

Sample projects

The repairs described on this page are just a sample of the potential uses for G/flex® Epoxy. They demonstrate G/flex Epoxy's versatility, which is expanded by the use of supplemental application tools, fillers, and additives. Supplemental products not included in the kit can be found in the *WEST SYSTEM® User Manual & Product Guide* and are available at WEST SYSTEM dealers.

Be sure to read *Handling epoxy* and *Basic techniques* on the reverse side of this guide before beginning these repairs. For additional information on WEST SYSTEM products or techniques, visit westsystem.com or call 866-937-8797 (toll free).

Aluminum boat seam repair

Determine the exact locations of leaks by putting the dry boat in the water or partially filling a small boat with water to see where it leaks.

Pressure wash the leaking area to be sure debris is removed from the rivets and seams. Abrade the area with a wire wheel on a drill motor or a wire brush to further remove debris. Drain and dry the boat.

Mix a small batch of G/flex 650 Epoxy and transfer it to a syringe included in the kit.



Heat the leaky seams with a heat gun or propane torch. The heat will drive residual moisture from the seams in the form of steam or boiling water, which is a good visual indicator that you are bringing the metal up to temperature (1).



Inject the epoxy with the syringe or apply it with a small brush along the seam while the metal is still warm (2). The epoxy will thin when it touches the warm metal and will flow deep into the crack. Use the heat gun to warm the metal along the seam as you direct the epoxy into it. The heat will help release air in the epoxy and speed the cure.

On very loose and leaky joints, a combination of new rivets and epoxy will work best. If rivets are not available, leaks have been sealed by filling the seam with thickened epoxy.

First warm the metal and apply the liquid epoxy as described above. Then use a putty knife, plastic spreader or syringe to force thickened G/flex into the seam. Thicken the

epoxy with 406 Colloidal Silica Adhesive Filler, included in the kit, to a mayonnaise consistency. Try to push the mixture through the seam to the other side of the hull. Thickened G/flex will bridge gaps and stay in the seam until it cures.

420 Aluminum Powder can be added to the thickened epoxy mixture prior to forcing it into the seams to make the repair less obvious and to provide UV protection for the epoxy.

Wipe up excess uncured epoxy from both sides using paper towels and dry cheesecloth. Solvents can be used sparingly if care is taken to avoid washing out the epoxy in the seam or dissolving paint in the area.

Let the epoxy cure overnight before using the boat. You may use a heat gun or heat lamp to shorten the cure time. For every 18°F increase in temperature, G/flex cures in half as much time, but do not heat the curing epoxy over 120°F (49°C). ■

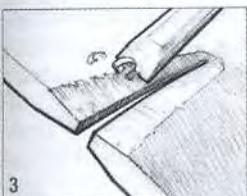
Plastic canoe & kayak repairs

Plastic canoes and kayaks are often made with thermoformed plastics like HDPE (high-density polyethylene), ABS, and occasionally PVC. G/flex adheres to these materials if specific surface preparations are followed. Refer to the *Surface Preparation* chart on the reverse of this page.

Split and crack repair

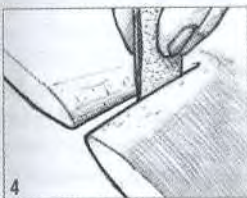
Open up cracks and splits with a saber saw or hacksaw blade to create a slight gap in the break. Bevel the edges of the crack with a sharp scraper like the end of a sharp chisel or with a cabinet scraper to create a $\frac{3}{8}$ " to $\frac{1}{2}$ " long bevel on both sides of the split and on both sides of the hull (3). Sand the beveled surfaces to round the edges and create more taper with 80-grit sandpaper (4).

Flame treat HDPE and LDPE (high-density and low-density polyethylene) plastic with a propane torch to oxidize the repair surfaces.



See *Special surface preparation* on the reverse of this page.

Mix an appropriately sized batch of G/flex 650 Epoxy thickened with the 406 Filler provided to a mayonnaise consistency. Apply a bead of the thickened epoxy to the beveled



joint, overfilling it slightly.

Cover the epoxy filled joint with 2" wide cellophane packaging tape while forcing the excess (overfill) epoxy through to the other side of the joint. Avoid using too much force, which could leave the taped side under filled.

Spread out the epoxy on the opposite side to fill in the beveled seam. Add or remove epoxy to fill the bevel flush.

