



Comparative Analysis

HONEYCOMB STONE BONDING ADHESIVE

HUNTSMAN

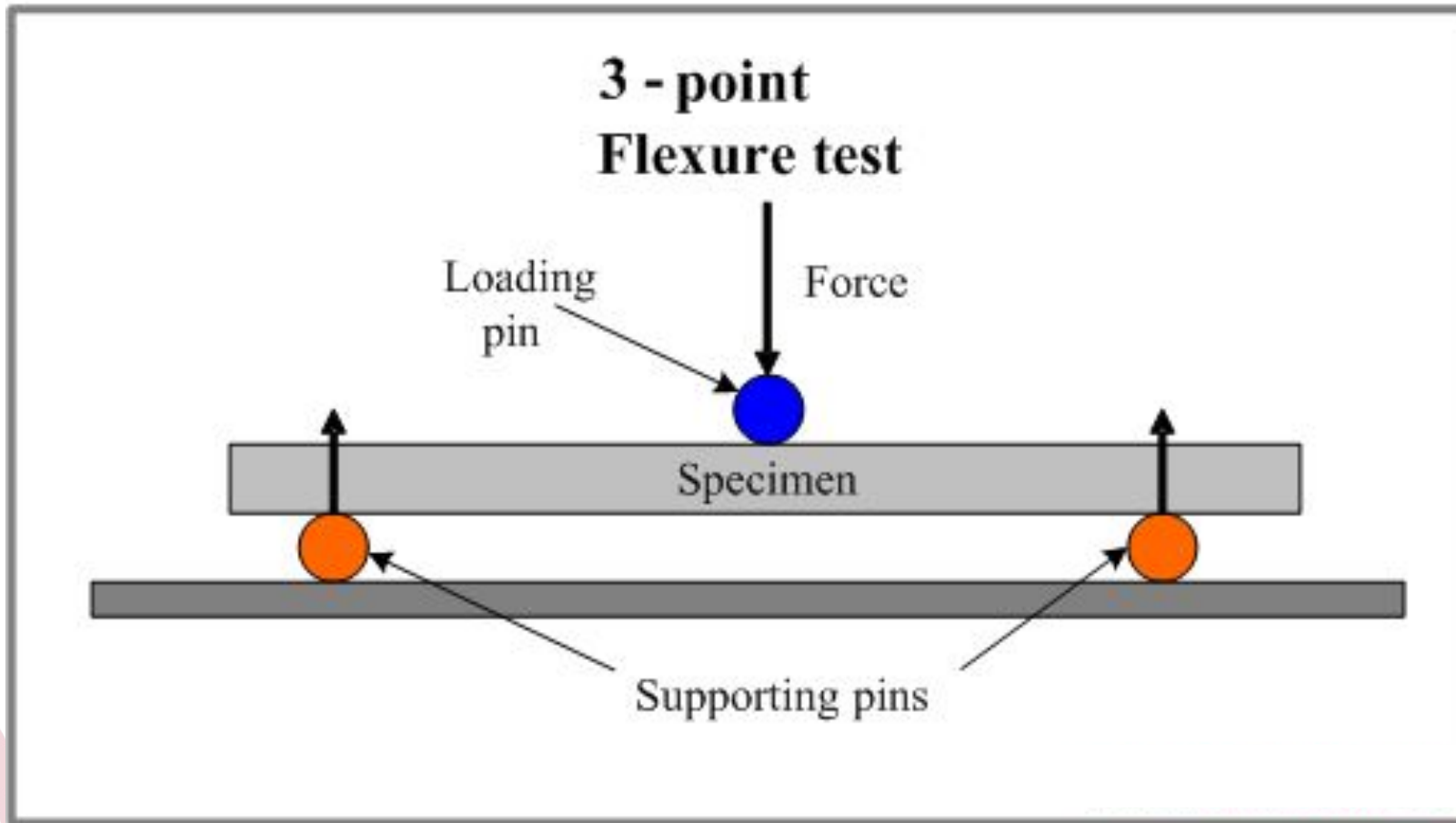
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FLEXURAL STRENGTH TESTING

- Flexure (Bend) tests are used to determine the flexural strength of a material. Flexural strength is the amount of force an object can take without breaking or permanently deforming.
- When a specimen is placed under flexural loading all three fundamental stresses are present: tensile, compressive and shear. The flexural properties of a specimen are the result of the combined effect of all three stresses.
- Flexural Strength $\sigma = 3FL / 2wd^2$
- F means the maximum force applied, L is the length of the sample, w is the width of the sample and d is the depth of the sample.

