

## Kit contents

885-6\* 1—Venturi Vacuum Generator with 885-7 Silencer. The Vacuum Generator develops over 20 inches Hg (mercury) of vacuum (10 psi of clamping pressure) at .4 SCFM and is designed to run off of conventional shop air compressors that continuously deliver at least 65 psi at 3.5 SCFM. Some item specifications may vary. (A 1/4" NPT male air fitting is required to connect to your air compressor.)

885-34\* 3—Vacuum Cups. Cups are placed over a 1/2" "X" cut in the vacuum bag film and provide a port through the bag for the vacuum gauge or the vacuum tubing. 20 ft—885-4 1/4" I.D Vacuum Tubing. Cut tubing to the appropriate length, to connect the vacuum cups to the generator and make a resin trap.

885-5 1—Vacuum Gauge\*. The Gauge screws into a vacuum cup and is placed over a 1/2" "X" cut in the vacuum bag film. Vacuum measurement is expressed in inches of mercury (0-30 Hg). Each increase of 1 inch of mercury (a single increment on the gauge) indicates an addition of about seventy pounds of pressure per sq ft (.48 psi) at sea level.

2—Junction "T" barbs. T's are used to connect tubing lines and cups. May be used to place a resin trap just ahead of the venturi intake.

15 sq ft—Release Fabric. Release fabric peels cleanly away from the cured epoxy. Cut it to fit an area larger than the repair area or saturated laminate layup.

15 sq ft—Breather Fabric. Placed over the release fabric, under the vacuum bag to provide an air passage for air to get to the port.

25 ft—Vacuum Bag Sealant. Apply sealant continuously around the outside of the release fabric area to seal the vacuum bag over the layup.

15 sq ft—Vacuum Bag Film. The film is cut larger than the area outlined by the sealant, to which the perimeter of the film is tightly sealed. Pieces of sealant are used to plug any buckles in the film or gaps in the seal.

002-150 Vacuum Bagging Techniques. A 52-page manual that describes the basic principles and practical application of vacuum bagging for repair and laminate construction.

\*Available as a replacement part—see price list.

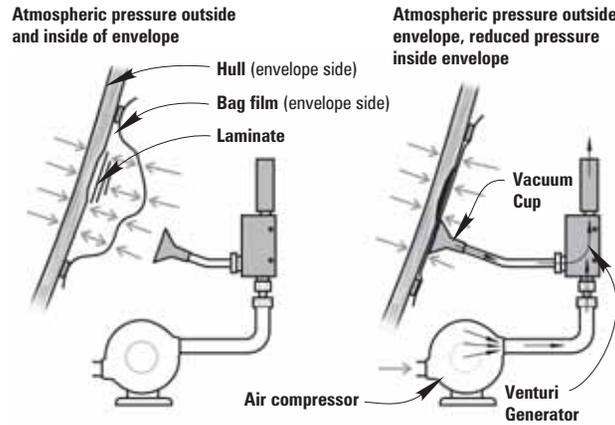


Figure 1—Typical repair before and after vacuum is applied

## Basic vacuum bagging

Vacuum bagging is a clamping technique that uses atmospheric pressure to press epoxy coated or saturated laminate together until it has cured. In the typical hull repair layup shown in the diagrams, the vacuum "bag" film is one half of an envelope. The hull (or mold if you are building a laminate) is the other side of the envelope\*\*. When the envelope is first sealed, air pressure inside and outside of the envelope are equal (about 14.7 psi). When air is sucked from within the envelope, interior air pressure is reduced (to about 5 psi) while outside, atmospheric pressure remains the same. Every-

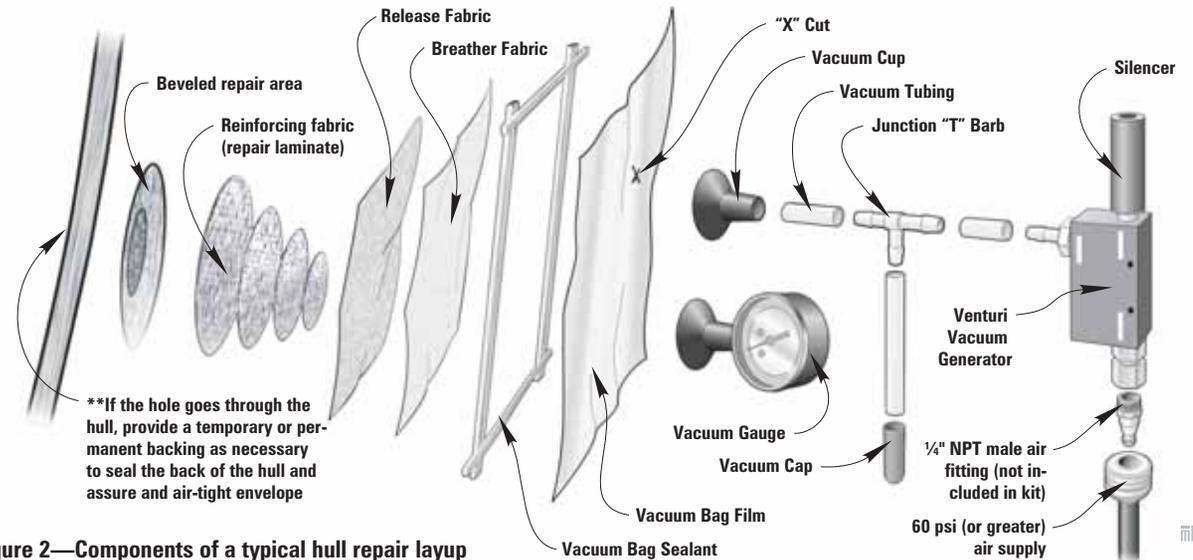


Figure 2—Components of a typical hull repair layup

thing within the envelope is compressed by the greater outside pressure pushing against the vacuum bag film and back of the hull/mold (Figure 1). The greater the pressure difference between the inside and outside of the envelope, the greater the clamping pressure. In this case the pressure differential is about a 10 psi. The flexible contents of the envelope and bag conform to surface contour of the rigid hull/mold side of the envelope.

