or R05) or Method C with (R10) FiberFlex rod	Use 1060FP Filler Prep before applying two-part epoxy filler.
	TPU, TPUR Thermoplastic Polyurethane	Very flexible	Bumper covers, soft filler panels, gravel deflectors	Method A or B w/ urethane (R01) rod or Method C with (R10) FiberFlex rod	

Clean Surface

In order to maximize strength any repair, thoroughly clean contaminants from the surface in the damaged area.

Step 1. Clean both sides with soap and water. Dry with a clean cloth or compressed air.

Step 2. Spray 1000 Super Prep or 1001-4 EcoPrep Plastic Cleaner onto the surface and wipe off while wet with a clean, lint-free cloth. Wipe in one direction to avoid spreading contaminants back over the clean area. Do not use cleaner after sanding or grinding the plastic. Use compressed air and/or tack cloth to remove dust.

Align Damage, Remove Dents and Deformation

If the plastic is distorted, heat with a heat gun and reshape the distorted area. When heating plastic, it is important that the plastic be heated all the way through. Hold the heat gun on the area until the opposite side of the plastic is uncomfortable to the touch. Once heated, force the plastic back into position with 6148 Bumper Rollers or other appropriate tool, then cool the area with a damp cloth. Stretched areas can be shrunk with the bumper cover cold. Keep working until smooth, then sand overall with 80 grit to help identify remaining low spots. Push out remaining low spots and repeat the process.

Thermoset polyurethanes (PUR, RIM) have a “memory” that will often cause them to go back to their original position if held under a heat lamp or in a heated spray booth.

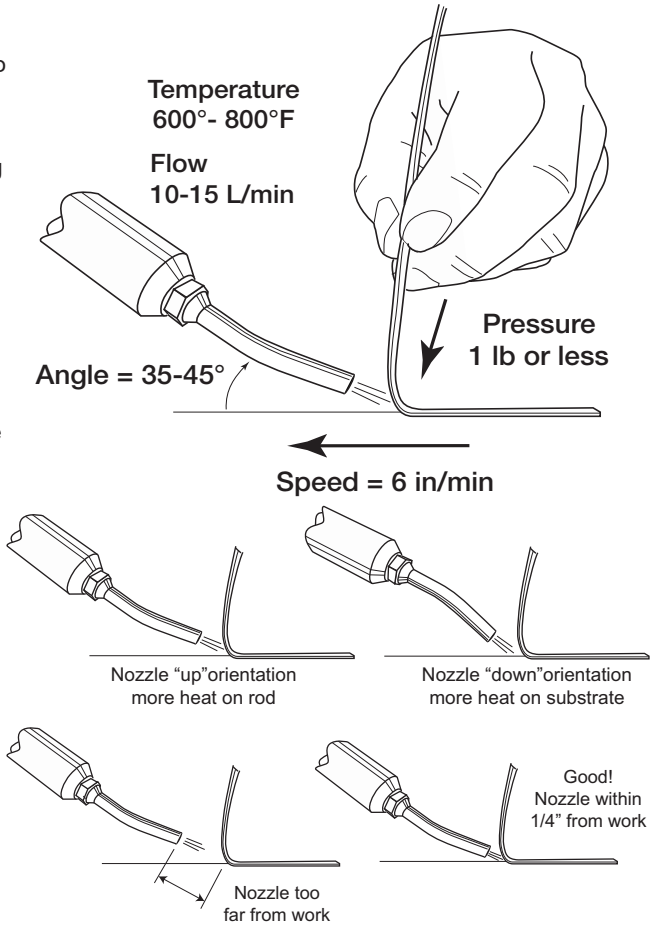
If the part is cut or torn to the edge, align the cosmetic surface with 6482 or 6485 Aluminum Body Tape and begin the repair process on the back. By aligning the outer surface, you minimize the amount of filler required to restore the proper profile to the part.