- [Instron 5544 3 point bend test - YouTube](#)



SAMPLE PREPARATION

Sample Size

- Porcelain and Honeycomb pieces cut by Customer
- Each piece measures 3" x 15"

Pre-treatment

- Quick IPA wipe of porcelain and honeycomb
- Allow IPA to fully dry

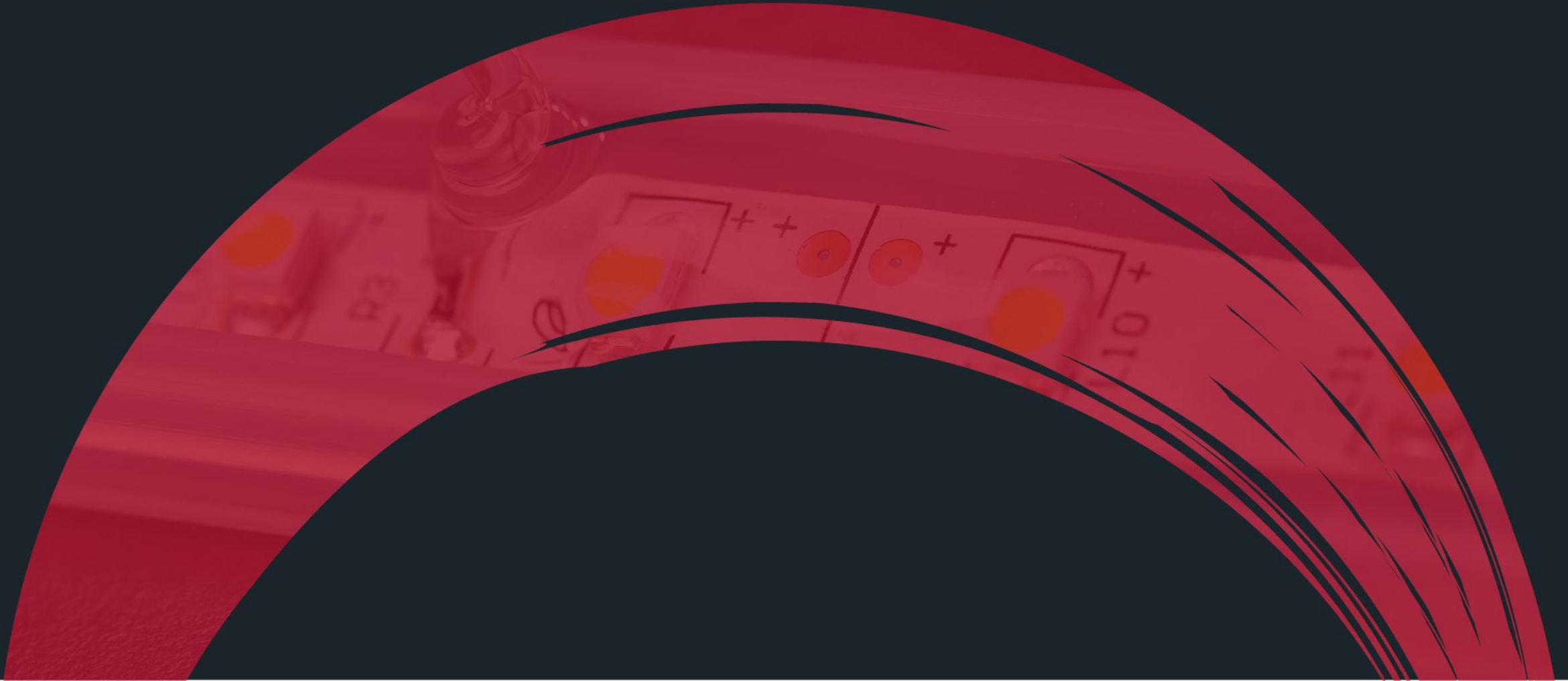
Application

- Competitor adhesive is mixed 1:1 and applied with 1/16" bondline thickness
- Araldite 9102 is mixed 2:1 and applied with 1/32" bondline thickness
- Substrates are joined together and light clamps added to ends of the sample

