



FORTRESS

STABILIZATION SYSTEMS

4020 EPOXY GEL

100% Solids, High Modulus, Two-Part Epoxy Gel for bonding CFRP systems

Product Description Fortress 4020 Epoxy Gel is a specially designed adhesive for bonding and laminating Fortress carbon strengthening products. It is a two-part, high-strength, high-modulus, zero V.O.C., and moisture tolerant epoxy adhesive for structural applications. Fortress 4020 Epoxy Gel has high adhesion and high pull-off resistance to many structural materials including concrete, masonry, steel, stone, and wood.



Key Features

- ❖ Easy 2:1 mixing ratio
- ❖ 100% solids
- ❖ Color coded for proper metering
- ❖ Less than 5% air entrapment, less than 1% with vacuum clamping
- ❖ No sag formula

PRODUCT USE

Target Applications

- ❖ Where a high strength, durable bond between CFRP products and substrates is desired.
- ❖ Bonds Fortress Carbon Plate & Carbon-Kevlar Strap Systems to concrete, masonry, timber, & other structural substrates.
- ❖ Bonds multiple layers of CFRP pre-preg plate & strap
- ❖ Bonds Fortec Carbon Bars to concrete & masonry using the near-surface-mounted (NSM) technique
- ❖ Bonds steel plate to concrete.
- ❖ Ideal for overhead and vertical applications

Benefits

- ❖ Zero V.O.C.s (solvent free)
- ❖ Full load transfer between CFRP and substrate
- ❖ Excellent adhesion
- ❖ Ambient cure
- ❖ Rapid strength development
- ❖ High strength bond

PRODUCT SPECIFICATIONS

HANDLING CHARACTERISTICS

Mix Ratio (Resin: Hardener) by volume	2:1
Mixed Density, Lb/Gal (g/l)	9.3
Pot Life of 2.4 oz (70 ml) @ 72°F (22°C) ASTM C881	10 minutes
Working Time, 1/2" (13 mm) Bead	20 minutes
Clamps Off Cure Time, 1/16" (1.5 mm) Bond Line @ 75°F (24°C)	2 hours
Minimum Cure Temperature	45°F (7°C)*

*The product will cure at temperatures as low as 45°F (7°C); however, keep cartridges at 70°F (21°C) or above when dispensing.

CURED CHARACTERISTICS**

Tensile Strength, psi (N/mm ²) ASTM D638	7,100 (49)
Tensile Elongation ASTM D638	4.0%
Tensile Modulus, psi (N/mm ²) ASTM D638	3,800 (26)
Flexural Strength, psi (N/mm ²) ASTM D790	12,500 (86)
Flexural Modulus, psi (N/mm ²) ASTM D790	37,500 (259)
Hardness (Shore D)	
1 Day ASTM D2240	82
2 Weeks ASTM D2240	85
Compressive Strength, psi (N/mm ²) at 2 Weeks ASTM D695	10,720 (74)
Glass Transition Temperature, T _g by DSC	125°F (52°C)
Heat Deflection Temperature ASTM D648	130°F (54°C)

**Curing data is based on 72°F (22°C) ambient temperature.

HOW TO USE

Preparation. Surfaces must be clean and structurally sound. Spalling or other damaged substrate must be removed to solid material. Concrete surfaces must be prepared to a structurally dense surface with exposed coarse aggregate to reveal an open texture surface by shot blasting, ultra-high pressure water blasting, bush hammering or other suitable mechanical means. Concrete surfaces should be prepared to a minimum concrete surface profile of CSP-3 as defined by the International Concrete Repair Institute (ICRI). Remove all weak, contaminated or deteriorated concrete, asphaltic or bituminous materials, oils, dirt, rubber, curing compounds, paint, carbonation, laitance, and any other potentially detrimental materials.

Surface preparation by bush hammering, grinding, and milling can create minute fractures or micro cracking in the substrate which may require more preparation as described above. Additional cleaning may be necessary to remove any debris remaining after the removal of unsound concrete. Oil-free compressed air may be used to remove any dust or debris immediately prior to the application of the epoxy.

Steel should be cleaned and prepared by sandblasting to conform to SSPC-SP10 specification with a 4 mil (0.1 mm) minimum anchor profile. If flash rust appears, the surface must be re-blasted to obtain minimum anchor profile.

Protect the work area from standing water and inclement weather. Surfaces may be damp. For concrete and masonry applications, patch all uneven surfaces with Fortress epoxy. Broadcast silica sand on patches to avoid amine blush.

Mixing. For best results, condition the components to 75°F (24°C) for 24 hours prior to mixing. For cartridges, use the attached static mixer. No further mixing is required.

For containers, identify part A, epoxy resin and part B, epoxy hardener. The mixing ratio is 2 parts A, resin to 1 part B, hardener by volume. Mix only that quantity that can be used within its working time (pot life).

Stir each component prior to blending. Proportion two (2) parts by volume of Component A resin and one (1) part of Component B hardener into a clean container with flat wall and bottom. Mix thoroughly for a minimum of three minutes using a low speed drill (600 rpm) and a mixing paddle (e.g. a Jiffy® and/or Plunge Mixer™). Keep the paddle below the surface of the material to avoid entrapment of air. Thorough mixing of both components is important to obtain optimum results. Carefully scrape the sides and bottom to ensure thorough mixing.