When the epoxy cures, the repair laminate becomes a permanent part of the hull structure. In a molding operation, mold release applied to the smooth mold surface assures the cured laminate will not become a permanent part of the mold.

When the Vacuum Generator is activated and air is removed from the envelope, the atmosphere presses Vacuum Bag Film upon the Breather Fabric beneath it. The breather presses upon the Release Fabric, which compresses the repair laminate against the hull surface (Figure 2). The excess epoxy is drawn through the Release Fabric into the breather material. The Breather Fabric resists total compression and therefore maintains an air space that allows air and excess epoxy to migrate from the edges of the layup to the port and out of the envelope. As long as the seal is maintained and the vacuum is held, the pressure of the atmosphere will keep the Vacuum Bag Film and everything beneath it packed tightly against the hull or mold. This clamping pressure must be maintained until the epoxy cures.

## Tips to make the job easier

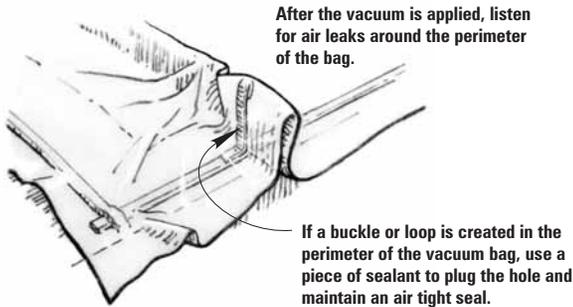
When repairing long or laminating larger areas, use an extra layer or strip of breather fabric to insure the complete removal of air from the bag and an even distribution of pressure on the laminate.

When making ½" "X" cuts in the bag film, circle them with a felt marker so you can locate them more easily.

To avoid making an impression in the surface of the repair place the Vacuum Cups on a part of the film not directly over the wet laminates.

Use a tank type vacuum cleaner or shop vac to evacuate a large or bulky bag setup before applying vacuum from the Venturi Generator.

Make a test layup to determine the exact number and weights of laminate cloths needed to match the specific thickness required for a repair. Using a flat smooth surface like a layer of glass, lay up a progressively thicker series of the kinds and weights of laminates that you like to use and apply vacuum pressure. When cured, measure and record the thickness for each combination.



Small leaks in the bag, seal or mold will have a cumulative effect of reducing vacuum levels under the bag. Seal all leaks with sealant or tape to improve vacuum levels. Some materials such as press board are porous enough to not be suitable as a mold surface unless they are coated and sealed with epoxy.

## A word of caution

The vacuum equipment and methods described in these instructions should not be used with adhesives that contain solvents or catalysts having medium to high vapor pressures. A very narrow band of latitude in time, temperature and pressure is available when applying vacuum to such adhesives and missing any mark can cause

unreliable repairs or outright failure. A good rule of thumb is, if some part of the product evaporates as a part of the curing process, it has a fairly high vapor pressure and should be avoided. Unsolvated epoxies in general and WEST SYSTEM epoxy in particular, have low vapor pressures and are very suitable for vacuum application.

## Advantages of vacuum bagging

All of the layers of fabrics and other materials used to fill the repair area can be wet out and applied at one time.

No matter the weight of the material or the location of the repair, the vacuum film will hold materials where placed.

The last layer of glass laminate can be laid up dry (not to exceed 25% of the glass laminate total). The vacuum generated pressure will force epoxy into the laminate, thereby reducing the amount of epoxy drawn into the breather fabric.

The higher clamping pressure results in a lower resin to higher fabric ratio and in a much stronger repair laminate for any given thickness.

After the initial cure stage (about 20 to 30 minutes at room temperature), the cure rate can be accelerated by warming the laminate with a hair dryer. Using this method, the entire cure time can be reduced by more than half.

When the Release Fabric is stripped from the cured repair, the excess epoxy is carried away in the breather fabric. The waxy surface film (amine blush) that forms on the surface of fully cured epoxy is also carried away. This eliminated the need to wash and dry the surface before proceeding with the finishing processes.

For detailed vacuum bagging information read 002-150 Vacuum Bagging Techniques.

Manufactured for West System by:

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# WEST SYSTEM®

# 885

## VACUUM BAGGING KIT

# Instructions

Vacuum bagging is a clamping system that uses atmospheric pressure to deliver firm, even clamping pressure over small and large surface areas, regardless of the type or quantity of material being laminated. It is used for repairs and composite construction to laminate a wide range of fabrics, core materials and veneers. By laminating over simple molds, composites can be molded into a wide range of functional shapes.

**The 885 Vacuum Bagging Kit is designed for room temperature repairs and small laminating projects up to 13 square feet.**