



Scotch-Weld™ Structural Adhesive Primer EW-5000

Technical Data

February, 2006

Product Description

3M™ Scotch-Weld™ Structural Adhesive Primer EW-5000 is a sprayable, water-borne, epoxy based, low VOC, heat curing, corrosion inhibiting primer that can provide protection against corrosive environments. Scotch-Weld EW-5000 primer is designed to provide ambient temperature drying with handleability prior to the bake cycle. Scotch-Weld EW-5000 primer meets the South Coast Air Quality Management District (SCAQMD) Rule 1124 VOC limit with less than 250 g per liter of volatile organic content.

Key Features

- Corrosion inhibiting package for excellent corrosion protection
- VOC is 178 g/liter, minus exempt solvents
- Can be sprayed to target thickness, 0.20 - 0.25 mil (5 - 6 μ), within one box coat (2 passes)
- High spray transfer efficiency
- 3 - 6 times higher coverage compared to solvent-borne primers
- Handleable prior to the bake cycle (no pre-bake required)
- Can be brush applied
- Pre-bake thickness can be checked by a gauge or a color chart
- Uses conventional spraying and drying (curing) equipment
- Hot/Wet durability
- BMS 5-89 and BMS 5-137 qualified

Typical Properties of Liquid Primer

Color:	Yellow
Base:	Epoxy resins
Vehicle:	Distilled water and small amounts of co-solvents
Net Weight:	8.9 lbs/gallon (1.06 g/cc)
Solids Content:	31.0 ± 1.0%
VOC with exempt solvents:	178 g/liter
VOC without exempt solvents:	213 g/liter
Corrosion Inhibitor Content:	15.5 ± 2% per total non-volatiles
Storage:	35 - 45°F (1 - 7°C) [DO NOT FREEZE]

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Typical Cured Physical Properties

Note: The following technical information and data is based upon limited 3M testing conditions and are considered typical values and should not be used for specification purposes.

I. Key Specifications

Appearance	Glossy to Semi-glossy
Air Dry Tack:	None
40 Day Salt Spray Exposure:	Pass ¹
Pencil Hardness:	7H ²
Pencil Hardness after 7 days in Skydrol®:	7H ²
Min. Thickness to MEK Resistance:	0.10 - 0.14 mil (2.5 - 3.6 μ) ³
Max. Thickness for Peel Performance:	0.38 - 0.40 mil (9.7 - 10.2 μ) ⁴

¹Tested according to ASTM B117 with 1/16 inch wide scribed lines. After 40 days, no corrosion was developed either beyond or inside the scribed lines. No pitting corrosion was developed when primer thickness was greater than 0.06 mil. See Product Application section for cure cycle.

²Tested according to ASTM D3363.

³Tested according to ASTM D5402.

⁴See metal-to-metal climbing drum peel data in section III of the Typical Cured Physical Properties.

II. Metal to Honeycomb Flatwise Tension

Adhesive: 3M™ Scotch-Weld™ Structural Adhesive Film AF 163-2M, .06 wt.

Adhesive Cure: 50 psi (0.35 MPa), 4°F/min (2.2°C/min) rise rate to 250°F (121°C) for 90 min.

Core: 1/4" cell, 0.625" thick, PAA treated 5052 Alloy, 4-mil foil, non-perforated.

Primer Cure: 30 min air dry followed by 60 min bake at 260°F (127°C).

Primer Thickness: 0.20 - 0.25 mil (5 - 6 μ).

Test Temperature	Flatwise Tensile Shear Strength
75°F (24°C)	1600 psi (11.0 MPa)
180°F (82°C)	780 psi (5.3 MPa)
250°F (121°C)	125 psi (0.86 MPa)

Tested according to ASTM C297; Test speed was set so as to produce failure within 3 - 6 minutes.

III. Metal/Metal Climbing Drum Peel

Adhesive: 3M™ Scotch-Weld™ Structural Adhesive Film AF 163-2OST, .06wt.

Adhesive Cure: 50 psi (0.35 MPa), 4°F/min (2.2°C/min) rise rate to 250°F (121°C) for 90 min.

Primer Cure: 30 min air dry followed by 60 min bake at 260°F (127°C).

