

Advantage EP-950A

Advantage EP-950A is an acrylic-based emulsion polymer isocyanate system (EPI) developed with exceptional water and heat resistance. It exceeds the requirements of ASTM D2559-12a, ASTM D7247-07ae1, ANSI 405-2013 and CSA 0112.10, which are required adhesive tests for many structural applications. This adhesive can be utilized in cold press equipment. The emulsion must be mixed with Hardener 200, a polymeric isocyanate, at 13-15 parts Hardener 200 to 100 parts emulsion.



PHYSICAL PROPERTIES

Advantage EP-950

Chemical family description: acrylic emulsion adhesive

Appearance: White colored liquid

Specific gravity: 1.28

Weight solids (%): 46.0 - 57.8%

pH: 6.5 - 8.2

Suggested minimum use temperature: 46°F/ 7°C

Typical viscosity (cps): 2900 - 5600 cps

Mixed viscosity (cps): 8000 - 9000 when mixed; 15000 - 17000 at one hour

**The physical properties listed are target ranges and not final product specifications.*

Hardener 200

Chemical family description: Polymeric MDI

Appearance: Brown colored liquid

Typical viscosity at 25°C (cps): 170 - 230

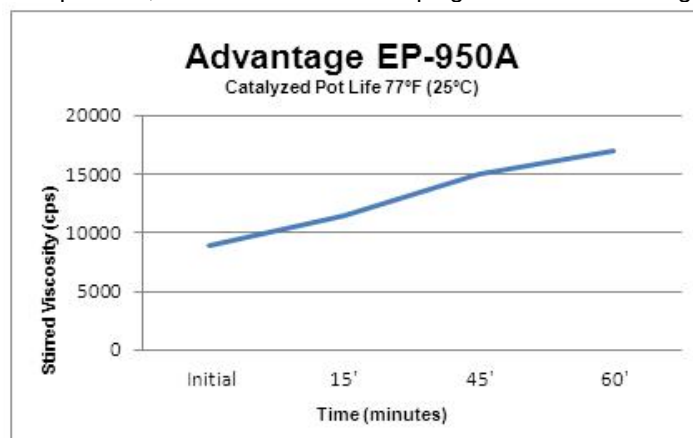
Specific gravity: 1.23

KEY PRODUCT FEATURES

- Two-part acrylic EPI system
- Recommended for applications requiring excellent water, heat and solvent resistance
- Very low foam development
- Exceeds ASTM D2559-12a, ASTM D7247-07ae1 and ANSI 405-2013
- Exceeds CSA 0112.9 and CSA 0112.10
- CCMC Evaluation Listing 14035-L
- AS/NZS 4364 Class I, II, III Approved
- Passes ASTM E119-16
- Meets the definition of NAF for CARB and TSCA Title VI

POT LIFE

The pot life of this system is approximately one hour at 77°F (25°C). However, the viscosity of the mix will increase as it ages. Wood glued with older material will have less water resistance, a characteristic common to most EPI adhesives. Therefore, it is recommended that fresh adhesive be mixed only when it is to be immediately used. EPI adhesives also generate foam during the reaction process; so we recommend keeping the material moving continually.



MIXING INSTRUCTIONS

Advantage EP-950A resin is mixed with Hardener 200 at a ratio of 100 parts resin to 15 parts Hardener by weight or 6.45 parts resin to one part Hardener by volume. Avoid mixing for long periods of time or with excessive agitation as pot life is affected by mixing time and speed. While this product can be easily mixed by hand, it is usually more convenient to mix the components in a meter mix unit. Your Franklin representative can work with you to supply the appropriate mixing equipment.

PERFORMANCE PROPERTIES

- Exceeds ASTM D2559-12a Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions: This standard covers adhesives suitable for the bonding of wood into structural laminated wood products for general construction and other uses where a high strength, durable adhesive bond is required. The strength and durability requirements are based on the performance of the adhesive in laminated wood as measured by the following test methods: resistance to shear by compression loading; resistance to delamination during accelerated exposure to wetting and drying; and resistance to deformation under static load.