Observations after sample preparation

- Competitor adhesive does not wet out entire surface due to viscosity
- Araldite 9102 could possibly be used even thinner and still wet out surface

TESTING RESULTS

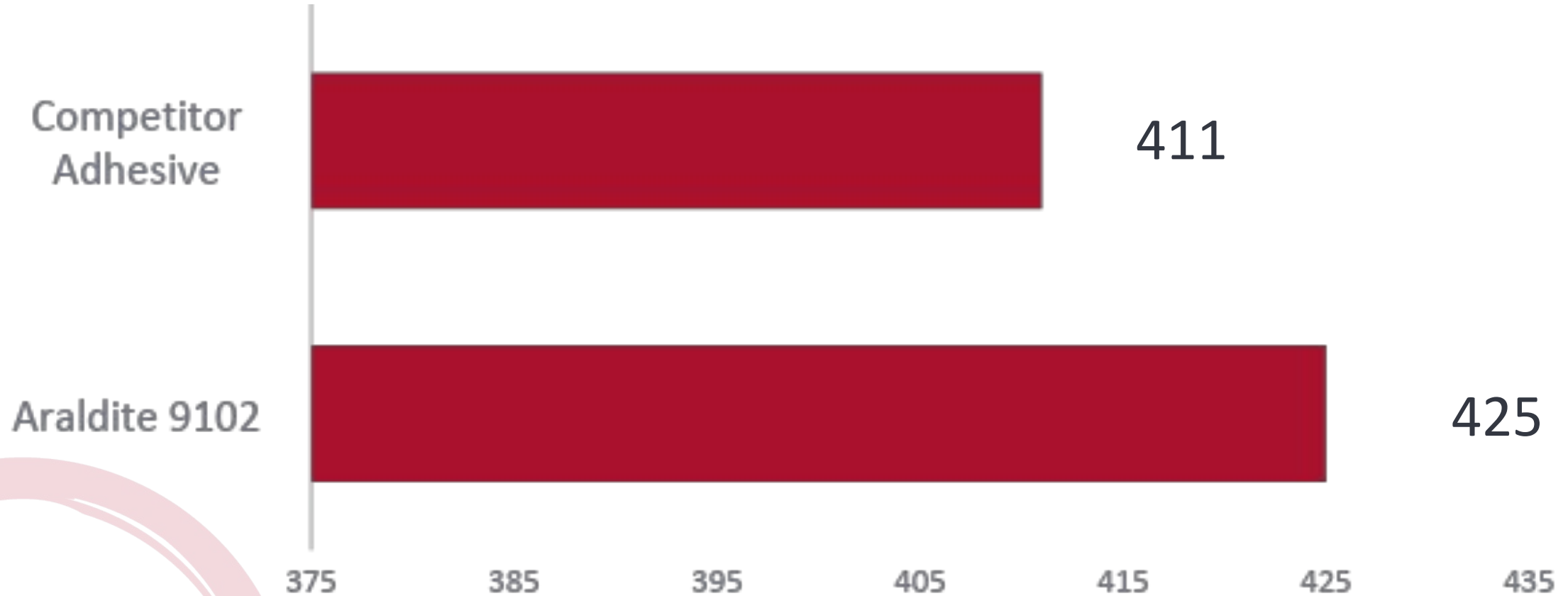


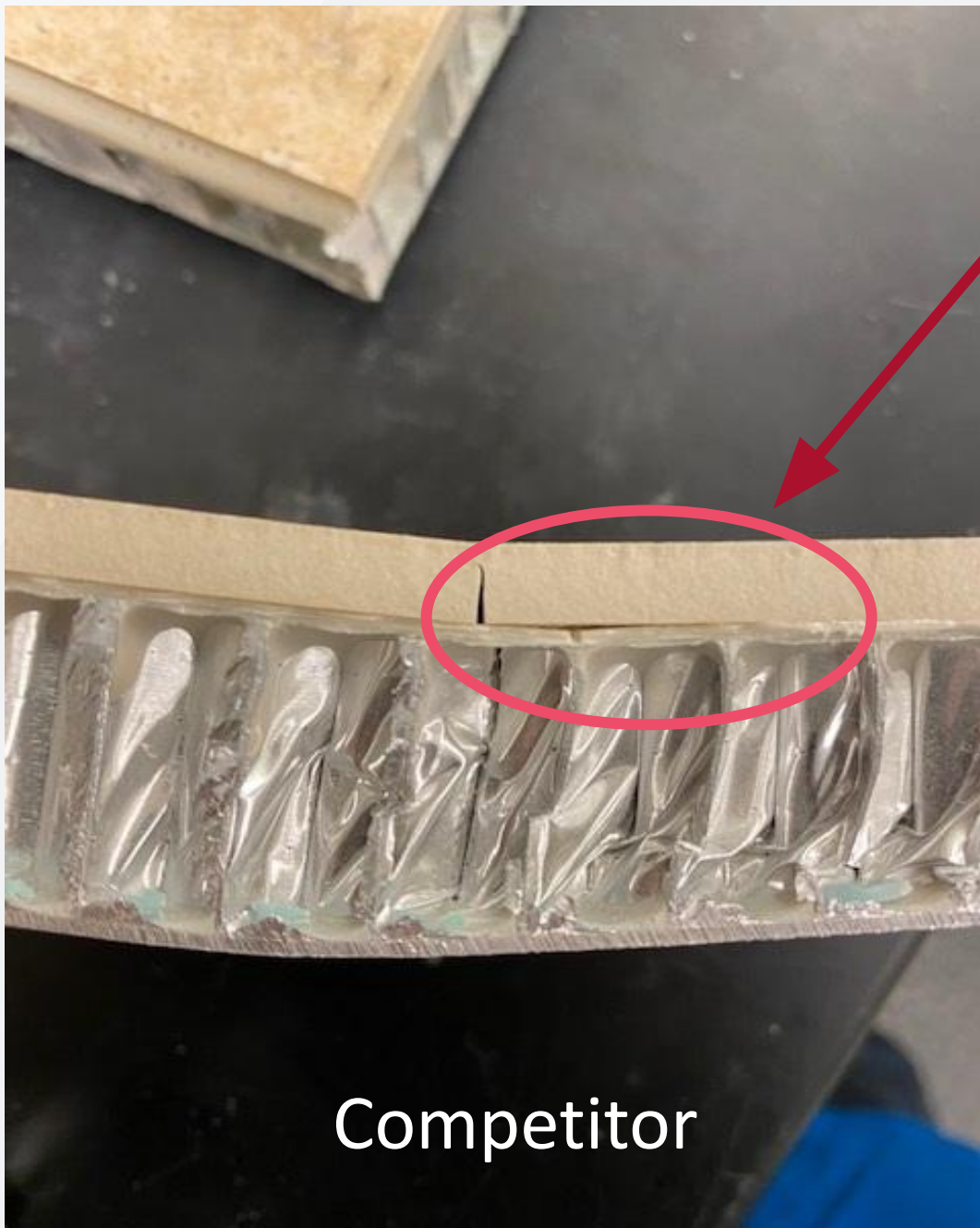
FLEXURAL STRENGTH (PSI)



