

G/flex

650-K Repair Kit

A guide for handling and using G/flex 650 Epoxy



Instructions for handling epoxy and basic techniques. Sample projects include repair to aluminum boat seams, plastic canoes and kayaks, wooden boats, and household and sporting equipment. Also included are tips on gluing to wet surfaces and gluing underwater, joining wood, gluing in fasteners, and blending epoxies.

G/flex 650 Epoxy is the result of years of experimentation to develop a toughened epoxy that was simple to use, viscous enough not to drain out of a joint, and would adhere tenaciously to a variety of materials under difficult conditions.

G/flex 650 is all that, and more. It is a marine-grade glue that can be accurately mixed in small batches with a simple 1:1 mix ratio. It has the advantage of a long open working time and a relatively short cure time.

G/flex 650 is, first of all, a high-strength epoxy—designed for permanent, waterproof, structural bonding. Furthermore, G/flex has a modulus of elasticity of 150,000 psi. It can deflect farther than West System 105/205 (modulus of elasticity of 450,000 psi). This gives G/flex the toughness to make structural bonds that can absorb the stresses of expansion, contraction, shock, and vibration.

G/flex adheres tenaciously to difficult-to-glue hardwoods, both tropical and domestic varieties—white oak, lpe, teak, greenheart, purpleheart and black walnut to name a few. G/flex also has the ability to glue damp woods. It can be used on wet surfaces, even underwater when applied with specific techniques.

G/flex is ideal for bonding a variety of other materials, including dissimilar ones—metals, plastics, glass, masonry, and fiberglass. It can be used to wet out and bond fiberglass tapes and fabrics.

We encourage you to read these instructions and then experiment with G/flex. We think you will find many projects for which the particular properties of G/flex are ideally suited. As always, our Technical Staff is available to answer your questions, and we will be eager to hear about your projects and repairs using G/flex Epoxy. Call 866-937-8797 (toll free).

Handling Epoxy & Basic Techniques

Safety

- Avoid skin contact with resin, hardener or mixed epoxy. Wear liquid-proof gloves and adequate protective clothing to keep the epoxy off your skin.
- Avoid eye contact with resin, hardener or mixed epoxy. Wear protective glasses. In case of contact with eyes, flush with water for 15 minutes and consult a physician.
- Avoid inhalation of vapors. Provide adequate ventilation. Wear a dust mask when sanding epoxy, especially epoxy that has not fully cured.
- Read and follow safety information on resin and hardener containers.

Starting out

Remove and discard the red inner seal from both containers. Trim the tip of each spout about 1/4" from the end.

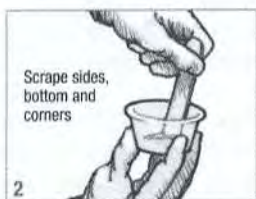
Before mixing epoxy, gather all necessary application tools, clamps and equipment. Check all parts for proper fit and be sure all surfaces to be coated are properly prepared.

Mixing and curing

Dispense equal volumes of G/flex 650



Resin and Hardener into a small mixing cup (1). Use a mixing stick to thoroughly blend the resin and hardener, while scraping the sides and bottom of the mixing cup (2). Small quantities can be mixed on a paper or plastic palette.



Scrape sides, bottom and corners

After mixing the resin and hardener, you will have about 45 minutes, at 72°F (22°C), to apply the mixture before it begins to gel and up to 75 minutes to assemble and clamp parts after the epoxy is initially applied. At 72°F (22°C), the epoxy mixture will solidify in 3-4 hours and reach a workable cure in 7-10 hours the epoxy may be sanded, clamps can be removed, and joints can be moderately loaded. Wait 24 hours before subjecting joints to high loads.

Epoxy cures faster in warmer temperatures and slower in cooler temperatures. When a quicker cure is desired, apply moderate heat to substantially reduce cure time. Cure time is reduced by half with each 18°F increase in temperature. G/flex 650 Epoxy will cure in temperatures as low as 40°F (5°C), but cure very slowly. When using G/flex at lower temperatures, it is a good idea to warm resin and hardener to room temperature while dispensing and mixing.

Curing epoxy generates heat. Thicker layers of epoxy generally cure faster than thinner layers, as this heat is concentrated in thicker layers and dissipated in thinner layers. Use caution when mixing large batches of G/flex 650 Epoxy. A large, confined quantity of curing epoxy (10 fl oz or more) may generate enough heat to burn your skin or melt a plastic mixing cup.

Cleanup

Clean uncured epoxy from skin and clothes with the alcohol pad provided, followed by washing with soap and water.

Remove excess epoxy from work surfaces with the flat end of a mixing stick or with paper towels. Clean up residue with an alcohol pad, citrus-based cleaner or a solvent such as acetone or lacquer thinner.

Basic surface preparation

For best adhesion, bonding surfaces should be:

CLEAN—Remove loose, chalky or flaky coatings, and contaminants such as grease, oil, wax, and mold release. Clean contaminated surfaces with an appropriate solvent applied with plain white paper towels. Wipe the surface with a clean, dry paper towel before solvent dries. Do not use laundered rags to apply or remove solvent as they may contaminate the surface with fabric softener residue.