ASTM D2559-12a: Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions -- (PFS Test Report #12-093)

Section 14: Resistance to Shear by Compression Loading

	Min/Min*	Min/Max*	Max/Max*
Average Wood Failure (%)	100	100	100
Required Wood Failure (%)	≥75%	≥75%	≥75%
Average Shear Strength (psi)	1930	1988	1713
Required Shear Strength (psi)	See below	See below	See below
RESULTS	PASS	PASS	PASS

Shear values for Douglas Fir must meet or exceed 1110 psi for 8% moisture content and 1020 for 12% moisture content. Test specimens were glued at 10-12% moisture content. *Minimum open time – 0 minutes; Maximum open time – 10 minutes

Section 15: Resistance to Delamination During Accelerated Exposure

	Delamination	Requirement	Result
Min/Min	0%	Total <5%	PASS
Min/Max	0%	Total <5%	PASS
Max/Max	0%	Total <5%	PASS

Section 16: Resistance to Creep Under Static Load

	Block #1		Block #2		Requirement	Result
	Side A	Side B	Side A	Side B		
160°F	0 in.	0 in.	0 in.	0 in.	< 0.139 in	PASS
80°F and 90% RH	0 in.	0 in.	0 in.	0 in.	< 0.139 in	PASS

- Exceeds ASTM D7247-07ae1 Standard Test Method for Evaluating the Shear Strength of Adhesive Bonds in Laminated Wood Products at Elevated Temperatures: This standard is used for evaluation of the shear strength of an adhesive at ambient and elevated temperature relative to the performance of solid wood at the same conditions.

ASTM D7247-07ae1 Standard Test Method for Evaluating the Shear Strength of Adhesive Bonds in Laminated Wood Products at Elevated Temperatures -- (PFS Test Report #12-093)

Type	Mean Shear Strength		Residual Shear Strength Ratio	Solid Wood Control		Compliance with section 8.5 (Note 6) ¹
	Elevated Temperature	Ambient Temperature		C.O.V. for Shear Strength at Elevated Temperature	Lower 95% Confidence Interval	
Solid Wood Control	494	1561	0.32	0.20	0.27	PASS
Bonded Wood	478	1667	0.29			

- Exceeds ANSI 405-2013 Standard for Adhesives for Use in Structural Glued Laminated Timber: This standard provides the minimum requirements for evaluation of adhesives to be used in structural glued laminated timber products. Adhesives must meet the requirements of ASTM D2559, ASTM D7247, as well as creep resistance, accelerated aging of bonded specimens compared to solid wood controls, and durability testing using boil-dry-freeze conditioning.

ANSI 405-2013 Standard for Adhesives for Use in Structural Glued Laminated Timber – (PFS Test Report #13-100)

2.1.1 Exterior Exposure – ASTM D2559 – PASS (see test results above)

2.1.2 Accelerated Aging – ASTM D1151 -- PASS

	Bonded Wood	Solid Wood	% of Solid Wood Strength	Result
Control	1190	978	122%	PASS
Aged	1208	1250	97%	PASS

Required: Bond strength must be equal to or exceed 90% of the average solid wood control.

2.1.3 High Temperature – ASTM D7247 – PASS (see results above)

2.1.4 Creep Resistance -- CSA 0112.9, section 4.10.1 – PASS

2.1.5 Accelerated Aging – ASTM D1183, D – PASS

	Strength	Wood Failure	% of Solid Wood Strength	Result
	psi	%		
Solid Wood	1777	100	112%	PASS
Bonded Wood	1986	100		

Required: Bond strength must be equal to or exceed 90% of the average solid wood control. Average wood failure shall be equal to or exceed 75%.