METHOD A - NITROGEN / HOT AIR WELDING

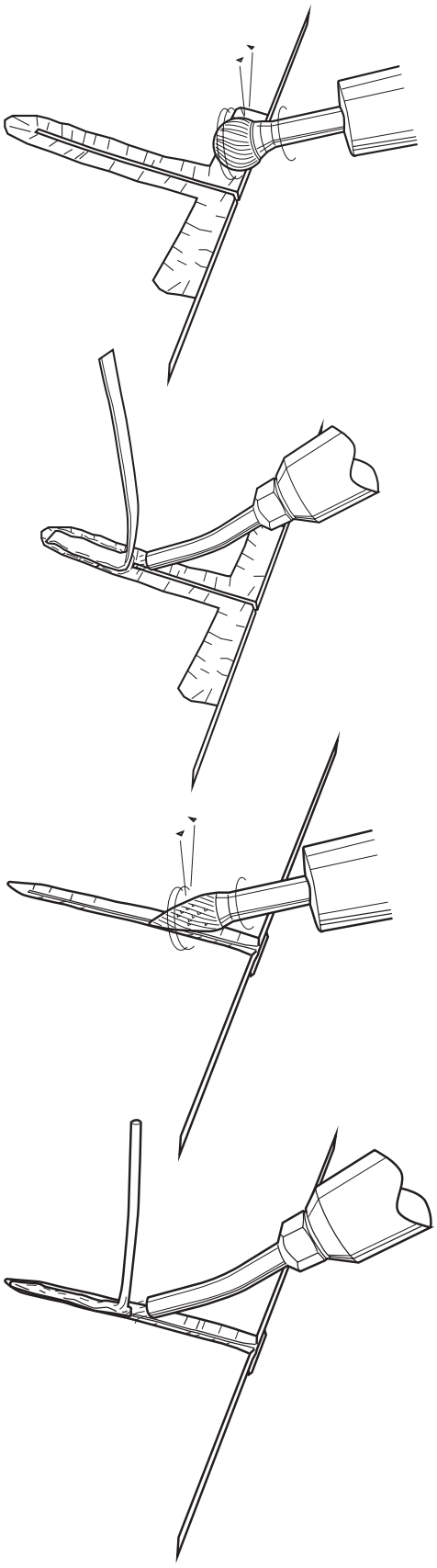
Basic nitrogen welding process

Welding with nitrogen or hot air involves the coordination of both hands, one controlling the torch and the other feeding the rod. When you weld, you just want to melt the bottom surface of the rod and the top of the substrate. You don’t “puddle” the rod like you do in metal welding. This makes for a stronger repair because it leaves the basic structure of the rod intact. When you’re making your weld, make sure you melt both the base material and the rod at the same time and fuse them together with slight downward pressure on the rod as you make your pass.

- For **temperature**, set the temperature on the nitrogen welder’s dial to the proper setting. For example, the PP/TPO setting will generate an air flow of about 700°-800°F.
- The **flow** should be set between 10 to 15 liters per minute depending on the plastic’s thickness; less for thinner plastics, more for thicker.
- An **angle** of 35-45° between the welder tip and the substrate is optimum. Aim the stream of hot air a little in front of the rod; for thick rod like the 06 profile, focus a little more heat on the rod. The rod should be about a 90° angle to the base material.
- The **orientation of the welder tip** can play a role in where the heat is concentrated. With the tip oriented “down”, more heat will be focused on the substrate. With the tip oriented “up”, more heat will be focused on the rod.
- The **distance of the tip to the work** is important because the temperature of the gas stream drops quickly the farther away the tip is. Keep the tip close to the work to ensure that the proper temperature is being used.
- Put a light downward **pressure on the rod** to fuse the rod and base material. Keep a steady downward pressure on the rod and keep the rod moving slowly. Don’t overheat the rod and let it fold over backwards.
- The **speed** of your weld should be about 4 to 6 inches per minute. With thin rod like the 03 profile, it’s difficult to go this slow. With thick rod like the 06 profile, it may go even slower. The important thing is to move steadily while making sure the base material and the bottom surface of the rod are both melted before they come together.



Repairing Thermoplastics with Nitrogen / Hot Air Plastic Welder



Prep backside for weld

- Fixture the crack on the frontside with aluminum tape to align cosmetic surface. Hot staples may also be used if needed to stabilize the crack.
- Grind v-groove along the crack at least as wide as the welding rod you plan to use to expose raw plastic. If the crack extends to the edge of the plastic, grind along the edge to prepare for a “cross stitch” weld to strengthen the repair.
- Grind no more than halfway through the plastic on the backside. This is because the frontside weld must go halfway through for adequate strength.

Weld backside

- In most situations, use the medium width (-04 profile) or narrow width (-07 profile) welding rod on the backside.
- Using the Basic Nitrogen Welding Process described on Page 5, pre-melt the end of the welding rod and the substrate, touch the welding rod down, apply a slight downward pressure on the welding rod to start rolling it toward the welder tip, then keep the heat focused closely to melt both the rod and substrate at the same time.
- Allow the welding rod to cool completely to room temperature before continuing the process on the frontside. Cooling may be accelerated blowing compressed air onto the weld or applying water.

Prep frontside for weld

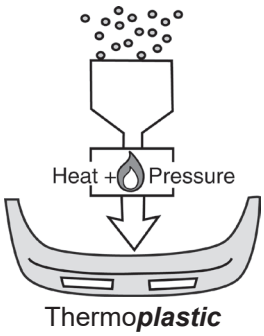
- Remove aluminum tape (and staples, if used) from the frontside. Apply aluminum tape to the backside over the weld to support the area and prevent the welding rod from pushing through.
- For welds on the frontside of the bumper cover, it is preferable to use the one-eighth inch round rod (-01 profile) or the narrow ribbon (-07 profile) to keep the weld area as narrow as possible.
- Use a tapered or small round cutter bit to make a deep, narrow v-groove as wide as the welding rod you plan to use. Grind about halfway through the plastic to ensure there is enough welding rod fused with the base material to provide adequate strength once the weld is sanded smooth. Make sure the v-groove tracks precisely down the middle of the crack. Grind about 1/4” beyond the crack on both ends.