SANDED—Sand smooth and non-porous surfaces with 80-grit aluminum oxide sandpaper to provide good texture for the epoxy to "key" into. Brush away sanding dust.

DRY—Although G/flex 650 Epoxy can be used to bond damp and wet surfaces (see Gluing to damp and wet surfaces, on the opposite page), maximum adhesion will be achieved when bonding to dry surfaces.

Additional surface preparation

Metals

Sand or grit-blast the surface to expose bright metal.

Clean the area with acetone or lacquer thinner using white paper towels. Allow the surface to dry completely.

Abrade through wet epoxy—Apply a thin coat of G/flex 650 Epoxy and immediately scrub metal surfaces through the wet epoxy coating with a fine wire brush or sandpaper.

Adhesion to aluminum can best be improved by treating it with the two-part WEST SYSTEM 860 Aluminum Etch prior to applying the epoxy. Aluminum can be prepared using the "abrade through wet epoxy" method with good results if an Aluminum Etch kit is not available.

Plastics

Sand ABS, PVC and polycarbonate plastics with 80-grit sandpaper to provide texture for improved adhesion.

Some plastics like HDPE and LDPE (high-density and low-density polyethylene) benefit from flame treating. First wipe the bonding surface with a solvent to remove contamination and dry with a clean paper towel.

FLAME TREATING—Pass the flame of a propane torch across the surface quickly. Allow the flame to touch the surface, but keep it moving—about 12 to 16 inches per second. No obvious change takes place, but the flame oxidizes the surface and dramatically improves adhesion with adhesives and coatings applied over it.

While flame treating will improve adhesion to most plastics, it appears to provide the greatest benefit to polyethylene. If you are unsure of the type of plastic, it doesn't hurt to flame treat.

Hardwoods, including tropical woods

Bonding to dry wood (between 6 and 12% moisture content) is best for achieving long-term reliable bonds. Sand mating surfaces with 80-grit parallel to the grain. Clean oily woods with a solvent such as acetone, lacquer thinner, or isopropyl alcohol. Apply solvent with plain white paper towels. Wipe the surface with a clean, dry paper towel before solvent dries. Do not use laundered rags to apply or remove solvent.

The extent of wood failure in tensile adhesion tests indicate that tensile adhesion achieved using G/flex 650 Epoxy, with proper surface preparation, approached the grain strength of the wood in all of the woods we tested.

Surface preparation for various dry materials

Material	Basic surface preparation	Additional surface preparation
Fiberglass laminate		
Aluminum		860 Aluminum Etch, two part
Steel		Wire brush through wet epoxy
Steel-galvanized		Wire brush through wet epoxy
Copper		Wire brush through wet epoxy
Bronze		Wire brush through wet epoxy
Lead		Wire brush through wet epoxy
ABS	As necessary, Remove soft and loose surface material	Flame treat optional
PVC	Remove contamination with solvent wipe	Flame treat optional
Polycarbonate (Lexan™)	Sand with medium-grit sandpaper	Flame treat optional
HDPE, LDPE plastic		Flame treat
Ipe		70% Isopropyl Alcohol wipe
Teak		Solvent wipe
White oak		
Walnut		
Purpleheart		
Greenheart		

Bonding

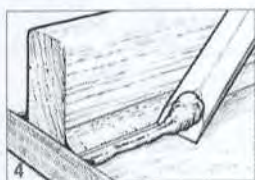
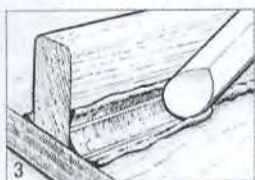
Apply the epoxy mixture to all properly prepared mating surfaces and clamp the components in position before the epoxy begins to gel—about 75 minutes at 72°F (22°C). Use just enough clamping pressure to squeeze a small amount of epoxy out of the joint. Leaving some glue in the joint increases bonding strength. Allow the epoxy to cure thoroughly before stressing the joint.

Thicken the epoxy with WEST SYSTEM 406 Adhesive Filler, included in the kit, as necessary to fill voids when gluing uneven mating surfaces or to bridge gaps in joints.

Use a spreader or notched trowel to apply G/flex 650 Epoxy to larger surfaces prior to clamping. Use a pipe cleaner or syringe to apply adhesive to hard to reach areas such as cracks and fastener holes when bonding hardware.

Making fillets

When parts are joined at or near right angles, fillets can be used to add considerable strength to the joint by increasing the surface area of the bond. Make fillets by applying a bead of G/flex 650 Epoxy, thickened with the filler provided to a mayonnaise consistency, along the inside corner of the joint. Form the epoxy into a cove section using the round end of a mixing stick (3). Clean off the excess epoxy with the beveled end of the mixing stick before the epoxy gels (4).