2.1.6 Durability – CSA 0112.9, section 5.5 -- PASS

Required: At least 50% of the specimens shall have a shear strength greater than or equal to 508 psi.

CSA 0112.9-10 Evaluation of Adhesives for Structural Wood Products (Exterior Exposure)

Test Details	Test Result	Requirement	
Vacuum-Pressure Soak/Dry Avg. Shear, % Wood Failure*	Min/Min: 957 psi, 90% Max/Max: 1102 psi, 93%	Avg. Shear > 812 psi Avg. Wood Failure > 85%	PASS
Delamination Resistance**	No delamination	Total delam of any bond line < 1% of end grain bond line	PASS
Creep Resistance Env A**	No evidence of creep	<0.05 mm average of all joints <0.25 mm for any bonded joint	PASS
Creep Resistance Env B1**	No evidence of creep	<0.05 mm average of all joints <0.25 mm for any bonded joint	PASS
Creep Resistance Env B2**	No evidence of creep	<0.06 mm average of all joints <2.9 mm for any bonded joint	PASS
Creep Resistance Env C**	No evidence of creep	<0.05 mm average of all joints <0.25 mm for any bonded joint	PASS
Cured Adhesive Film pH**	Average pH 6.8	>2.5 pH	PASS
Dry Test*** Avg. Shear, % Wood Failure	Min/Min: 1930 psi, 100% Max/Max: 1713 psi, 100%	Avg. Shear > 1450 psi Avg. Wood Failure > 85%	PASS
4Boil-Dry-Freeze****	Min/Min: 622 psi, 100% Max/Max: 1138 psi, 100%	Avg. Shear > 537 psi Avg. Wood Failure > 85%	PASS

*FP Innovations-Project No. 301010324 T.21.1
**PFS Report 15-015B

***PFS Report # 12-093
****PFS Report # 13-100

APPLICATION GUIDELINES

Moisture content: Six to ten percent is the recommended moisture content for the gluing stock. Higher moisture content will increase the clamp time needed. Additionally, moisture content should mirror (as closely as possible) that which will be experienced in the end use market for the wood product being manufactured.

Stock preparation: The preparation of the stock to be glued is extremely important. Joints cut from rip saws should be free of saw marks. They should also be straight and square. Moulded or jointed stock should be free of knife marks. Glazed or burnished joints will prevent adhesive penetration and should be avoided. When possible, glue joints should be prepared and glued the same day. Gluing stock should be uniform in thickness. Variation in thickness should not exceed ± 0.005 inches/0.12 mm. Sanding to thickness should be performed using higher than 50 grit abrasives.

Spread rate: The recommended adhesive coating layer is the same as for most PVA products or approximately 0.007 inches/ 0.178 mm in thickness. EPI adhesives have superior gap filling properties due to their higher percent solids content. Generally, 200 g/m² / 41 #/MSGSL of glue line is adequate.

Conveyorized spreaders are commonly used in edge-gluing applications. Adjust the applicator to ensure complete coverage on the staves. One side application is adequate in most situations. Verify that adequate coverage exists by monitoring squeeze-out along the glue lines when the panels are under pressure.

Assembly time: The assembly time of Advantage EP-950A varies with moisture content and spread rate. Higher spread rate can increase the assembly time of the product. When substrates are brought under pressure, a small bead of squeeze-out should be seen on the first samples assembled. Structural testing was completed with the following parameters:

Open Assembly Time: 10 minutes
Total Assembly Time: 20 minutes
Spread rate: 11-12 wet mils (351-384 g/m²)
Moisture Content: 10-12%
Laboratory Temperature: 70°F (21°C) Relative
Humidity: 50%

Clamping pressure: Pressure is dependent upon the species or material to be glued and joint preparation. Direct contact of the gluing surfaces must be made to obtain maximum strength. Suggested clamp locations for various wood densities are eight to fifteen inches (20-38 cm) apart and two inches (5 cm) from the end of the panel to evenly distribute pressure along the entire length of the glue line.

