



DEPARTMENT OF THE ARMY
U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND
ARMY RESEARCH LABORATORY
SPECIFICATIONS & STANDARDS OFFICE
ABERDEEN PROVING GROUND, MARYLAND 21005-5066

Adhesive product name: PR-2930

Manufacturer contact information:

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Test notes

- ARL surface preparation: 1. Scotchbrite (very fine grade) with die grinder 2. Acetone wipe 3. Grit blast with aluminum oxide 4. Nitrogen dust off 5. Rinse with acetone 6. Immerse in deionize water for 2 minutes 7. Immerse for 2 minutes in 120°F bath of ChemKleen 490MX at a concentration of 1 oz/gal deionized water 8. Immerse in deionized water for 2 minutes 9. Spray rinse with deionized water 10. Dry in oven at 60 C for 5 minutes 11. Bonded immediately after treating
- ARL cure cycle: Fixtures placed in RT oven, oven ramped to 135°C from RT in approximately 3 hours, isothermal at 135°C for 1-hour, oven powered off and allowed to cool overnight with the doors closed. Temperature was measured at bond line using a calibrated thermocouple using a blank fabrication fixture.
- PPG surface preparation: 1. MEK wipe; 2. Grit blast with 54 grit aluminum oxide; 3. Nitrogen dust off; 4. Rinse with acetone; 5. Immerse in 3-glycidyloxypropyltrimethoxysilane solution for 90 seconds, as specified in ARL-ADHES-QA-001.01 Rev. 2.2; 6. Nitrogen dust off; 7. Bake treated lap-joint coupons for 1hr at 100°C; 8. Remove from oven and bond immediately after cooling (within 30 minutes)
- PPG cure cycle: Single lap joint samples placed into pre-heated 180°C oven, once oven back to 180°C set timer 30 minutes, after 30 minutes removed from oven and placed on cooling rack overnight.

MIL-PRF-32662 Tier I - Single Lap Joint, ambient room temperature, dry conditioning					
Sample ID	Test lot ID	Testing Organization	Maximum strength (MPa)	Displacement at complete failure (mm)	Mode-of-failure
20220012	PR-2930-ARL-2022-RT-01	DEVCOM ARL	43.6	4.62	cohesive
20220012	PR-2930-ARL-2022-RT-01	DEVCOM ARL	46	5.83	cohesive
20220013	PR-2930-ARL-2022-RT-01	DEVCOM ARL	44.6	4.82	cohesive
20220014	PR-2930-ARL-2022-RT-01	DEVCOM ARL	43.4	4.52	cohesive
20220015	PR-2930-ARL-2022-RT-01	DEVCOM ARL	46.5	6.22	cohesive
S-220215-00279	PR-2930-PPG-2022-RT-01	PPG	46.1	5.293	mixed mode
S-220215-00281	PR-2930-PPG-2022-RT-01	PPG	45.3	5.18	mixed mode
S-220215-00285	PR-2930-PPG-2022-RT-01	PPG	46.4	6.06	mixed mode
S-220215-00292	PR-2930-PPG-2022-RT-01	PPG	45.9	5.26	mixed mode
S-220215-00293	PR-2930-PPG-2022-RT-01	PPG	44.7	4.69	mixed mode
		Average	45.3	5.25	
		Standard Deviation	1.1	0.61	
		Classification - Group I			

MIL-PRF-32662 Tier II - Single Lap Joint, hot/wet conditioning				
Sample ID	Test lot ID	Testing Organization	Maximum strength (MPa)	Mode-of-failure
20220001	PR-2930-ARL-2022-HW-01	DEVCOM ARL	30.6	adhesive
20220002	PR-2930-ARL-2022-HW-01	DEVCOM ARL	31.4	adhesive
20220003	PR-2930-ARL-2022-HW-01	DEVCOM ARL	32.2	adhesive
20220004	PR-2930-ARL-2022-HW-01	DEVCOM ARL	32.1	adhesive
20220005	PR-2930-ARL-2022-HW-01	DEVCOM ARL	32.1	adhesive
20220006	PR-2930-ARL-2022-HW-01	DEVCOM ARL	32.4	adhesive
20220007	PR-2930-ARL-2022-HW-01	DEVCOM ARL	34.2	adhesive
20220008	PR-2930-ARL-2022-HW-01	DEVCOM ARL	33	adhesive
20220009	PR-2930-ARL-2022-HW-01	DEVCOM ARL	33.8	adhesive
20220010	PR-2930-ARL-2022-HW-01	DEVCOM ARL	33.8	adhesive
S-220215-00275	PR-2930-PPG-2022-HW-01	PPG	40.3	adhesive
S-220215-00276	PR-2930-PPG-2022-HW-01	PPG	43	adhesive
S-220215-00280	PR-2930-PPG-2022-HW-01	PPG	42.5	adhesive
S-220215-00282	PR-2930-PPG-2022-HW-01	PPG	42.3	adhesive
S-220215-00288	PR-2930-PPG-2022-HW-01	PPG	43	adhesive
		Average	35.8	
		Standard Deviation	4.8	
		Stength retention (%)	78.8	Pass