Weld frontside

- Start the weld by heating the end of the welding rod and the substrate for about ten seconds until both plastics appear to be melted on the surface.
- Touch the welding rod down onto the surface and apply a light downward pressure. Maintain a steady, light pressure on the welding rod and let the rod collapse down onto the substrate as it melts. To get a good fusion weld, it is essential that you melt both plastics at the same time before they come together. Continue the process until you reach the end of the v-groove, focus the heat on the rod until it is completely melted, and gently detach it from the welding rod you have applied to the base material.
- Depending on the thickness of the plastic, you will probably find it necessary to apply another pass of welding rod to completely fill the v-groove.
- Once the weld is completed and the welding rod is still hot, use the flat tip of the airless plastic welder to smooth the weld down. Make one slow, even pass to smooth the rod and eliminate porosity and imperfections.
- Once weld cools completely to room temperature, sand smooth and prepare for application of filler or primer.

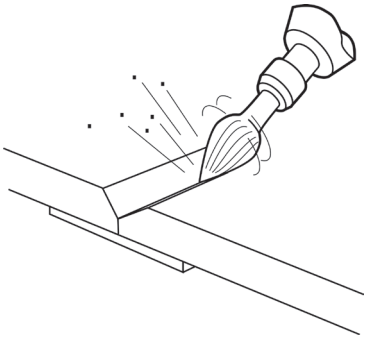
Repairing Thermoplastics with Fusion Welding using Airless Plastic Welder

Excluding urethane bumper covers, all bumper covers, most other plastics on automobiles, and nearly everything else made of plastic, are made of thermoplastic materials. This means they can be melted with the application of heat. Thermoplastic parts are made by melting pellets of plastic and injecting the melted material into a mold, where it cools and solidifies. This means that thermoplastic parts can be melted.



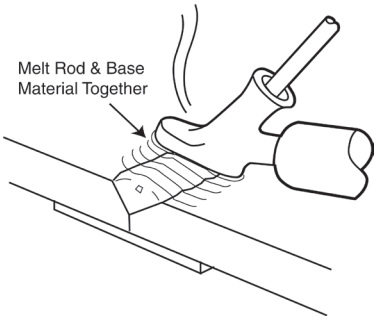
The most common thermoplastic automobile bumper material is TPO (PP+EPM). TPO is fast becoming the most popular material for all sorts of interior and underhood plastics as well. TPOs can be welded using the fusion technique described on this page, but our FiberFlex® rod often makes an easier and stronger repair on TPO than airless fusion welding (see Repair Method C, Page 8). If you have the equipment, the strongest way to repair any thermoplastic is with the nitrogen/hot air welding process shown on Pages 5 - 6.

The least common bumper material, Xenoy (PC+PBT), is best repaired using the following thermoplastic fusion technique.



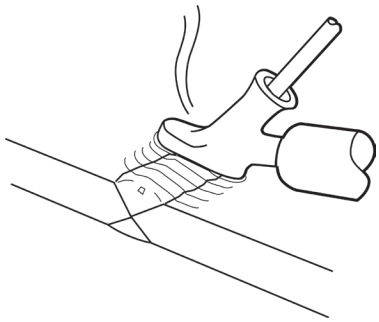
V-Groove Damaged Area

- Line up the outer surface of the tear with 6481, 6482 or 6485 Aluminum Body Tape or with clamps.
- V-groove halfway through the part with either the 6121-T Teardrop Cutter Bit and a rotary tool or the sharp edge of the plastic welding tip.
- Remove the paint in the area surrounding the v-groove and radius into the v-groove with coarse sandpaper.



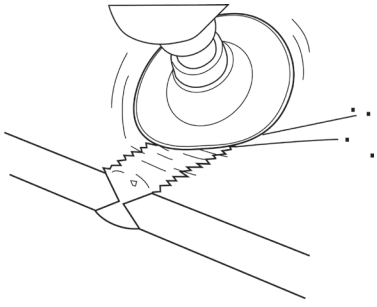
Melt the Rod Together with the Base Material

- Set the temperature setting of your airless plastic welder to the setting that's appropriate for the welding rod you selected in the identification process. In most cases, the welding rod should melt cleanly and not be discolored (the only exception would be nylon, where the rod should turn a light brown).
- Use the tip of the welder to pre-melt about two inches of plastic inside the v-groove.
- Lay the welder tip on the surface of the plastic and slowly melt the rod into the v-groove. Pull the welder toward you so you can see the welding rod fill the v-groove as you make your pass.
- Lay down no more than 2 inches of welding rod into the v-groove at a time. Remove the rod from the welder tip, and before the melted rod has time to cool down, go back over it with the hot welder tip and thoroughly melt the rod together with the base material. It helps to press into the plastic with the edge of the welder tip to mix the materials, then go back and smooth it out. Keep the heat on it until you have a good mix between the rod and base material.