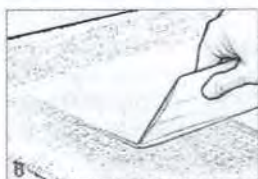


Lightweight fiberglass fabrics and tapes (4–9 oz/sq yd range) can be used with G/flex 650 Epoxy when fiber reinforcement is desired to add stiffness or abrasion resistance, or to patch a damaged area.

Fiberglassing

Cut the fabric to fit the area. If heavier reinforcing is desired, use multiple thin layers rather than a single thick layer. Properly prepare the surface before applying fabric.

Coat the substrate with epoxy. Lay the fabric in position on the wet epoxy. Spread mixed epoxy onto the fabric using a plastic spreader (5).



When the fabric and substrate have been saturated, use the spreader to smooth and remove excess epoxy (6). Repeat the process with additional layers. Use a heat gun or hair dryer to moderate the

warm the epoxy, lowering its viscosity and improving glass wet-out on heavier fabrics or in cooler temperatures.

Fairing (surface filling)

Use WEST SYSTEM 407 Low-Density Filler to thicken G/flex 650 Epoxy for use as a fairing compound. This mixture also works for light bonding, surface filling, and shaping. The more 407 Filler you add to the epoxy, the easier it will be to carve and sand. Use a mixing stick or spreader to apply and shape the mixture slightly higher than the desired surface contour. Sand it to shape after the epoxy cures. Seal the sanded fairing compound with unthickened epoxy before painting.

Coating and re-coating

G/flex 650 Epoxy can be used as a moisture barrier coating. It has a mixed viscosity similar to honey, but it has good flow characteristics when brush applied. Use a stiff bristled brush (cut the bristles of a standard paintbrush to half their length) or apply with a flat spreader for best results. On horizontal surfaces, a fine notched trowel can be used to apply a uniform coat. One to two coats are usually enough given the viscosity of G/flex 650 Epoxy.

If you are gluing to or applying more coats of epoxy, apply the next coat while the previous coating is still tacky—usually 2–3 hours after applying at 72°F (22°C). Cured G/flex can be varnished, painted, or recoated or bonded to with epoxy. Wash cured G/flex with water and sand surfaces to a dull finish providing a texture for good adhesion. ■



G/flex 650 Epoxy is the latest addition to the WEST SYSTEM line of epoxy products. While G/flex offers physical properties and applications that are different than WEST SYSTEM 105 Resin-based epoxies, they share the same high standards for performance and reliability.

West System is the world's leading brand of marine epoxy, created by Gougeon Brothers—sailors, boatbuilders, and formulators who literally wrote the book on wood/epoxy boat building. We know the engineering and chemistry required to formulate epoxies for high-performance composite structures. It requires thorough research, rigorous test programs, skillful shop work and direct experience with today's high-performance boats and other engineered structures. This experience and dedication to performance have given WEST SYSTEM another quality that sets it apart from other brands of epoxy.

For forty years, reliability has been the hallmark of WEST SYSTEM. We adhere to the highest standards of quality assurance in our formulating and manufacturing practices, from raw material qualification to testing and certification of finished resins and hardeners. This means that every properly mixed batch of WEST SYSTEM resin and hardener, including G/flex resin and hardener, will cure as it is supposed to, every time. This commitment to quality has earned certification to the ISO 9001:2000 standard. WEST SYSTEM is your reliable solution.

Outstanding customer service

WEST SYSTEM provides you with something else as reliable as our epoxy—knowledge. Whether your project is large or small, the WEST SYSTEM Technical Staff and comprehensive instructional publications will help assure the success of your building and repair project. WEST SYSTEM is renowned for its outstanding customer service.

WEST SYSTEM technical publications and DVD provide detailed procedures and instructions for specific repair and construction applications. Look for these comprehensive publications: 002 *The Gougeon Brothers on Boat Construction*, 002-970 *Wooden Boat Restoration & Repair*, 002-550 *Fiberglass Boat Repair & Maintenance*, and 002-650 *Gelcoat Blisters: Diagnosis, Repair & Prevention*. 002-898 *WEST SYSTEM How-To DVD* demonstrates basic techniques and fiberglass boat repair.

The WEST SYSTEM website provides basic product information, dealer locations and links, project articles and galleries, and safety information. Visit westsystem.com.

Further assistance can be obtained by contacting the friendly and knowledgeable Technical Staff. Send e-mail to tech-support@westsystem.com or call 866-937-8797 (toll free).

Ask for the **FREE Literature Pack** and you will receive the *WEST SYSTEM User Manual & Product Guide*, as well as 000-425 *Other Uses—Suggestions for Household Repair*, the latest issue of *Epoxyworks* magazine, the current product price list, and the Stocking-Dealer Directory. The 30-page *User Manual & Product Guide* is essential for first-time WEST SYSTEM users. It covers epoxy handling, safety, and the basic techniques used in most repair and building procedures. It includes complete product descriptions, selection and coverage information, and a problem-solving guide.

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