MIL-PRF-32662 Tier II - Single Lap Joint, 71°C/160°F				
Sample ID	Test lot ID	Testing Organization	Maximum strength (MPa)	Mode-of-failure
20220016	PR-2930-ARL-2022-ET-01	DEVCOM ARL	42.2	adhesive
20220017	PR-2930-ARL-2022-ET-01	DEVCOM ARL	42.2	adhesive
20220018	PR-2930-ARL-2022-ET-01	DEVCOM ARL	39.2	adhesive
20220019	PR-2930-ARL-2022-ET-01	DEVCOM ARL	40.9	adhesive
20220020	PR-2930-ARL-2022-ET-01	DEVCOM ARL	39.8	adhesive
20220021	PR-2930-ARL-2022-ET-01	DEVCOM ARL	38.4	adhesive
20220022	PR-2930-ARL-2022-ET-01	DEVCOM ARL	36.6	adhesive
20220023	PR-2930-ARL-2022-ET-01	DEVCOM ARL	39.7	adhesive
20220024	PR-2930-ARL-2022-ET-01	DEVCOM ARL	35.7	adhesive
20220025	PR-2930-ARL-2022-ET-01	DEVCOM ARL	38.1	adhesive
S-220215-00274	PR-2930-PPG-2022-ET-01	PPG	41	adhesive
S-220215-00283	PR-2930-PPG-2022-ET-01	PPG	40.8	adhesive
S-220215-00284	PR-2930-PPG-2022-ET-01	PPG	42.2	adhesive
S-220215-00273	PR-2930-PPG-2022-ET-01	PPG	39.2	adhesive
S-220215-00278	PR-2930-PPG-2022-ET-01	PPG	38.8	adhesive
		Average	39.7	
		Standard Deviation	2.0	
		Stength retention (%)	87.3	Pass

MIL-PRF-32662 Tier III - Crack Extension Test, hot/wet conditioning				
Sample ID	Test lot ID		Fracture toughness, stress corrosion cracking (G1SCC) (kJ/m ²)	Mode-of-failure
20230001	PR-2930-ARL-2023-CE-01	DEVCOM ARL	9.27	mixed mode
20230002	PR-2930-ARL-2023-CE-01	DEVCOM ARL	5.91	mixed mode
20230003	PR-2930-ARL-2023-CE-01	DEVCOM ARL	2.73	mixed mode
20230004	PR-2930-ARL-2023-CE-01	DEVCOM ARL	8.73	mixed mode
20230005	PR-2930-ARL-2023-CE-01	DEVCOM ARL	7.35	mixed mode
20230006	PR-2930-ARL-2023-CE-01	DEVCOM ARL	0.99	mixed mode
20230007	PR-2930-ARL-2023-CE-01	DEVCOM ARL	5.32	mixed mode
20230008	PR-2930-ARL-2023-CE-01	DEVCOM ARL	9.27	mixed mode
S-220215-00167	PR-2930-PPG-2022-CE-01	PPG	4.41	mixed mode
S-220215-00168	PR-2930-PPG-2022-CE-01	PPG	2.56	mixed mode
S-220215-00169	PR-2930-PPG-2022-CE-01	PPG	7.7	mixed mode
S-220215-00170	PR-2930-PPG-2022-CE-01	PPG	5.08	mixed mode
S-220215-00171	PR-2930-PPG-2022-CE-01	PPG	2.85	mixed mode
		Average	5.6	
		Standard Deviation	2.8	
		G1SCC > 0.61 kJ/m²	Pass	

MIL-PRF-32662A Product Characteristics:

3.4 Storage life: The Group I, Group II, Group III, and Group IV adhesive bonding systems shall meet the bond strength requirements of tests for Tier I, II, and III of table I, if applicable, after storage for 6 months at a temperature not to exceed 30° ± 2°C in the absence of sunlight. Storage stability shall also be maintained at an elevated temperature of 40° ± 2°C for two weeks (14 days).

- **Yes**

3.5.1.1 Viscosity (Pa-s: 80 to 2500 Pa-s as measured with a rotational (Brookfield®) method. The adhesive should be hand trowelable or extrudable from cartridge containers using a hand-operated or pneumatic static mixing gun.

- **Yes**

3.5.1.2 Pot life/Open time: For manual application, the open time life of the adhesive when mixed for preparing a serviceable bond at 23° ± 3°C, shall be a minimum of 15 minutes.

- **Yes**

3.5.1.3 Sag and Bridging: The adhesive will have thixotropic static flow characteristics.

- **Thixotropic**

3.5.1.4 Curing Pressure: The adhesive shall be capable of curing and making satisfactory bonded joints as described within this specification when only contact pressure is applied during the period of cure.

- **Yes**

3.5.1.5 Curing Time and Pressure: The adhesive should harden to a workable state within a time frame of 15 minutes to 3 hours (at room or elevated temperatures) and should reach full bonding strength within 7 days at room temperature.

- **Yes**

DOD Manufacturing Readiness Level (MRL)

9 - Low rate production demonstrated: Capability in place to begin Full Rate Production, The system, component or item has been previously produced, is in production, or has successfully achieved low rate initial production. Technologies should have matured to TRL 9. This level of readiness is normally associated with readiness for entry into Full Rate Production (FRP). All systems engineering/design requirements should have been met such that there are minimal system changes.

- **Yes**

10 - Full Rate Production demonstrated and lean production practices in place, Technologies should have matured to TRL 9. This level of manufacturing is normally associated with the Production or Sustainment phases of the acquisition life cycle. Engineering/design changes are few and generally limited to quality and cost improvements. System, components or items are in full rate production and meet all engineering, performance, quality and reliability requirements. Manufacturing process capability is at the appropriate quality level.

- **In-process**

Restricted substances associated with this material

Restricted substances				
Substance name	CAS number	Amount (%)	Substance rating	Legislation name
bisphenol-A-(epichlorhydrin); epoxy resin	25068-38-6	5	Caution	Community Rolling Action Plan (CoRAP) List
Carbon black	1333-86-4	1	Caution	Canadian Chemical Challenge