V-Groove and Weld Opposite Side

- After the weld on the back side cools, repeat the V-groove and welding process on the cosmetic side. V-groove deep enough to penetrate into the welding rod on the back side.



Grind Weld to a Smooth Contour

- If you need to refinish the plastic, grind weld to a smooth contour with coarse sandpaper. Grind the weld slightly flush so that filler can cover the welded area completely. Finish with a skim coat of 2000 Flex Filler 2.

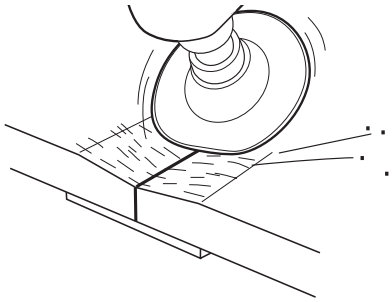
Repairing with FiberFlex® Universal Rod

FiberFlex® is a unique repair material in that it sticks to virtually any plastic substrate. It is not a true welding rod, but rather a thermoplastic or hot-melt adhesive. When you do a repair with the FiberFlex, you will actually be using the heat of the welder to apply an adhesive. FiberFlex has a very strong bond and is reinforced with carbon and glass fibers for outstanding strength. FiberFlex also incorporates sandable fillers, so you can create a good cosmetic repair with it as well.

FiberFlex is a popular way to repair TPOs (aka TEO, PP/EPDM, TSOP), the most common automotive bumper material. The reason is that there are no two TPOs that are exactly alike. As a result, our TPO (R05 series) welding rod will not match any TPO exactly. FiberFlex was formulated to work best on TPO bumper covers, but it can also be used to repair virtually any plastic. It will stick to urethanes and Xenoy, too. When you are not sure what type of plastic your part is made of, try Fiber-Flex.

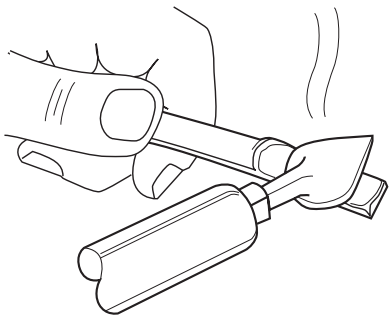
V-Groove Damaged Area

- Line up the outer surface of the tear with 6481, 6482, or 6485 Aluminum Body Tape or with clamps.
- Grind away plastic into the shape of a broad V-groove halfway through the backside of the part using a die grinder with the 6122 Heavy Duty Round Burr, 6125 Heavy Duty Tapered Burr or the 6134-R Round Cutter Bit. You'll want the v-groove to be about 1-1/2 inches wide when you get done.
- It is very important to put some "tooth" in the plastic by grinding the v-groove with 50 grit or coarser sandpaper. Use a low speed grinder. Grinding at high speed will tend to melt many thermoplastics.
- Using 80 grit in a DA sander, feather back the paint in the area around the v-groove and radius smoothly into the v-groove. This will give you a better featheredge when you get ready to sand the FiberFlex.



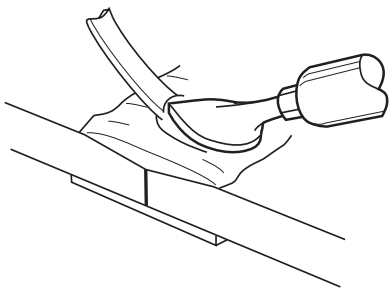
Melt on the FiberFlex®

- With the airless welder set to the highest temperature setting, use the 6031 Teardrop Welding Tip to melt the (R10-04) FiberFlex welding rod onto the surface. Best adhesion is achieved by pre-melting one side of the end of the rod, then flipping the rod over so that the melted portion sticks to the plastic. Cut the melted part of the ribbon off using the edge of the welder tip and spread the FiberFlex into the v-groove. Do not attempt to melt the base material together with the FiberFlex. Repairing with FiberFlex is similar to a brazing process.



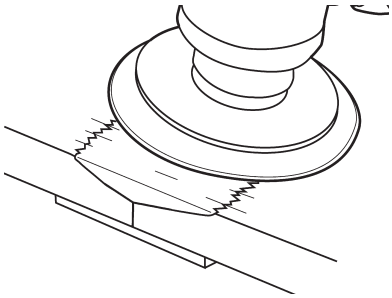
V-Groove and Weld Opposite Side

- After the FiberFlex on the backside cools (you may force cool with air or water), repeat the v-grooving and welding process on the opposite side. Build the FiberFlex slightly higher than the surface. FiberFlex is also a sandable filler.