Allow to cure 7–10 hours before removing tape. Use a scraper or sandpaper to remove high spots and smooth the surface. Paint the area with plastic-compatible paint like Krylon™ Fusion.

Small hole repair

Canoes and kayaks are often dragged over sand and rocks, resulting in worn off ends and eventual leaks near the bow and stern.

Clean the area being repaired with a mild solvent like rubbing alcohol and paper towels. Sand with 80-grit sandpaper to create a slight taper around the perimeter of the repair. Flame treat the repair surfaces of HDPE and LDPE plastics.

If the worn section has a gap that is too wide to bridge with thickened epoxy, say $\frac{1}{4}$ " to $\frac{3}{8}$ " across, cover the back of the hole with a temporary backer to support the epoxy while it cures. The backer can be a wad of plastic wrap, piece of polystyrene foam, or any appropriately shaped material covered with plastic wrap. The plastic wrap will allow for easy removal after the epoxy cures.

Mix an appropriately sized batch of G/flex 650 Epoxy thickened with the 406 Filler provided to a mayonnaise consistency.

Apply the epoxy to the area with a mixing stick or plastic spreader. Apply enough epoxy to fill the hole and build up low areas to match the original thickness. Apply additional epoxy, if necessary, while previous applications are still tacky.

Allow to cure 7–10 hours before removing excess cured epoxy and shaping the surface with a cabinet scraper, file, or sandpaper. Paint the area with a plastic-compatible paint like Krylon Fusion.

Create skid plates or repair larger holes

Avoid wearing holes on the keels and ends of canoes and kayaks by applying an abrasion resistant fiberglass strip on the wear areas. Fiberglass reinforcement can also be used to patch larger holes (over $\frac{3}{8}$ ").



Clean the surface with a mild solvent like rubbing alcohol and paper towels. Sand the end of the canoe along the bottom and up the sides a few inches with 80-grit (5). This area will define the size of the skid plate. Flame treat HDPE or LDPE plastics. If



you are patching a hole, cover the back with a temporary backer as described earlier.

Cut three or four layers of light fiberglass cloth (4–6 oz fabric) to cover the sanded area. Cut the bottom piece of fiberglass to fit to the sanded/flame-treated boundary. Trim each successive layer an inch or two narrower and shorter than the previous. This tapers the thickness of the fiberglass skid plate/patch toward the edges so it will easily deflect and cling to the hull as it flexes.

Mix enough G/flex 650 Epoxy to wet out and apply one or two layers of fabric.

Apply a coat of epoxy to the sanded/treated area. Lay the largest piece of fiberglass onto the wet epoxy. Apply more epoxy to wet out the fiberglass cloth. If necessary, a heat gun can be used to warm the epoxy and improve wet out on heavier fiberglass fabrics. Use a

spreader to smooth the fabric and remove excess epoxy (6).

Repeat the fiberglass application with the remaining piece(s). Center each smaller layer on the one before it. Wet out the fabric, and then use a spreader to smooth the fabric and remove excess epoxy.

Apply fairing compound if desired while the fiberglass application is still tacky. See *Fairing (surface filling)* on the reverse of this page.

Allow to cure 7–10 hours before removing any rough edges or excess cured epoxy with a cabinet scraper, file or sandpaper. Paint the area with a plastic compatible paint like Krylon Fusion. ■

Wood construction and repair

G/flex 650 Epoxy is an excellent adhesive for wood. It is especially good for gluing native hardwoods like white oak and for tropical woods like teak and purpleheart. There are many uses for G/flex Epoxy in building and repairing boats, indoor and outdoor furniture, cabinetry, and trim.

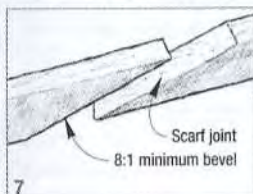
Refer to *Special surface preparation* and *Bonding* on the reverse page for basic gluing information. Here are some additional wood bonding applications that extend the uses of G/flex Epoxy.

Joining wood

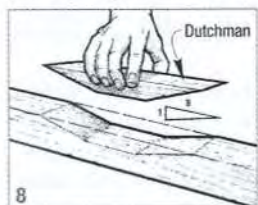
BUTT JOINTS are used to edge glue lumber to create wider boards. Edges are typically square cut at 90° and simply butted up to one another when gluing. This joint is used for edge gluing lumber; it is not recommended for end gluing, or lengthening boards parallel to the grain.