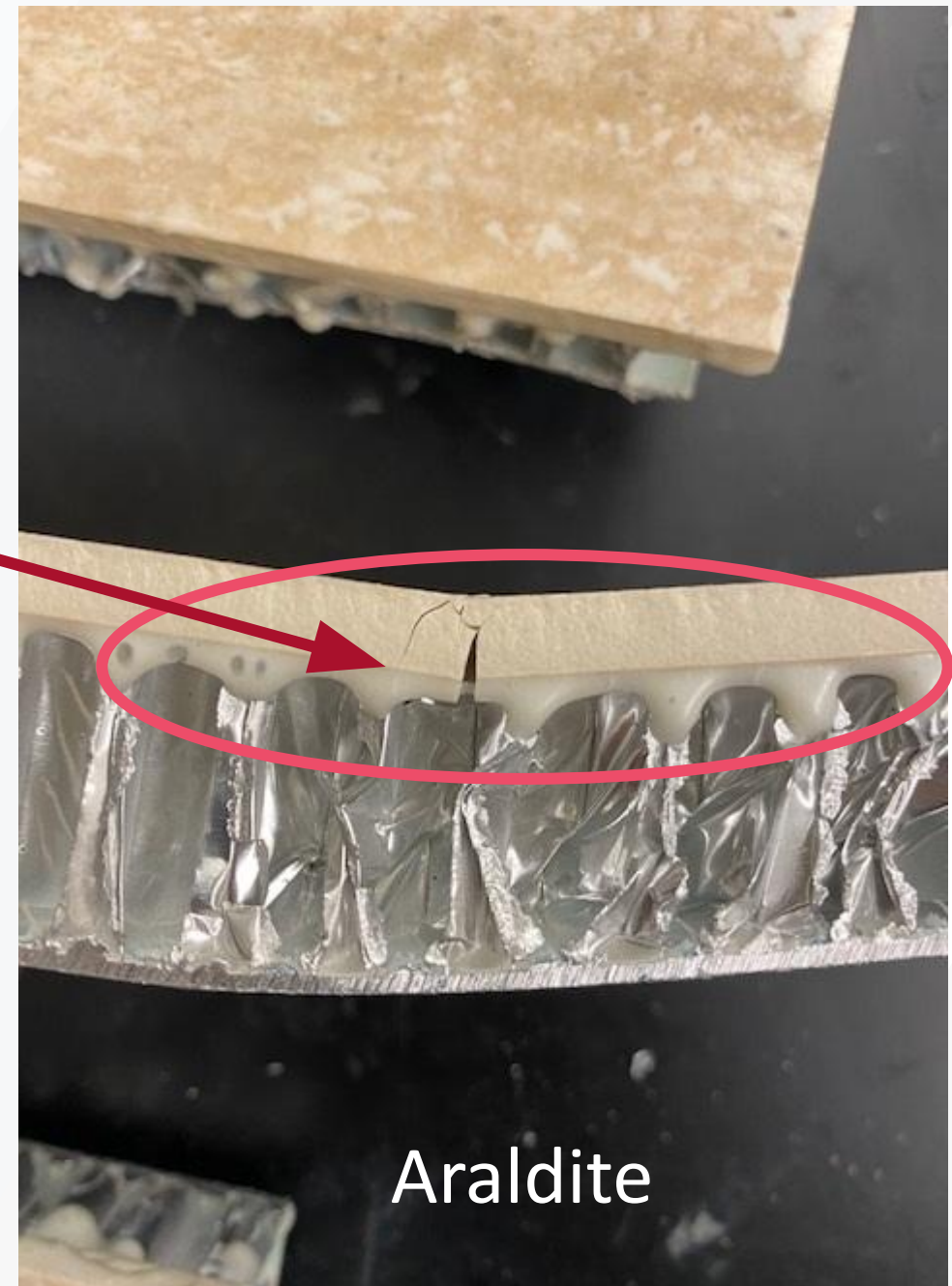
- 7% Improvement in Flexural Strength
- No delamination/better coverage

FAILURE FORCE (LBF)