Finish Sand

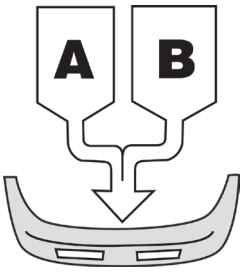
- After allowing the FiberFlex to cool completely, sand with 80 grit paper in a DA sander at low speed. Progress to finer grits, ending with 320 grit.
- Fill any low spots with more FiberFlex or with a skim coat of 2000 Flex Filler 2 or 2020 Hardset filler.



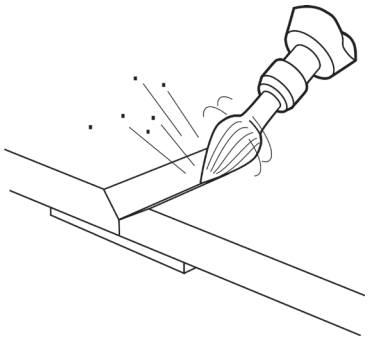
Repairing Thermoset Urethanes

Automotive urethane, or PUR, is a “thermoset” material. Similar to what happens when mixing body filler and cream hardener, thermoset plastic is formed when two liquid chemicals come together in the mold to form a solid. The importance of this is that if polyurethane is “melted” the plastic decomposes and prevents adhesion of repair materials. DO NOT TRY TO MELT URETHANE BUMPER COVERS WITH THE WELDER!

A positive way to identify thermoset urethane is to press a HOT welding tip into the backside of the part. If it’s a urethane, the plastic will liquefy, bubble and smoke. (Note: welder must be extremely hot for this to happen). After the heated area cools off, it will remain gummy or tacky. This is an indication that the heat broke down the chemicals in the plastic. Thermoset urethanes can be easily repaired with the airless plastic welder, but the repair will be more like brazing rather than a true fusion weld.

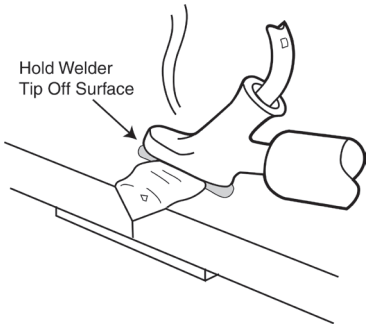


Thermo***set***



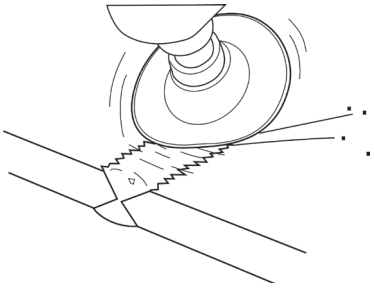
V-Groove Damaged Area

- Line up the outer surface of the tear with 6481, 6482 or 6485 Aluminum Body Tape or with clamps.
- V-groove halfway through the back side of the part with the 6121-T Teardrop Cutter Bit or the 6125 Tapered Burr. You cannot use a hot tool to melt the v-groove into urethane because it will decompose.
- Scratch the inside of the v-groove with coarse sandpaper (80 grit or coarser) to put “tooth” into the plastic. Also, remove the paint in the area surrounding the v-groove and radius the edges of the v-groove for extra strength.



Melt the Rod into the V-Groove

- Turn the temperature of your airless plastic welder to the “R01” rod setting. Using the R01 urethane welding rod, the rod should come out of the bottom of the welder’s shoe completely melted and clear, not discolored or bubbling. Turn your welder up or down as needed, until you get this result.
- Holding the welder’s tip slightly off the surface of the plastic, melt the rod into the v-groove. Don’t overheat the base material, simply melt the rod onto the surface. Again, you are NOT trying to melt the rod and the base material together; the bumper material is NOT meltable!
- Lay down no more than 2 inches of welding rod into the v-groove at a time. Remove the rod from the welder tip, and before the melted rod has time to cool down, go back over it with the hot welder tip and smooth out the weld. You can touch the bumper with the welding tip, but keep the tip moving so you don’t overheat the base material.

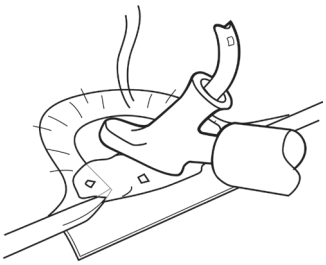


V-Groove and Weld Opposite Side

- After the weld on the back side cools, repeat the V-groove and welding process on the cosmetic side. V-groove deep enough to penetrate the welding rod on the back side.

