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ChemBond

ATS ChemBond™ Putty and Resin

ChemBond™ has been at the heart of ATS modifiable joining systems since 1993. The following condensed literature is available in full size upon request.

- Clean Room Safe
- Low Odor
- No Sanding Required
- Superior Chemical Resistance
- High Structural Strength
- FM Approved as a Joining System
- ChemBond™ offers features important to the cleanroom industry:
- Acceptable Microcontaminant (ng/cm2) Levels
- Extremely low emission of VOCs during installation
- NO SANDING
- High Corrosion Resistance
- High Strength Bonds
- Bonds Multiple Materials
- Ease of Installation

ATS ChemBond™ Resin is a unique product with characteristics that simplify the installation of ATS FXP™ duct. ChemBond™ resin with glass reinforcement can be used to bond two adjoining pieces of ATS FXP™ duct without pre-sanding the duct surface. Because it has minimal odor, requires no sanding, and has no adverse microcontaminant effect on silicon wafers (whether it is a liquid or solid state), it is especially desirable in sensitive cleanroom environments where dust and odors are prohibited and where microcontamination is a concern.

ATS, Inc. has done extensive testing of ChemBond™ to insure it meets the needs and standards of the industry.

- Structural Testing of Joints with ChemBond™
- Peel Strength Studies]
- Full Scale Pressure and Vacuum Testing of Saddle Tap Bonds using ChemBond™
- Corrosion Testing in Full Immersion at Elevated Temperatures

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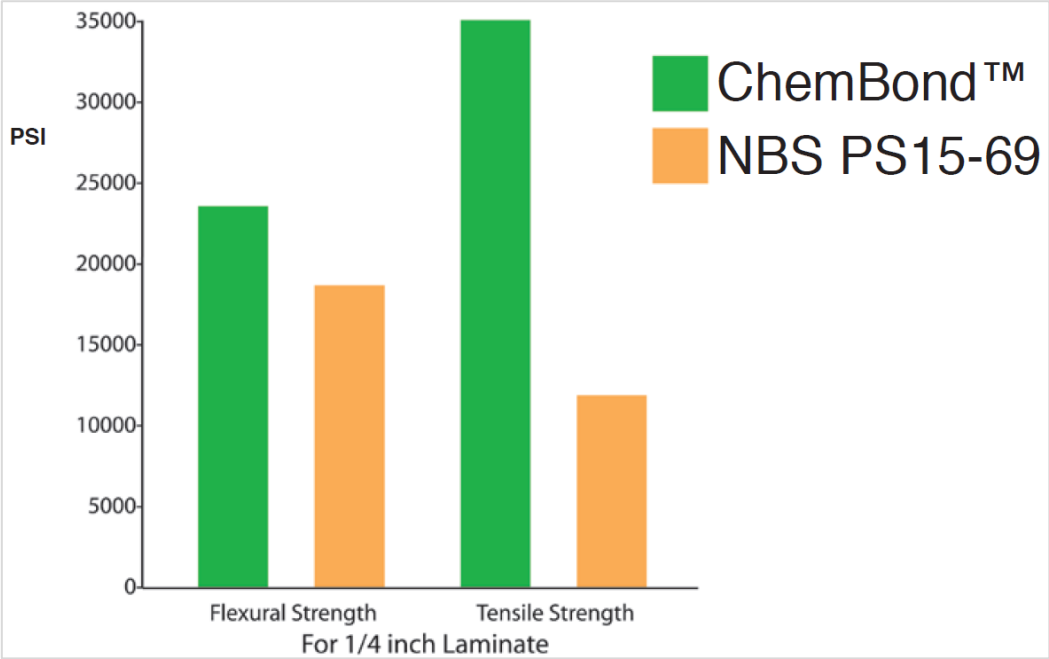
- VOC Offgassing Studies
- Microcontaminant Offgassing Studies (both solid and liquid states)
- FM Approval for use with ATS FXP™ duct Systems



For structural tests, samples were sent to California State University at Long Beach. CSULB determined the tensile strength, flexural modulus, and the flexural strength for a laminate of ChemBond™ resin and glass reinforcement. These values were considerably greater than those recommended in the National Bureau of Standards Product Standard 15-69.

