Scotch-Weld™
Core Splice Adhesive
EC-3500 B/A

Technical Data **September, 2005**

Introduction

3M™ Scotch-Weld™ Core Splice Adhesive EC-3500 B/A is a two-part core splicing material designed for filling mismatch areas and reinforcing honeycomb core.

- High performance over a temperature range of -67°F to 350°F (-55°C to 177°C)
- Low density
- Long worklife
- Low volatile loss during cure

Description

Color:	Gray (mixed)
Base:	Modified epoxy
Form:	Two-part paste
Weight:	40 lbs./cu. ft. nominal
Volatile Loss on Cure:	Less than 1% (1 hour @ 350°F [177°C])
Cure Cycle:	250°F to 350°F (121°C to 177°C) for 1 hour with a 10°F (-12°C)/minute warmup rate. (350°F [177°C] for best elevated temperature resistance.)

Product Performance

Porosity: A cured 2" x 2" x 1" test block did not absorb JP-4 under a pressure of 30 psi for 48 hours.

Mechanical Properties

Compression Strength: 1" x 1" x 2" samples were cut from a cured test block of Scotch-Weld EC-3500 B/A adhesive. Compression was run with force applied to the 1" square surfaces. Compression Rate: 0.02"/minute

Cure Cycle: 250°F (121°C), 1 hour, 50 psig, 10°F (-12°C)/min. warmup rate

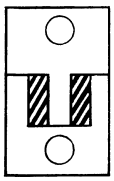
Test Temperature	Compressive Strength
75°F (24°C)	Min. 6000 psi
350°F (177°C)	Range: 6000-9000 psi

Shear Strength: Shear strength was determined using a tongue and groove test block as shown below.

Metal: 2024 T-3 bare aluminum

Load Rate: 0.1"/min. jaw separation

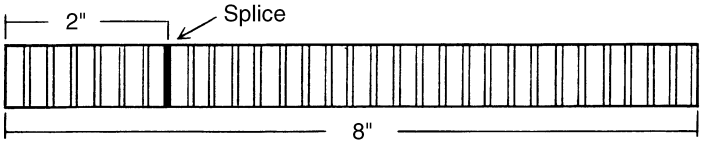
Cure Cycle: 350°F (177°C), 1 hour, 50 psi, 10°F (-12°C)/min. warmup rate



Product Performance ***(continued)***

Test Temperature	Scotch-Weld EC-3500 B/A Adhesive
75°F (24°C)	1000 psi
270°F (132°C)	1000 psi
350°F (177°C)	800 psi

Core Shear Strength: The core shear strength of 3M™ Scotch-Weld™ Core Splice Adhesive EC-3500 B/A was run on a 3" x 8" beam flexure specimen with a splice located 2 inches from one end as shown in the diagram below.



Cure Cycle:	350°F (177°C), 1 hour, 50 psi, 10°F (-12°C)/min. warmup rate
Face Sheet Adhesive:	3M™ Scotch-Weld™ Structural Adhesive Film AF-130
Load Pad:	1.5" single pt. load
Reaction Pads:	3/4"
Load Rate:	500 lbs./minute
Honeycomb:	5052, NP, 1/8" cell, 4 mil foil, 1/2" thick type ID
Face Sheets:	2024 T81 bare aluminum, 0.063" thick
Core Shear Strength:	$\frac{P}{b(t + t_c)}$ (psi)

P = Load in lbs.
b - Beam width
t = Specimen thickness
t_c = Core thickness

Test Temperature	Core Shear Strength
-67°F (-55°C)	930 psi
75°F (24°C)	925 psi
270°F (132°C)	945 psi

Volatile Condensible Material for Scotch-Weld EC-3500 B/A Adhesive
As per SP-R-0022 "Specification-Vacuum Stability Requirements for Polymeric Material for Space Craft Application."

	TWL	VCM
Scotch-Weld EC-3500 B/A adhesive	0.70	0.05

TWL = Total weight loss in percent as measured per SP-R-0022A procedure.

VCM = Volatile condensible material in percent measured using SP-R-0022A procedure.

*Note: Published by NASA.

Product Application

Proper adhesive application is as important as proper bond design and adhesive choice to obtain maximum joint properties. Improper adhesive application techniques can result in partial or complete failure of an assembly.

Scotch-Weld EC-3500 B/A adhesive performance data reported in Product Performance was developed using the following suggested procedures. Variations from these procedures should be fully evaluated to insure bond properties sufficient to meet the requirements of your particular assembly.

Surface Preparation

A thoroughly cleaned, dry, grease-free surface is essential for maximum performance of 3M™ Scotch-Weld™ Core Splice Adhesive EC-3500 B/A. Cleaning methods which will produce a break-free water film on metal surfaces are generally satisfactory.