Coverage. Coverage yield will vary with technique used, surface, and substrate roughness. The following is a theoretical yield based at a given thickness. It does not account for loss of material, or for application at greater thicknesses. At 40 to 60 mils (1.0 to 1.5 mm): approximately 25 to 45 sq.ft. per gal (0.6 to 1.1 m²/L).

Application. Apply mixed Fortress 4020 Epoxy Gel to the substrate using a trowel or spatula at a uniform thickness of 40 to 60 mils (1.0 to 1.5 mm). Thoroughly press and work the epoxy mixture into the substrate for positive adhesion. Apply a similar thickness of adhesive to a prepared Fortress Carbon-Kevlar or other Carbon Grid. Using gloved hands, mate the gelled surfaces together. Press and squeeze out excess epoxy and air voids using a hard laminating roller. Remove excess adhesive.

For Fortress Carbon-Kevlar or other Fortress Grid, let the adhesive squeeze through the grid to assure a proper bond. For a single grid layer, apply an epoxy top coat at a rate of approximately 160 ft²/gal (4 m²/L) (10 mil or 0.3 mm thickness) while the base resin is still within its working limit (depending on temperature) and smooth for a finished appearance. After cure, perform sounding to locate any voids. Inject epoxy resin as needed to fill all voids.

Amine Blush. Amine Blush is the phenomenon where a wax-like or greasy film on the surface of the cured epoxy is formed where certain temperatures and humidity exist during cure. Amine blush can occur with any type or brand of epoxy. An Amine blush is usually formed after the initial set of the epoxy. Amine Blush can hinder the adhesion of a successive application of epoxy. If the blush is slight it may be hard to detect visually or by touch. Blush will be more noticeable in cool, damp or humid conditions.

Amine blush must be removed before applying additional layers of epoxy. If a second layer of epoxy cannot be applied within 12 hours after the previous application, it is recommended that the surface be prepared to remove any blush that may have occurred. Light sandblasting between coat applications is the recommended procedure for surface preparation to remove blush or contaminants that may create inter-coat adhesion problems. Amine blush may also be removed by wet sanding.

Some amine blushes may be water soluble. Test with a pressure wash at a minimum 750 psi with injection of sufficient Dawn® dishwashing liquid (usually 2-3%) to remove and clean the surface of contaminates. As an alternative, wash down and thoroughly scrub the surface between applications with a solution of Dawn® dishwashing liquid. Rinse with plenty of fresh water to thoroughly remove the dissolved blush and allow drying completely before application of the next layer of epoxy.

Note: Many experienced contractors have advised that a wash down and scrub with Dawn® dishwashing liquid and water is easy and does not create a mess. Do not use solvents to remove the blush.

It is important that the user evaluate a small test area of successive epoxy applications for proper preparation and bond before proceeding with a full scale operation.

Dawn® is a registered trademark of Procter & Gamble.

Spill Clean Up. Ventilate area. Confine spill. Collect with tools and absorbent material. Dispose of in accordance with current, applicable local, state and federal regulations. Uncured material can be removed with approved solvent. Cured material can only be removed mechanically.

Qualifications.

- ❖ Each structural and life safety application requires the design and certification of a licensed, professional engineer.
- ❖ Do Not Thin Fortress 4020 Epoxy Gel- Solvents will prevent proper cure.
- ❖ Material is a vapor barrier after cure, test on-grade substrates for moisture-vapor transmission prior to application (Ref. ASTM F-1869; ASTM D-4263). Fortress 4020 Epoxy Gel, when cured, creates a non-breathing film. This produces a vapor barrier and should not be applied to surfaces where the transmitted vapor can condensate under coating and freeze. Do not completely encapsulate mortar or concrete subjected to freezing.
- ❖ Do not apply over wet, shimmering surface.
- ❖ Minimum age of concrete prior to application is 21-28 days, depending on curing and drying conditions.
- ❖ For applications on exterior, on-grade substrates, consult Technical Service.
- ❖ Proper application is the responsibility of the user.

Cautions. Fortress epoxies contain alkaline amines. Strong sensitizer; MAY CAUSE SKIN SENSITIZATION or allergic response ranging from mild wheezing to a severe asthmatic type attack. Avoid contact with skin or eyes. IN CASE OF CONTACT immediately wash skin with soap and water. Flush eyes with water and obtain medical attention. Wear protective clothing, goggles, and barrier cream on all exposed skin.

An externally applied CFRP system is a vapor barrier. Consult with a licensed, professional engineer to evaluate results of encapsulating porous substrates. Installation should be performed only by a Fortec trained and approved installer.

FIRST AID

Inhalation. Remove person to fresh air.

Skin. Remove contaminated clothing. Wash skin thoroughly for 15 minutes with soap and water.

Eyes. Flush thoroughly with water for 15 minutes.

Ingestion. Do not induce vomiting. Contact a physician immediately.

In all cases, contact a physician immediately if symptoms persist.

Keep Out Of Reach of Children - Keep Container Tightly Closed – Not For Internal Consumption – For Industrial Use Only

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