Tensile Testing of Unsanded 4 in. and 10 in. Diameter Ducts Bonded with ChemBond™

Sample No.	Bond Type	Maximum Load (lb.)	Failure Description	Curing Process
4J 4in.	1 Layer	9000	C	Old Heat Cure
4K 4in.	1 Layer	8400	C	No Heat Cure
4L 4in.	1 Layer	10000	D	New Heat Cure
10J 10in.	1 Layer	10000	D	Old Heat Cure
10K 10in.	1 Layer	10000	D	No Heat Cure
10L 10in.	1 Layer	10000	D	New Heat Cure

Structures Laboratory CSULB # 94-10-33

Failure Descriptions:

C Failure of Exterior Overwrap of Duct at the Joint

D No Failure

NOTE–Actual load requirements for both the 4 in. and 10 in. diameter ducts are generally below 1,000 lbs of tension.

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Shear Strength Studies of ChemBond™ to Various Materials(ASTM-3163)

Average Shear Strength in Pounds per Square Inch (PSI)

	Surface Treatment			
Material Tested	Sanded	Sand Blasted	Flame Treated	Solvent Wash
Phenolic Fiberglass Reinforced Plastic	420[1]	487[1]		
Vinyl Ester Laminate	120[1]	700[1]		500[3]
Stainless Steel 316		1800[2]		
Low Density Polyethylene			250[3]	
Poly Vinyl Chloride			110[2]	
Galvanized				223[2**]

Structures Laboratory CSULB Rpt# 01-12-31 & 01-11-19
1 Laminate Failure
2 Bond Failure
3 Bond Failure After 300-400% Elongation
** Lowest Value Tested

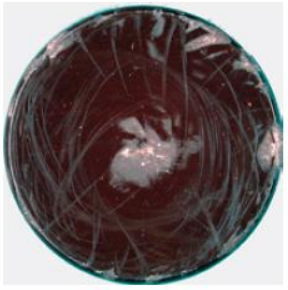
Note– Values shown are in PSI. To determine the actual strengh of a bond multiply the number of square inches by the value shown. Example: A 6" wide Joint on a 12" dia. Phenolic FRP duct with a sanded surface (420 psi): 6 x 12 x 3.14(pi) = approx. 206 sq. inches. 206 sq. inches x 420 psi = approx. 86520 lbs.

Corrosion Resistance

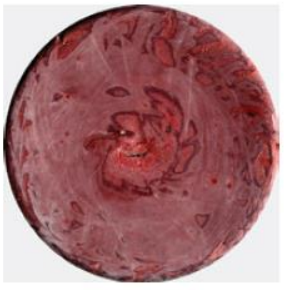
ChemBond™ - 31 Day Full Immersion @ 39°C (102°F)

Solution	Change in Mass*	Durometer Hardness (All Samples started at 88)
96% Sulfuric Acid H_2SO_4	-0.15%	89
20% Nitric Acid HNO_3	2.04%	78
25% Hydrofluoric Acid HF	10.41%**	78
10% Acetic Acid	-0.42%	86

*ATS Criteria < 5% Reduction in Mass passes
** Swells but does not deteriorate
CTL REF #18138



As received appearance



After exposure to 96% Sulfuric acid for 31 days at 39°C (102°F)

NOTE- Other companies have tried to duplicate ATS' ChemBond™. One material competitors to ATS have tried to use was Epoxy Resin #IM1260 with Epoxy Hardener #H2432. This material was "essentially destroyed" when immersed in 96% Sulfuric Acid for 33 days @ only 35°C (95°F) (Corrosion Testing Laboratories, Inc. ctl ref #19056).