Primer Thickness mil (μ)	Peel Strength in-lb/in (mN/m)	Percent Cohesive Failure Mode
0.24 (6.1)	82.5 (367.5)	100%
0.33 (8.4)	79.0 (351.9)	100%
0.35 (8.9)	78.9 (351.4)	100%
0.36 (9.1)	81.4 (362.6)	100%
0.37 (9.4)	82.6 (367.9)	100%
0.38 (9.7)	80.1 (356.8)	99%
0.40 (10.2)	79.7 (355.0)	98%
0.41 (10.4)	76.5 (340.8)	88%

Tested according to ASTM 1781, crosshead speed of 3 in/min (76 mm/min).

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Typical Cured Physical Properties (continued)

Note: The following technical information and data is based upon limited 3M testing conditions and are considered typical values and should not be used for specification purposes.

IV. Wide Area Shear

Adhesive: 3M™ Scotch-Weld™ Structural Adhesive Film AF 163-2M, .06 wt.
 Adhesive Cure: 50 psi (0.35 MPa), 4°F/min (2.2°C/min) rise rate to 250°F (121°C) for 90 min.
 Primer Cure: 30 min air dry followed by 60 min bake at 260°F (127°C).
 Primer Thickness: 0.20 - 0.25 mil (5 - 6 μ).

-67°F (-55°C)	5000 psi (34 MPa)
75°F (24°C)	5000 psi (34 MPa)
180°F (82°C)	4000 psi (28 MPa)
250°F (121°C)	2000 psi (14 MPa)
75°F (24°C) after 30 days at 100% RH / 120°F (49°C)	5200 psi (36 MPa)
75°F (24°C) after 30 days salt spray at 95°F (35°C)	5600 psi (39 MPa)
75°F (24°C) after 7 days in JP-4 fuel at 75°F (24°C)	4600 psi (32 MPa)
75°F (24°C) after 7 days in hydrocarbon fluid (TT-S-735) at 75°F (24°C)	4800 psi (33 MPa)
75°F (24°C) after 7 days in Skydrol® at 150°F (65°C)	5700 psi (39 MPa)

Tested according to ASTM D3165, crosshead speed 0.05 in/min.

V. Honeycomb Peel

Adhesive: 3M™ Scotch-Weld™ Structural Adhesive Film AF 163-2M, .06 wt.
 Adhesive Cure: 50 psi (0.35 MPa), 4°F/min (2.2°C/min) rise rate to 250°F (121°C) for 90 min.
 Core: 1/4" cell, 0.625" thick, PAA treated 5052 Alloy, 4-mil foil, non-perforated.
 Primer Cure: 30 min air dry followed by 60 min bake at 260°F (127°C).
 Primer Thickness: 0.20 - 0.25 mil (5 - 6 μ).

75°F (24°C)	84 in-lb/3-in (124.7 mN/m)
75°F (24°C) after 30 days at 100% RH / 95°F (35°C)	83 in-lb/3-in (123.2 mN/m)
75°F (24°C) after 30 days salt spray at 95°F (35°C)	82 in-lb/3-in (121.8 mN/m)

Tested according to ASTM 1781, crosshead speed of 3 in/min (76 mm/min).

VI. Other Performance Tests

Adhesive Cure: 50 psi (0.35 MPa), 4°F/min (2.2°C/min) rise rate to 250°F (121°C) for 90 min.
 Primer Cure: 30 min air dry followed by 60 min bake at 260°F (127°C).
 Primer Thickness: 0.20 - 0.25 mil (5 - 6 μ).

Test	Adhesive	Test Condition	Results
Wedge ¹ Crack	AF163-2K .06WT	100% RH / 140°F (60°C) for 7 days	100% cohesive failure, crack length less than 0.25 in (6 mm)
Slow Cycle Fatigue	AF163-2M .06WT	100% RH / 140°F (60°C); 1500 psi (10.3 MPa); 5 cycles/hr	> 2000 cycles
Fatigue ²	AF163-2M .06WT	Ambient conditions; 30 Hz at 1500 psi (10.3 MPa)	> 2.0 x 10 ⁷ cycles

¹Tested according to ASTM D3762.

²Tested according to ASTM D3166.