Grind Weld to a Smooth Contour

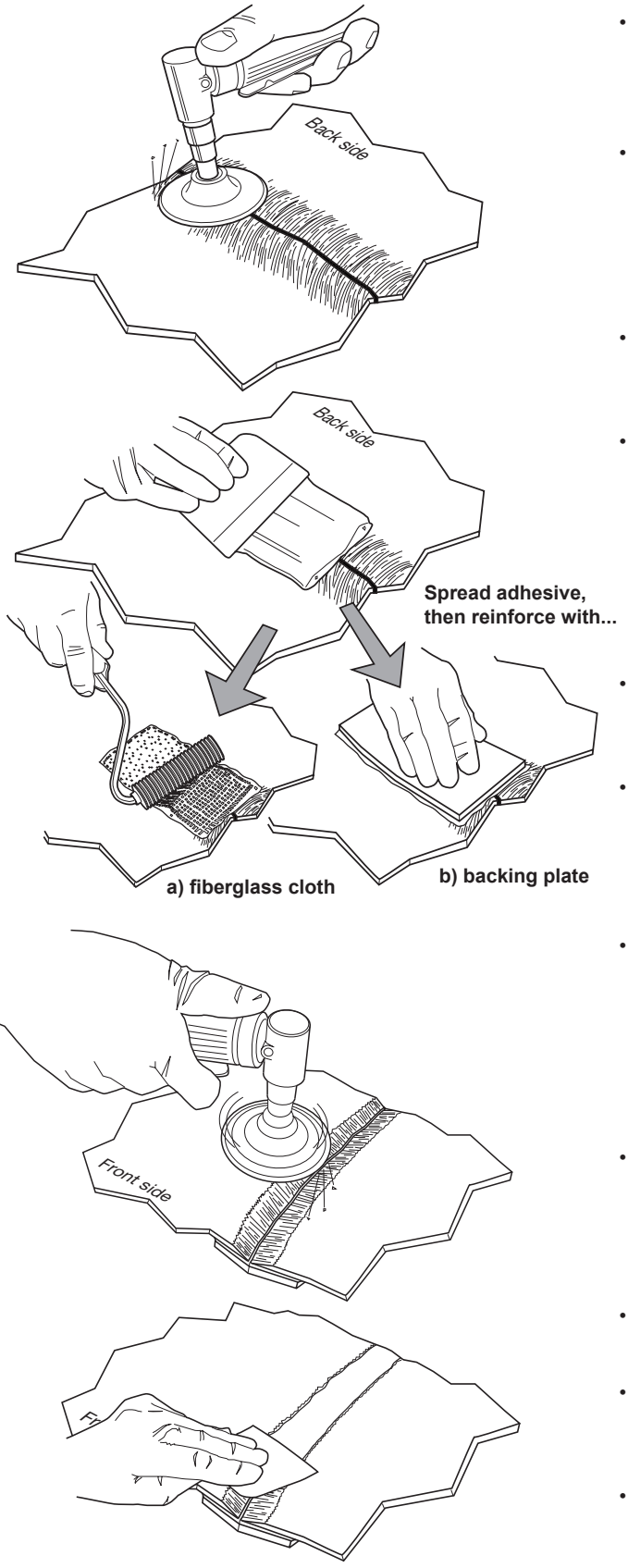
- Using coarse sandpaper, grind the weld to a smooth contour. The urethane welding rod will not feather very well, so it will need to be covered with 2000 FlexFiller 2 epoxy filler to refinish completely. Grind the weld slightly below flush so that filler can cover the welded area completely.



Repairing Torn Bolt Holes on Urethanes

- Taper the plastic all around the hole down to a sharp edge on both sides using a coarse sandpaper disc in an angle grinder.
- Use 6481, 6482 or 6485 Aluminum Body Tape to create a bridge across the torn mounting hole. Melt R01 urethane welding rod into the area. Drill out hole when finished.

Repairing Plastics with Two-Part Adhesives



- Clean both sides of the plastic in the damaged area with 1000 Super Prep Plastic Cleaner or 1001-4 EcoPrep Plastic Cleaner. Fixture the front side with clamps or aluminum tape to hold the part together.
- Sand the backside of the area to be repaired with 50 grit sand paper or coarser. A v-groove is not required unless you need to sand the backside flat for cosmetic reasons. Remove paint in the surrounding area with 80 grit in a DA. Coarse sand scratches are desirable to maximize the mechanical strength of the bond. Blow dust free with clean, dry compressed air.
- If the material is TEO, TPO or PP, apply 1060FP Filler Prep or 1050 Plastic Magic Adhesion Promoter. Brush or spray a medium wet coat onto the sanded area and allow to flash off; do not overapply.
- Choose a two-part adhesive system to match the hardness of the substrate per the table:

Adhesive	Substrate
2000 Flex Filler™	Flexible substrates, polyurethane, soft TPO
2020 Hardset Filler	Rigid substrates, semi-rigid TPO, SMC, fiberglass
2510 PlastiFix® two-part	Rigid substrates, Metton®, SMC, fiberglass, metals, ABS, acrylics, polycarbonate

