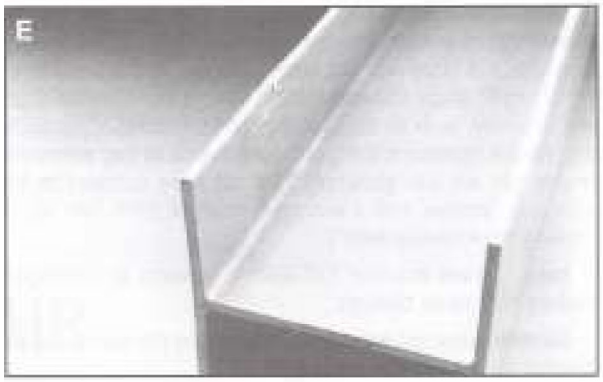
REPAIR PROCEDURE – SPLICING

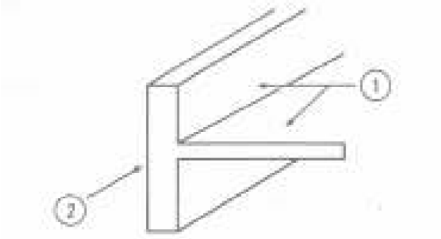
FRP is a composite consisting of uni-directional glass rovings and continuous strand mat. The uni-directional rovings are in the lengthwise direction and the maximum physical properties are also in that direction The transverse direction has approximately ¼ the strength of the longitudinal direction.

As a policy, Exel Composites does not ship fractured FRP profiles. However, during customer fabrication or in-plant operations these profiles may be damaged. The left flange in Picture E is an example of this damage. When the profile is fractured, its function in the structural application must be carefully reviewed from an engineering viewpoint. In general, if a profile has been struck by a blow severe enough to cause a fracture in excess of 4", the best repair is to replace the entire section. If replacement is not feasible, then the damaged section must be repaired to maintain its structural integrity. Failing to do so may result in the fracture propagating down the entire length of the structure.

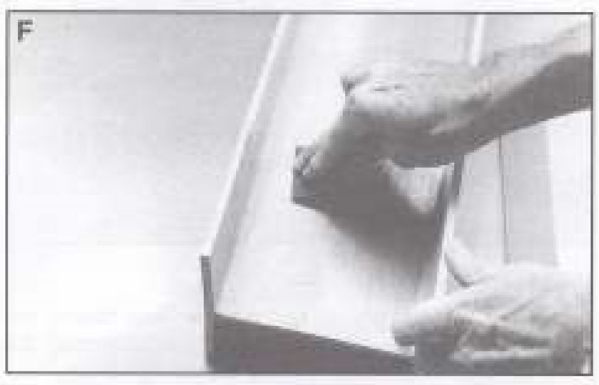


Procedure

1. This procedure will use a Exel Composites Wide Flange Beam as an example. The concepts will be similar for other structural FRP profiles, Exel booms, and Exel custom shapes; the "splicing profile" sections may be different.
2. Conceptually, the splice will be made using angles on each side of the beg/flange interface (see 1 on the sketch) and flat sheet on the back surface of the flange (see 2 on the sketch). Care must be exercised in selecting profiles with sufficient physical properties for the application.



3. Cut the angles and plate to be used as a splice 6" longer than the fracture. A good "rule of thumb" is to use the same thickness on the "splicing profiles" as the damaged profile. For Exel structural shapes, the same colour should be used for the "splicing profiles" as the damaged profile; the various grades of Exel Composites FRP are colour coded for corrosion and flammability resistance.
4. The procedure will utilise an epoxy adhesive for the bond. Trace the outline of the "splicing profiles" onto the damaged profiles and sand as in Pictures F and G. The tracing will aid in avoiding sanding where no bonding is to occur. Sanding is necessary for best adhesion of the epoxy bond.