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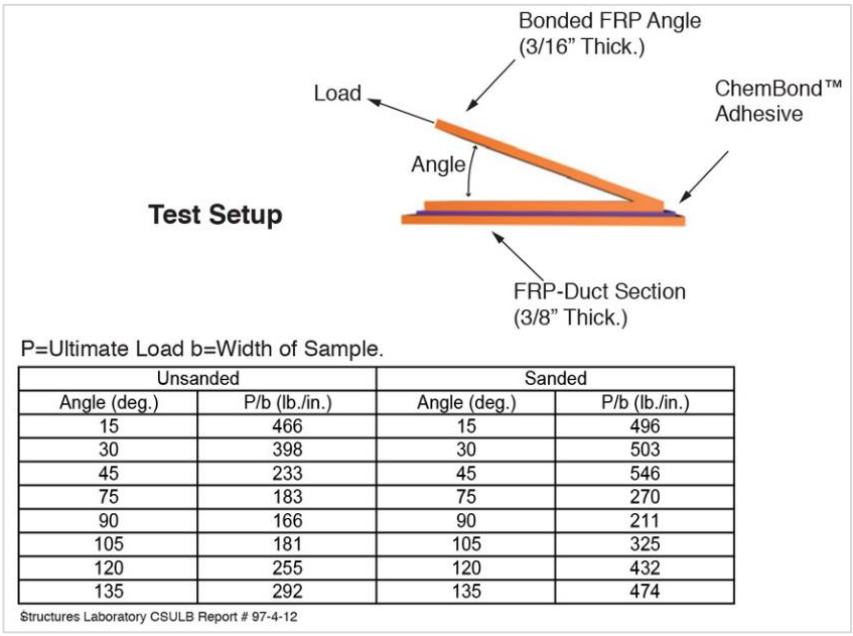
Peel Strength Studies of ChemBond™ to ATS FXP™ Duct

ASTM-D1876 @ 90º. Same test method used for all angles.



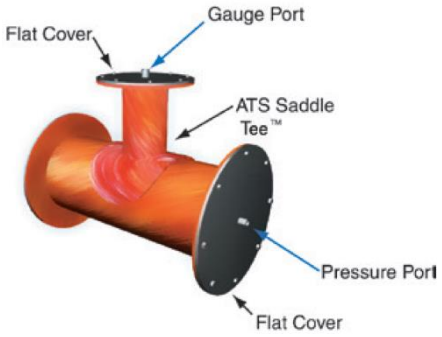
P=Ultimate Load b=Width of Sample.

Unsanded		Sanded	
Angle (deg.)	P/b (lb./in.)	Angle (deg.)	P/b (lb./in.)
15	466	15	496
30	398	30	503
45	233	45	546
75	183	75	270
90	166	90	211
105	181	105	325
120	255	120	432
135	292	135	474

Structures Laboratory CSULB Report # 97-4-12

Full Scale Pressure and Vacuum Testing ofATS Saddle Tap™ using ChemBond™

Test Setup



Vacuum tested to a maximum of 30 in. water column with no leakage at seal to tap.
Pressure tested to a maximum of 39 PSI with leakage at tap seal (see chart below)

Sample #	Desc	Maximum Test Pressure (psi)	Observations at Max. Test Pressure
S1	8" Duct, 4" 90 deg Tap	37	No leakage at Tap. Leakage only occurred at flat cover of the flange assembly on duct ends.
S2	8" Duct, 4" 45 deg Tap	39	No leakage at Tap. Leakage only occurred at flat cover of the flange assembly on duct ends.
S3	16" Duct, 6" 90 deg Tap	25	No leakage at Tap. Leakage only occurred at flat cover of the flange assembly on duct ends.
S4	16" Duct, 6" 45 deg Tap	25	No leakage at Tap. Leakage only occurred at flat cover of the flange assembly on duct ends.
S5	24" Duct, 18" 90 deg Tap	26	No leakage at Tap. Leakage only occurred at flat cover of the flange assembly on duct ends.
S6	24" Duct, 18" 45 deg Tap	21	No leakage at Tap. Leakage only occurred at flat cover of the flange assembly on duct ends.

Vacuum tested to a maximum of 30 in. water column with no leakage or damage to joint