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Product Application

Note: This information is provided as a general application guideline based upon typical conditions. No two applications are identical due to differing assemblies, method of heat and pressure application, production equipment and other limitations. It is therefore suggested that experiments be run, within the actual constraints imposed, to determine optimum conditions for your specific application and to determine suitability of product for particular intended use.

I. Metal Surface Preparation

A thoroughly cleaned, dry, grease-free surface is essential for maximum performance. Cleaning methods that will produce a break free water film on metal surfaces are generally satisfactory.

The best performance will be achieved with the surface preparation by alkaline (e.g. Oakite™ 164 or Isoprep™ 44 solutions) degreasing, then FPL etching, according to ASTM D2674, and followed by anodizing, according to ASTM D3933.

II. Agitation

Always mix well before transferring it to the spray system. Mixing can be achieved by the following options:

1. **Roller mixer.** Place the primer on the roller mixer, and let it roll for 20 minutes.
2. **Mechanical stirrer.** Use a propeller type blade. Stir at medium low speed (100 - 150 rpm) for 15 - 20 minutes.
3. **Paint shaker.** Use with caution. Do not shake for more than 5 minutes. Otherwise excessive foam can form.

III. Spray

1) Equipment and settings:

Spray Equipment	Conventional HVLP spray gun ¹ , e.g. 3M™ PPS™ Paint Preparation System HVLP Spray Gun Part #16212 ² Accuspray® Series 12 HVLP Spray Gun Binks® Mark 1 HVLP Spray Gun
Fluid and Air Nozzle	1.3 mm or less for siphon or gravity feed guns 1.0 mm or less for pressure feed guns
Atomizing Pressure	6 - 10 psi (40 - 69 kilopascal) at the air cap (gun tip) ³
Fluid Nozzle Setting	1/2 - 3/4 turn out from close position
Fan Pattern	Adjust fan pattern control to provide about 45 - 60 spray pattern
Gun Distance	6 - 12 inch (15 - 30 cm) from the panel

¹Can be either a siphon or gravity-feed gun.

²3M PPS Part #16212 comes with a kit that contains a fluid nozzle of 1.3 mm tip.

³For 3M™ PPS™ Paint Preparation System Spray Gun, set the pressure just below the purple zone at the gauge attached to the gun.

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Product Application (continued)

2) Spray Process

- Make sure to let the primer warm up to ambient temperature before spray. Preferably 65°F (18°C) or higher, but not to exceed 95°F (35°C).
- The spray of water-borne products varies with temperature and humidity conditions. To assure good spray appearance, the booth temperature should be above 70°F (21°C), and humidity should be below 50%.
- For best post-cured appearance, allow flash-off between passes. At high humidity and low temperature conditions, spray less material each pass, and allow extra passes to achieve the designated thickness.
- A training DVD is available through your 3M Aerospace Sales Representative.

IV. Primer Thickness

Optimal thickness: 0.18 - 0.28 mil (4.5 - 7.0 micrometer) after cure.^{1,2}

V. Drying and Bake

Air-Dry: 30 minutes.

Bake: 260°F (127°C) for 60 minutes.

Shelf Life and Stability

3M™ Scotch-Weld™ Structural Adhesive Primer EW-5000 should be stored at refrigerated condition, e.g. 35 - 45°F (1 - 7°C). DO NOT FREEZE. The shelf life under this condition is 1 year from date of shipment.

Scotch-Weld EW-5000 primer should be warmed thoroughly to room temperature before use. However, do not expose it to above 100°F (38°C) for a prolonged period of time.³

The out time of Scotch-Weld EW-5000 primer is 15 days under 80°F (27°C), and 7 days at 90°F (32°C).

¹Primer thickness can be measured after the surface is flashed off, yet before bake. If thickness is measured before bake, about 0.02 - 0.05 mil (0.5 - 1.2 micrometer) shrinkage will occur after bake.

²The recommended thickness should be achieved within 2 to 3 passes (or 1 to 1.5 box coats) depending on temperature and humidity.

³The primer should not be exposed for more than 24 hours at 100°F (38°C), and should not be more than 1 hour at 120°F (49°C).

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Precautionary Information

Refer to product label and Material Safety Data Sheet for health and safety information before using this product.

Always wear personal protection equipment, such as 3M™ Multi Gas/Vapor Respirator Assembly 5106 and safety eyewear.

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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