SCARF JOINTS are used to join two pieces of wood together along their length. The ends of lumber are machined with an 8:1 to 12:1 bevel angle (7). Longer bevels create more gluing surface and potentially stronger joints. Scarf joints are often used to replace damaged sections of frames and ribs in traditionally built wood boats. Use G/flex 650

unthickened if your fits are good or thicken G/flex 650 with the 406 Filler provided to bridge gaps in the joint.

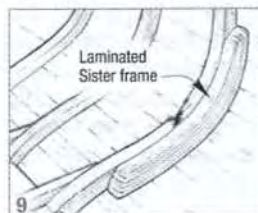


A **DUTCHMAN** is a wood splice used to repair damaged sections of wood timbers. We



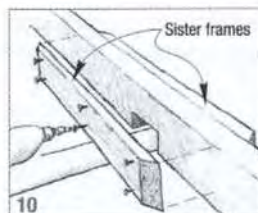
recommend creating an 8:1 bevel (8) on each end of the joint to provide adequate gluing area to maintain structural integrity.

SISTER PLANKS are used to build up the strength of the lumber by gluing additional

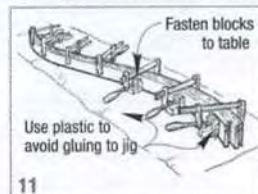


pieces or sister planks on one or both sides.

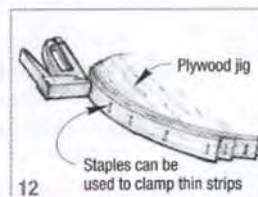
Bond sister planks where structural members have been damaged by rot (9) or weakened by cutouts for plumbing or drain holes (10). They are useful where weight or appearance is not a factor.



LAMINATING multiple layers of wood strips is a great way to create custom-shaped lumber for frames, sister frames, legs, arches, railings, and trim. Laminated lumber is



stronger and more stable than steambent or sawn lumber. Glue strips using the preparation and bonding techniques on the reverse page. Use a jig or mold to clamp strips to the desired shape (11, 12). Jigs should be strong



enough to provide even clamping pressure and prevent springback until the epoxy cures. ■

Repairing splits, cracks and delaminations

Paddles, oars, garden tool handles, and sports equipment made with wood or laminated materials can split or crack under normal use or abuse. Ice hockey sticks, for example, are exposed to bending loads as well as high shock forces from impact with the puck, the ice, and other sticks. Handles and blades often chip and split, as does the equipment from many other sports. G/flex 650 Epoxy's tenacious adhesion and ability to resist shock loads make it a good choice for these kinds of repairs.

Insert a wedge into the crack(s) to expose as much bonding area as possible without increasing the damage. Heat the area to be repaired with a heat gun or hair dryer. This will lower the epoxy's viscosity on contact, allowing it to penetrate deeper into cracks. Fix the item in position so gravity will pull epoxy into the crack.

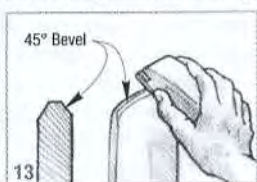
Mix a small batch of G/flex 650 Epoxy. Work epoxy into the crack with the mixing stick or a small brush, or inject epoxy with an 807 Syringe. Use a fine blade or stick to push epoxy as far down into the crack as possible.

Wait a few minutes for absorption to take place before removing wedge and clamping the crack(s) closed. Allow to cure 7–10 hours before removing clamps and sanding away epoxy squeeze-out. Wait 24 hours before using.

Thicken the epoxy as necessary to bridge gaps or fill in missing material. A layer or two of light weight fiberglass fabric (4–6 oz) can be applied for additional reinforcing. Refer to *Fiberglassing* on the reverse page. ■

Create durable tips on wood paddles & oars

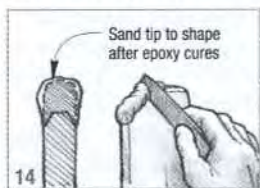
The tips of canoe and kayak paddles take lots of abuse from scraping bottom, pushing off rocks, and fending off debris. Use G/flex 650 Epoxy to produce a durable edge to protect tips from damage.



Sand varnish or paint from the tip of the paddle to expose fresh wood. Use sandpaper on a hard

sanding block to create a slight bevel around the edge of the paddle tip (13).

Apply a generous coating of G/flex 650 Epoxy to the sanded surfaces to wet out the exposed end grain.