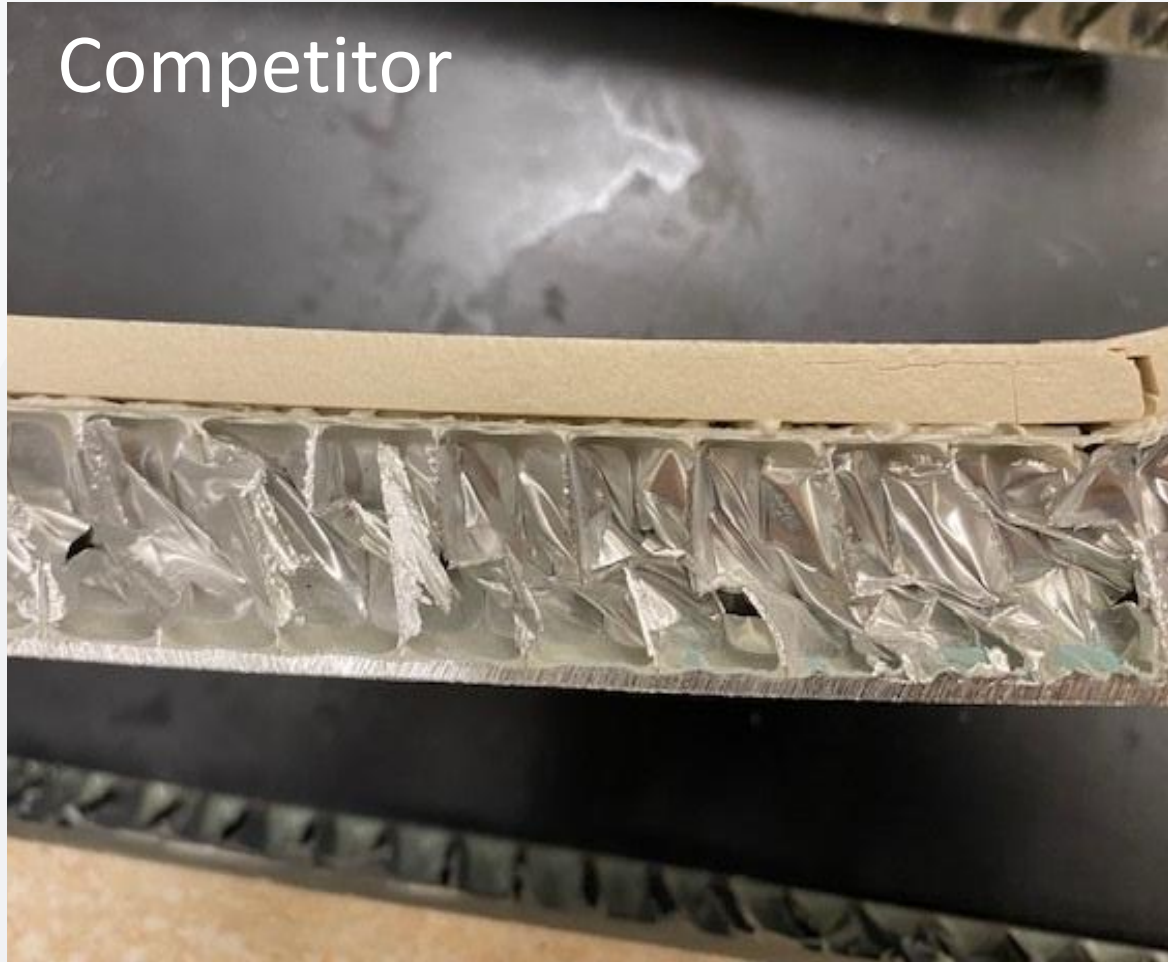




Full Coverage.
Porcelain failed
with no
delamination



Competitor



Araldite

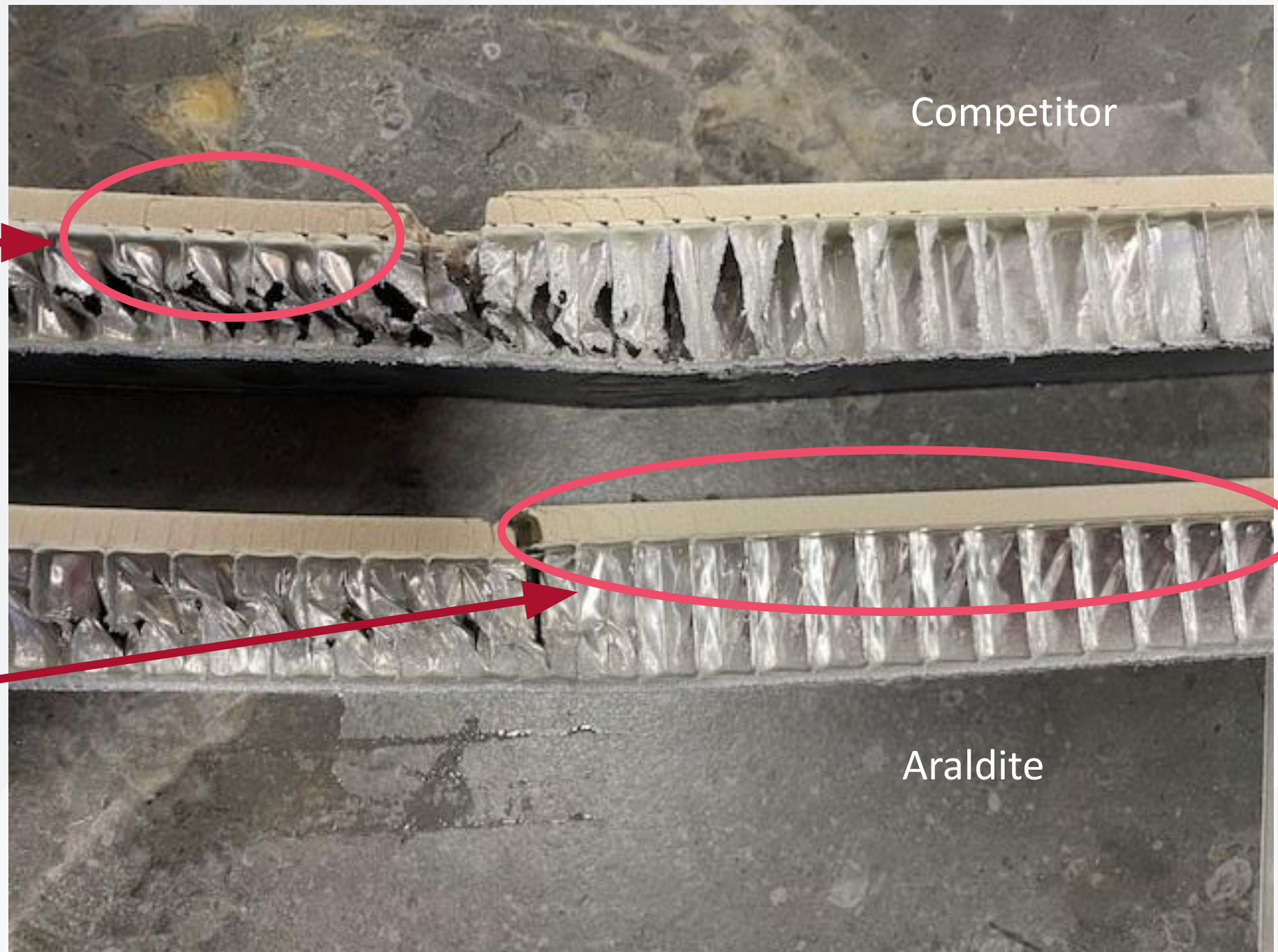


Peaks and valleys from
notched trowel that
Never compressed and fully
wetted out even with
clamping pressure

Competitor

Consistent bond line

Araldite



RESULTS SUMMARY



- Araldite 9102 outperforms competitive adhesive even at a thinner bond line thickness
- The lower viscosity of Araldite 9102 helps to ensure even and full coverage across entire surface area
- The thick consistency of competing product results in peak/valleys under the porcelain, the only way to truly eliminate that would be to add additional clamp pressure over the bonded surface
- Araldite 9102 showed no samples with delamination after testing
- Meets flame, smoke, and toxicity requirements for passenger rail
- Improved performance
- Cost savings/process improvements



COST STUDY

COST COMPARISON

Huntsman AW 9102		Competitor	
List Price	Price per kit - AW 9102 Drum Kit	Est. Price Per Kit - Competitor - Pail Kit	\$480
	\$10,961.60	Gallons Per Kit	7.55
Gallons Per Kit	144.6	Price per gallon	\$63.58
Price per gallon	\$75.81		