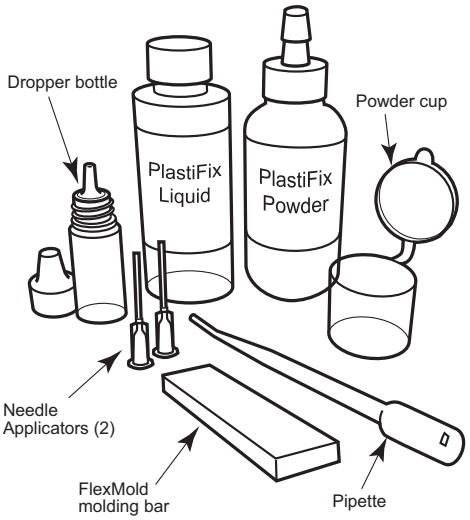
- Select a reinforcing method for the backside of the part. For flat areas, it is often easiest to cut a backing plate out of scrap material. For contoured areas, use fiberglass cloth or fiberglass drywall tape.
- Prepare reinforcement by cutting 1 to 3 pieces of glass cloth to cover the damaged area about 2”-4” wide. If using a backing plate, make sure it extends at least 2” beyond damage in all directions. Rough grind the side of the backing plate that will be applied to the surface.
- Mix the two-part adhesive according to package directions. Spread a generous amount on the backside with a body spreader. If using a backing plate, press the plate firmly into the adhesive, allowing a small amount of adhesive to squeeze out from the edges. If using fiberglass cloth, lay the cloth into the adhesive and wet the fibers using a 2042-R Saturation Roller. Apply more adhesive over the area and embed another layer of fiberglass cloth if desired.
- Once the adhesive on the backside is cured, peel the aluminum tape off the front and grind a v-groove about 1”-2” wide with a die grinder and/or a coarse sanding disc. Sandscratch the inside of the v-groove coarsely. Round off any sharp edges and feather the paint back with 80 grit in a DA.
- If the material is TEO, TPO, or PP, apply adhesion promoter as was done on the backside.
- Mix the two-part adhesive and apply into the v-groove with a body spreader. Slightly overfill the v-groove so that it can be sanded flush when finished.
- When the adhesive on the front side is fully cured, sand with 80 grit in a DA sander, then progress to finer grits to finish.

Repairing Plastics with PlastiFix® Rigid Plastic Repair Kit

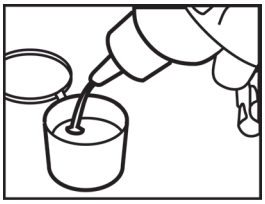
The PlastiFix® Rigid Plastic Repair Kit allows you to repair cracks, fill gaps, rebuild tabs, and fix stripped threads on most rigid plastics. The most unique feature of the PlastiFix Rigid Plastic Repair Kit is the FlexMold flexible molding bar. The FlexMold bar allows you to replace a broken tab by forming a mold from an undamaged piece, then casting your new part using the PlastiFix acrylic adhesive system. This system is *ideal* for ABS, acrylic, polycarbonate and other hard plastics, however it does not work on olefinic plastics like PE, PP, or TEO.

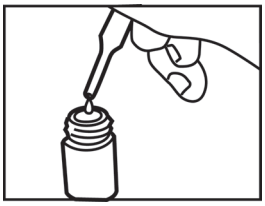
See our PlastiFix training videos at **www.polyvance.com/video/plastifix**.

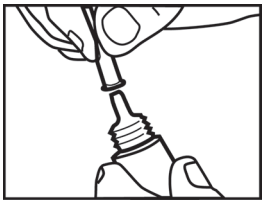
Kit Components:



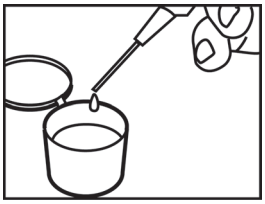
Getting Ready

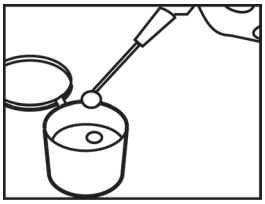

Dispense powder into cup.

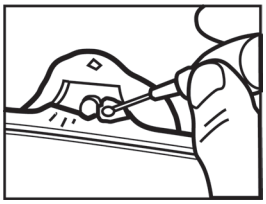

Use pipette to dispense liquid into the dropper bottle.


Insert dropper tip into bottle and place applicator needle onto dropper tip.

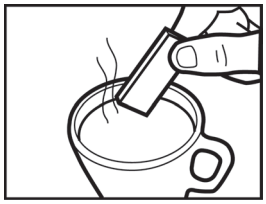
Application

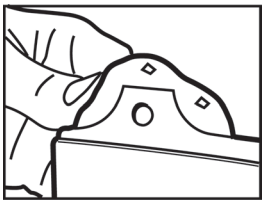

Squeeze one or two drops of liquid into powder.

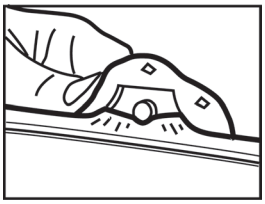

Pick up liquid/powder mix with tip of needle.