Recommended clamping pressures:

Species	Clamping pressure	Example
Low density wood species	100-150 psi or 7-10 kg/cm ²	Pine, Poplar
Medium density species	125-175 psi or 9-13 kg/cm ²	Rubberwood, Cherry
High density species	175-250 psi or 13-18 kg/cm ²	Oak, Maple

Press/clamp time: A minimum press time of 30 minutes is recommended under ideal conditions when using soft wood species at moisture content less than eight to ten percent and factory temperatures of 68 degrees Fahrenheit/ 20 degrees Celsius. Longer press times will be required for higher density species, higher moisture contents and colder factory temperatures. It is recommended that optimum press times be determined in actual plant conditions recognizing that seasonal changes may lead to variable requirements.

Working pauses: The spreader should be kept running during pauses in production for lunch breaks, etc. to help extend the working life of the adhesive.

Machining: Post-gluing conditioning is not unlike PVA products, although shorter curing times are frequently possible. We recommend that panels be allowed to condition at least six hours prior to additional processing.

Hot Press time: Press time is dependent on the adhesive used, gluing stock type, moisture content of the stock and environmental conditions. This hot press schedule is provided as a recommended starting point. In plant testing is recommended especially for temperatures and substrate thicknesses beyond this chart.

		Platen Temperature °F									
		160	170	180	190	200	210	220	230	240	250
Distance to Deepest Glue Line	1/32"	1' 31"	1' 25"	1' 19"	1' 14"	1' 09"	1' 05"	1' 01"	0' 57"	0' 53"	0' 50"
	1/16"	1' 53"	1' 46"	1' 39"	1' 33"	1' 27"	1' 21"	1' 16"	1' 11"	1' 07"	1' 02"
	3/32"	2' 22"	2' 13"	2' 04"	1' 56"	1' 49"	1' 42"	1' 35"	1' 29"	1' 24"	1' 18"
	1/8"	2' 58"	2' 46"	2' 36"	2' 26"	2' 16"	2' 08"	1' 59"	1' 52"	1' 45"	1' 38"
	5/32"	3' 42"	3' 28"	3' 15"	3' 02"	2' 51"	2' 40"	2' 29"	2' 20"	2' 11"	2' 03"
	3/16"	4' 38"	4' 20"	4' 03"	3' 48"	3' 33"	3' 20"	3' 07"	2' 55"	2' 44"	2' 33"
	7/32"	5' 47"	5' 25"	5' 05"	4' 45"	4' 27"	4' 10"	3' 54"	3' 39"	3' 25"	3' 12"
	1/4"	7' 15"	6' 47"	6' 21"	5' 57"	5' 34"	5' 13"	4' 53"	4' 34"	4' 17"	4' 00"

Clean-up: The foaming and cross-linking characteristics of EPI may cause blockages in the wastewater plumbing. Furthermore, there may be disposal concerns with the mixed product. It is recommended that the excess glue from the spreader and mixing containers be poured into a container and disposed of. Avoid sealing the container for at least 24 hours to permit EPI components to finish reacting. Glue pans and rollers may then be washed in warm water.

HANDLING AND STORAGE

Shelf life: Best if used within six months of date of manufacture. Please mix before use since it is very common for filler to settle out during aging. Product is not freeze-thaw stable. It will have a lumpy, coagulated appearance if it has frozen.

Storage of Hardener: Hardener 200 is very susceptible to moisture. We recommend that it be kept in a sealed container. A desiccant or nitrogen blanket is recommended.

Safety and disposal: Hardener 200 is a polymeric isocyanate. Use of nitrile gloves and local exhaust ventilation are required. Consult SDS before use for additional information.

For additional questions, Franklin's technical service team is available at 1.800.877.4583. 24/7 technical service is available online at www.franklinadhesivesandpolymers.com.

IMPORTANT NOTICE TO CUSTOMER:

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