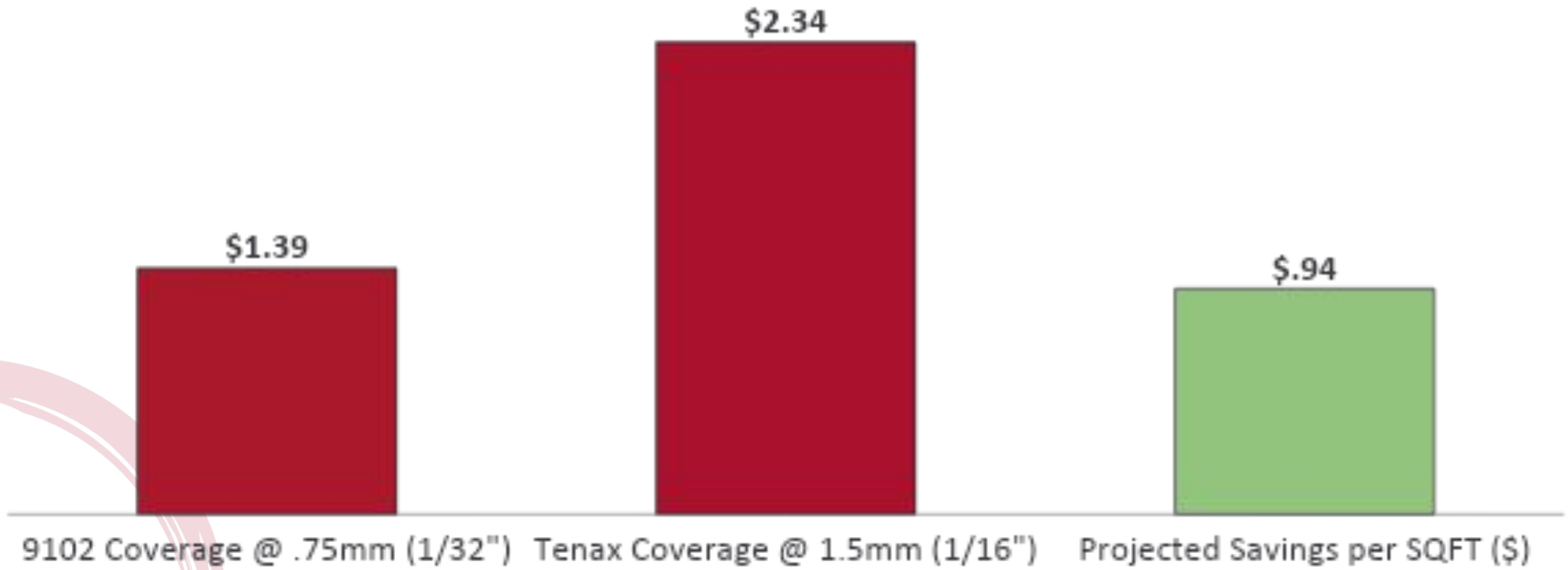
Coverage	Price Per SQFT	Gal per SQFT	Coverage	Price Per SQFT	Gal per SQFT
N/A (Due to viscosity thicker bond line not possible)			Competitor Coverage @ 1.5mm (1/16")	\$2.34	0.0368
9102 Coverage @ 1mm	\$1.86	0.0245	Competitor Coverage @ 1mm	\$1.56	0.0245
9102 Coverage @ .75mm	\$1.39	0.0184	N/A (Due to viscosity thinner bond line not possible)		
9102 Coverage @ .5mm	\$0.93	0.0123			

COST COMPARISON

Cost Comparison	
9102 Coverage @ .75mm (1/32")	\$1.39
Competitor Coverage @ 1.5mm (1/16")	\$2.34
Projected Savings per SQFT (\$)	\$.94
Projected Savings %	40.38%
Estimated Annual Usage (SQ FT)	25,000.00
Estimated Annual Savings	\$23,596.49

Bondline Thickness	Savings per SQ FT	Savings per SQ FT (%)	Estimated Annual Savings
Projected Savings @ 1mm	\$0.48	20.51%	\$11,983.99
Projected Savings @ .75mm	\$0.94	40.38%	\$23,596.49
Projected Savings @ .5mm	\$1.41	60.25%	\$35,208.98

COST COMPARISON



CONCLUSION

- Better flowing formulation results in up to 50% reduction in volume of adhesive used
- Cost savings of 20-60% were possible while using a premium product that was more expensive per gallon and higher quality (No silica filler)
- Araldite 9102 outperforms competitive adhesive even at a thinner bondline thickness
- The lower viscosity of Araldite 9102 helps to ensure even and full coverage across entire surface area
- The thick consistency of competing product results in peak/valleys under the porcelain
- Araldite 9102 showed no samples with delamination after testing
- Meets flame, smoke, and toxicity requirements for passenger rail
- Easier to dispense and apply = Labor savings