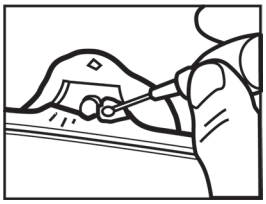

Squeeze bottle to apply liquid/ powder mix to repair area.

FlexMold Molding Bar Use

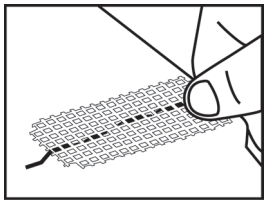

Place FlexMold bar in very hot water until it softens.

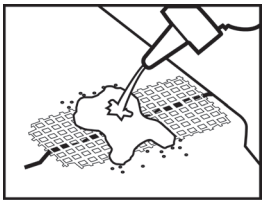

Shape FlexMold bar over pattern. Caution! Very hot!

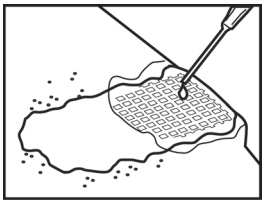

When FlexMold bar cools, position in repair area.

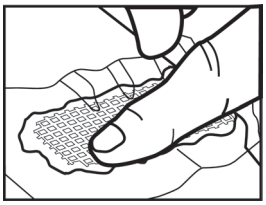

Fill mold with PlastiFix powder/ liquid mix, allow to cure 30 min., remove mold.

Reinforcing

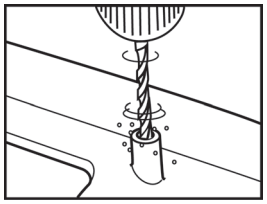

Cut fiberglass cloth to cover damage on backside.

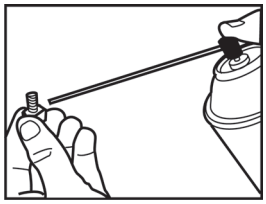

Cover fiberglass cloth with thin layer of PlastiFix powder.

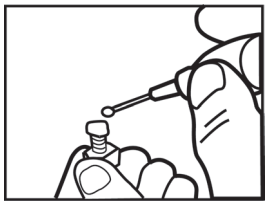

Saturate powder with PlastiFix liquid.

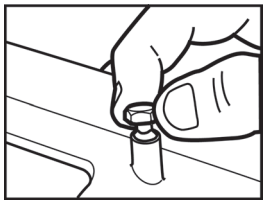

Cover with plastic sheet, press to shape, allow to cure.

Repairing Threads


Drill or file threads from hole.


Apply lubricant to screw threads.


Apply PlastiFix powder/liquid mixture to screw threads.


While adhesive is wet, insert into hole.

To complete the plastic repair after performing a plastic weld, the part must be refinished. The following instructions provide an overview of the products and processes required to restore your PP/EPDM or TPO plastic bumper fascia back to its original appearance.

1. Sand Weld	After allowing the plastic weld to cool completely, sand the welding rod slightly flush with 80 grit sandpaper. Feather the paint back with 180 grit. Blow dust free with clean, dry compressed air.	
2. Adhesion Promoter	Before applying filler, apply adhesion promoter on PP/TPO substrates. (1050 Plastic Magic is National Rule-compliant; 1051 is California-compliant)	 **1050 Plastic Magic**  **1051 Low VOC Plastic Magic**
3. Filler	Apply a skim coat of flexible or rigid filler over the repair area. Allow to cure completely, then sand with 80 and 180 grit paper.	 **2000 Flex Filler or 2020 Hardset Filler**
4. Adhesion Promoter	Before spraying primer, apply adhesion promoter again over any exposed raw plastic areas (same products as used in Step 2).	
5. Primer-Surfacer	Spray a high-build waterborne primer-surfacer over the repair area. Allow to dry completely. (All of our waterborne primer surfacers are 50-state VOC-compliant.)	 **3041 All Seasons E-Z Sand Light Gray**  **3043 All Seasons Black Jack**
6. Spot Putty, Sand, and Prime Again	Apply spot putty over any visible imperfections. Allow to dry, then sand the repair area with 220 and 320 grit paper. Prime again and repeat process until desired appearance is obtained. It may be necessary to prime and block sand several times.	
7a. Apply Your Topcoat System	Apply your shop's color coat system to complete the refinish of smooth, painted plastics.	
7b. Apply Texture Finish	If the bumper is textured, apply Flextex VT flexible texture coating to simulate the original texture. (Use 3804N-4 reducer for National Rule areas, 3804R-4 reducer for Low-VOC areas.)	 **3804 Flextex VT Low VOC Texture Coating**

For more technical support on plastic repair & refinishing:

- Search for Polyvance on YouTube to see our huge library of plastic repair training videos
- Download the Polyvance app on Apple's App Store or Google Play
- See Polyvance's instructor-led and virtual training options at www.polyvance.com

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