Suggested Cleaning Procedure for Aluminum

1. Vapor Degrease – Hang skins in condensing vapors of perchloroethylene for 5 minutes.
2. Alkaline Degrease – Immerse skins in Oakite No. 164 solution (9-11 oz./gallon water) at 180-200°F (82-93°C) for 10-20 minutes. Rinse in generous quantities of clear running water.
3. Acid Etch – Place skins in the following solution for 10 minutes at 150 ± 5°F (66 ± -15°C).

   Caution: Read and follow etch solution component supplier's health and safety recommendations prior to using these materials.

Sodium Dichromate ($Na_2Cr_2O_72H_2O$)	4.1 - 4.9 oz./gallon
Sulfuric Acid, 66° Be	38.5 - 41.5 oz./gallon
2024T-3 aluminum (dissolved)	0.2 oz./gallon minimum
Tap Water	Balance

4. Rinse – Rinse face sheets in clear running water.
5. Dry – Air dry 15 minutes; force dry 10 minutes with parts at 150 ± 5°F (66 ± -15°C).

Aluminum Honeycomb Core

1. Soak in clean Aliphatic Naphtha (to conform to TT-N-95A) for five minutes at RT. Dry 10 minutes at 150 ± 10°F (66 ± -12°C).
2. Optional – Immerse in etching solutions for 2 minutes at 150 ± 5°F (66 ± -15°C). Rinse, air dry and force dry in similar manner to skin panels.

Two-Part Mixing

Two parts by weight of Scotch-Weld EC-3500 B (resin) and three parts by weight of Scotch-Weld EC-3500 A (hardener) should be mixed thoroughly on any convenient mixing apparatus. Care should be taken in mixing to avoid a high volume of entrapped air. Deaeration is then carried out by placing the mixed two-part in a vacuum oven at 30 in. of Hg for 1/2 hour. Slight heating (120°F [49°C]) will expedite the deaeration procedure.

Adhesive Application

Application can be made with any convenient method such as a spatula, putty knife, etc. Care should be taken such that a minimum amount of air is entrapped upon application.

CURE CYCLE

General

Time, temperature and pressure determine the final bond properties. These properties may also be effected by the type of curing equipment used for each specific application. Curing ovens must be vented to the outdoors. In general, the cure properties of Scotch-Weld EC-3500 B/A adhesive are as follows:

Cure Initiation Temperature: 200-250°F (93-121°C).

A cure of 60 minutes at 250°F (121°C) or 60 minutes at 350°F (177°C) is suggested where maximum results are desired.

Surface Preparation ***(continued)***

Cure Cycle (Autoclave or Platen Press)

The following cure cycle is suggested to obtain dense material which gives the strengths reported in the Product Performance section.

1. Bonding Pressure – Apply before reaching a bondline temperature of 150°F (66°C) and maintain throughout the press cure cycle.	0-50 psi
2. Bondline temperature rise rate	10°F (-12°C)/minute
3. Cure	60 min. @ 350°F (177°C)
4. Temperature at which pressure is released (In laboratory tests, panels are removed at 350°F [177°C]with no adverse effects.)	200°F (93°C) or below

Storage

Storage at 40°F (4°C) is suggested for unmixed 3M™ Scotch-Weld™ Core Splice Adhesive EC-3500 B/A. Material tested at 3M showed no decrease in cured mechanical properties after storage for 6 months at 40°F (4°C).

Note: Scotch-Weld EC-3500 A should not be frozen. Our data indicates that short term ambient temperature exposure up to 24 hours does not degrade unmixed Scotch-Weld EC-3500 B/A adhesive; however, these ambient temperature exposures are additive in effect.

Caution: Refrigerated Scotch-Weld EC-3500 B/A adhesive should be permitted to thoroughly warm to room temperature before containers are opened in order to prevent moisture condensation on the product.

Precautionary Information

Refer to Product Label and Material Safety Data Sheet for health and safety information before using this product. For additional health and safety information, call 1-800-364-3577 or (651) 737-6501.

For Additional Information

To request additional product information or to arrange for sales assistance, call toll free 1-800-235-2376 or fax 1-800-435-3082 or 651-737-2171. For U.S. Military, call 1-866-556-5714 or fax 651-737-4380. If outside of the U.S., please contact your nearest 3M office.

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AS9100

This product was manufactured under a 3M quality system registered to AS9100 standards.

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Aerospace and Aircraft Maintenance Division
3M Center, Building 223-1N-14
St. Paul, MN 55144-1000
www.3M.com/aerospace

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