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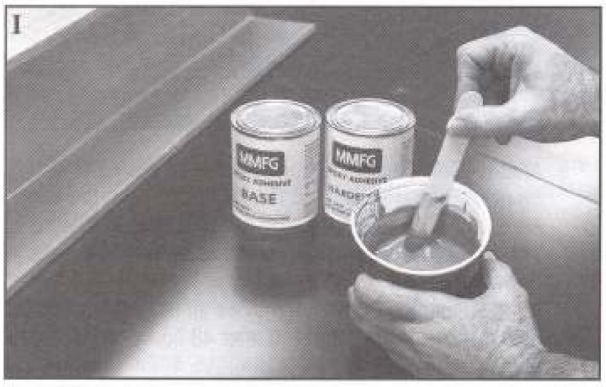
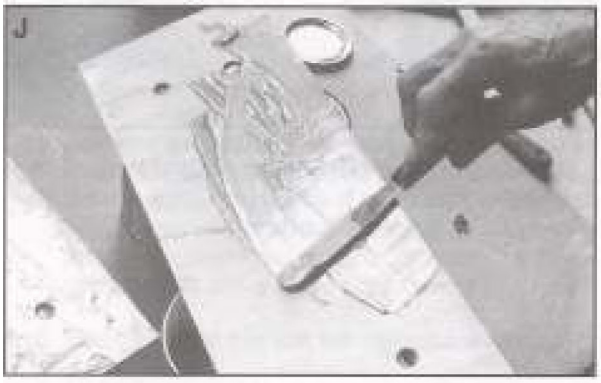
5. Clamp all of the profiles into position as shown in Picture H and drill holes for the subsequent insertion of Fibrebolt. Pre-drilling will insure minimum movement of the profiles after the epoxy adhesive has been applied; movement of the epoxy joint can damage the adhesive strength. The Fibrebolt will hold the splice together while the adhesive "sets" and serve as an additional bond. The Fibrebolt should not be considered as the primary bond.

6. Mix enough epoxy adhesive to cover all of the bonding surfaces. MMFG's epoxy repair kit requires that one part of hardener be added to one part of base until a uniform grey colour appears. An example of this mixing is seen in Picture I. Care must be exercised in using epoxy adhesives; the epoxy is toxic and the vapors may be harmful. Detailed instructions and precautions can be found on MMFG's Epoxy Adhesive Kit.

7. Spread the adhesive over the surfaces to be bonded as seen in Picture J. This must include the "splicing profiles" in addition to the damaged section. The mechanical clamp supplied by the Fibrebolt will squeeze the epoxy into the damaged area. Do not permit the profiles to stand after applying the adhesive; proceed to the next stem immediately.



8. After coating with adhesive, place the "splicing profiles" onto the damaged profile. Insert the Fibrebolt and tighten with a torque wrench as seen in Picture K (Consult Exel Composites publications for the amount of torque that can be applied with the size of Fibrebolt used). Remove excess adhesive from the repaired section before it cures. *Wait 48 hours* for the adhesive to cure prior to using the damaged section.



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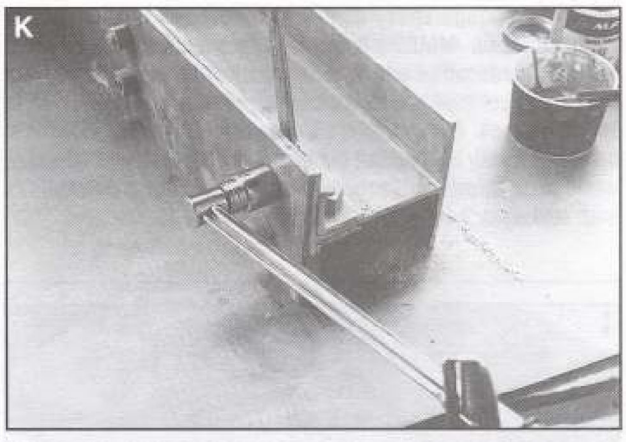

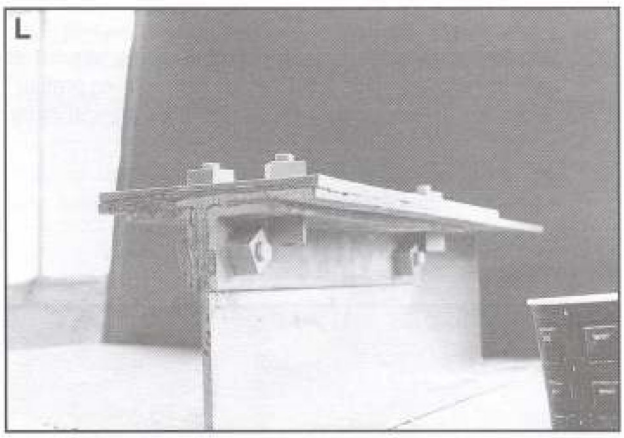

9. After the epoxy adhesive cures, it may be desirable to chip away any of the epoxy that has squeezed from the joints. An example of epoxy squeeze out is shown in Picture L. The repair will be functional whether or not the excess is chipped away. It the adhesive is still soft after 24 hours at room temperature (70°F), it may be an indication of an off ratio mix of epoxy. If still soft after 48 hours, a new repair may be required.

10. In repairing crosswise cracks, the same procedure is employed.