Mix an appropriate amount of G/flex 650 Epoxy thickened with 406 Colloidal Silica Filler to a mayonnaise

consistency. Apply a thick bead of the thickened mixture around the edge of the paddle blade (14). Apply additional thickened epoxy to extend the tip, if desired, after the initial application has gelled and will support the additional weight.

Allow to cure 7–10 hours. Wash with water before shaping the tip with a file or sandpaper. Apply paint or varnish if desired. ■

Gluing to wet surfaces and surfaces underwater

While gluing to a dry and properly prepared surface is best for producing reliable long-term bonds, gluing to damp, wet, and even underwater surfaces is possible.

Abrade bonding surfaces with 80-grit sandpaper. Mix an appropriately sized batch of G/flex thickened with 406 Filler to a mayonnaise consistency. Gluing to wet surfaces requires a thickened adhesive that will displace water in the scratches and pores at the bonding surface when it is applied.

Forcefully apply the thickened epoxy onto the bonding surfaces with a plastic spreader or stiff brush.

Bring the mating surfaces together and apply just enough clamping pressure to squeeze out excess epoxy and moisture. Allow to cure 7–10 hours before removing clamps and 24 hours before stressing the joint. ■

Bonding fasteners

G/flex 650 Epoxy can be used for a variety of household and marine projects and repairs that involve threaded fasteners, especially fasteners subject to shock or vibration. Installing screws and other threaded fasteners with G/flex 650 Epoxy dramatically improves load carrying capacity. Use G/flex

650 Epoxy to install new fasteners and hardware, repair stripped screw holes and replace missing wood around fasteners. When cured, G/flex can be sanded, sawn, nailed and screwed. Small screws, nails, and tacks can be driven into it without pre-drilling. Larger fasteners may require a pilot hole. Experiment for best results.

The easiest method is to simply wet out new pilot holes (or stripped fastener holes) (15) with G/flex 650 Epoxy prior to installing the screws (16). The epoxy will soak into the exposed end grain

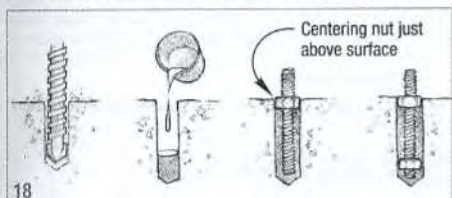
on the inside of the hole, effectively increasing fastener diameter. This results in more holding power, and seals water out so the wood stays drier. Drier wood is stronger than damp wood.

For even greater strength and stability, drill oversized holes 2/3 the depth of the fastener. Wet out the holes and the fastener with epoxy, then fill the hole with thickened epoxy/adhesive filler (17). Use 406 Colloidal Silica Filler to thicken the epoxy to a mayonnaise consistency. Install the fasteners with just enough force to hold the hardware in place until the epoxy cures.

Bonding anchor bolts
One of epoxy's best uses is to bond anchor bolts into concrete. The principle is the same as for wood. Drill an oversized hole. Wet out the hole with epoxy. Then place the bolt or threaded rod in the hole.

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It's a good idea to put a nut on the threaded rod so that its top is barely above the surface (18). This centers the rod in the hole and will help to reduce the creep load on the epoxy when the hardware item is tightened down. ■

Blending epoxies

Advanced users can blend G/flex 650 Epoxy with WEST SYSTEM 105 Resin-based epoxy combinations to modify toughness, flexibility, cure speed, viscosity, strength, and elongation. The epoxy blend will have properties/characteristics derived from both epoxy systems, roughly in proportion to the percentage of each epoxy in the blend.

Blending WEST SYSTEM 105/205 with G/flex 650 will speed up the cure of G/flex, lower its mixed viscosity (for better wet out of heavier fiberglass fabrics), and increase rigidity of the cured epoxy, compared to using G/flex 650 alone. Viscosity will range from 15,000 cps for 100% G/flex 650 to 975 cps for 100% 105/205. Tensile elongation will range from 30% for 100% G-flex 650 to 3.4% for 100% 105/205.

To blend G/flex 650 Epoxy with 105 Resin-based epoxies, you must meter the appropriate resin to hardener mix ratio of each epoxy prior to blending the two combinations together.

Additional information on blending G/flex with other WEST SYSTEM Epoxy combinations can be found at westsystem.com or by contacting the WEST SYSTEM Technical Staff.

Email to tech-support@westsystem.com or call 866-937-8797 (toll free). ■

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