APPLICATION & INSTALLATION GUIDE

HAMMERHEAD™
MARINE COMPOSITE PANELS

AVIENT™

PRODUCT DESCRIPTION

Hammerhead™ Marine Composite Panels are made from continuous glass-fiber reinforced thermoplastic face sheets and polyester foam cores. They are engineered to provide **simplified installation, long-lasting components**, and **overall cost reduction** for boat manufacturers.

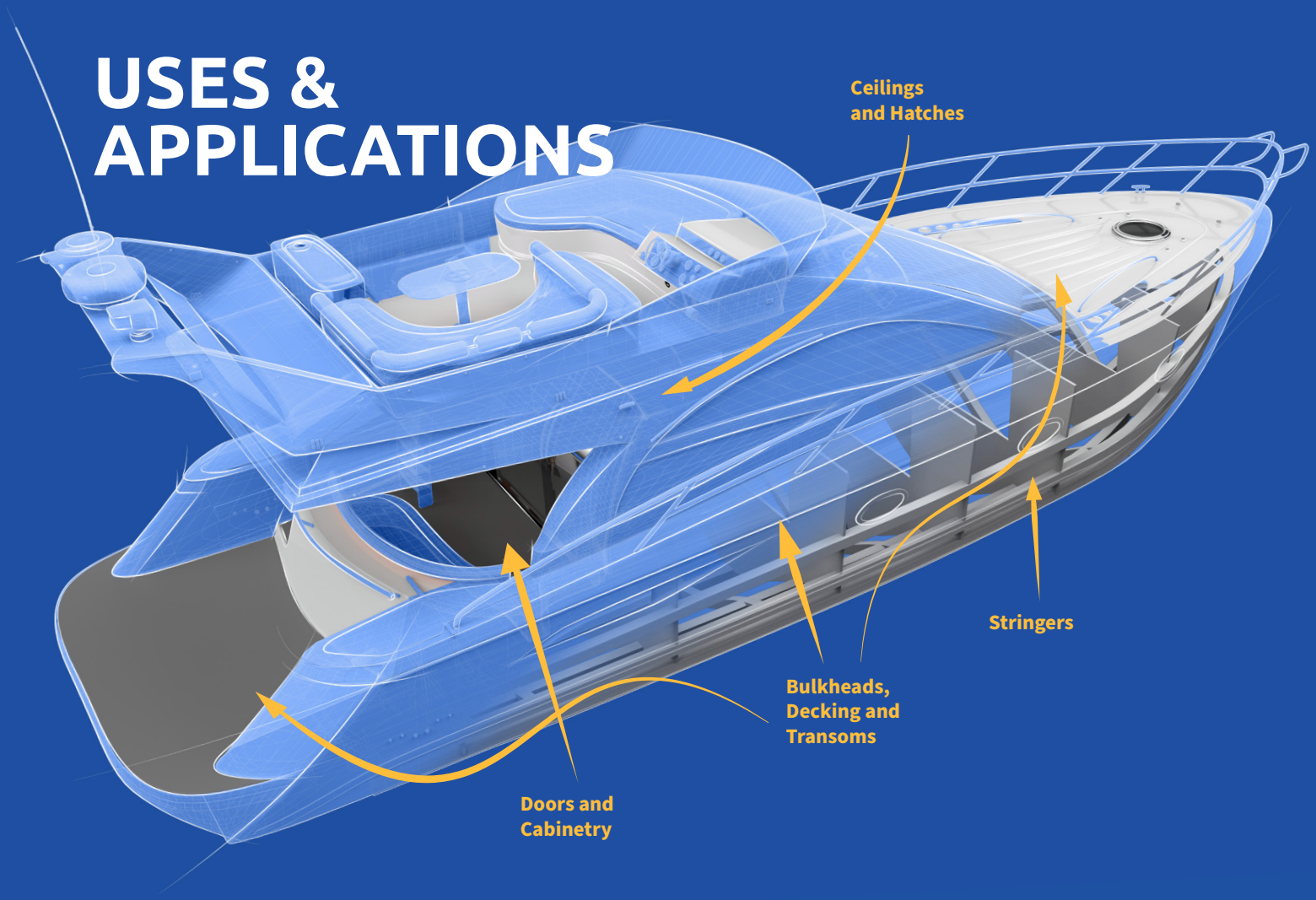
PERFORMANCE ADVANTAGES

FEATURE	BENEFIT
Exceptional strength-to-weight ratio	Lightweight yet strong structural performance and increased payloads
Resistance to UV light, chemicals, moisture degradation and rot	Resistance to harsh marine conditions
Tough and impact resistant	Durability and long product life
Dimensionally stable	Consistent performance in extreme temperature and humidity fluctuations
Strong adhesive properties	Easy bonding to various materials

MANUFACTURING ADVANTAGES

FEATURE	BENEFIT
Ready-to-install	Fewer parts & reduced scrap
Large format	Improved aesthetics with seamless designs
Made via continuous-fiber manufacturing process	Consistent quality in every panel

USES & APPLICATIONS



MECHANICAL PERFORMANCE

Superior strength-to-weight ratio

PROPERTY	TEST METHOD	PANEL THICKNESS		
		.50"	.75"	1.00"
		13 mm	19 mm	25 mm
Core Density*	ISO 845	7 lb/ft³	7 lb/ft³	7 lb/ft³
		115 kg/m³	115 kg/m³	115 kg/m³
Flexural Rigidity	ASTM D7249	35,000 lb/in² 10.3 kg/m²	75,000 lb/in² 21.9 kg/m²	118,000 lb/in² 34.5 kg/m²
Areal Weight	Calculated	0.89 lb/ft² 4.3 kg/m²	1.03 lb/ft² 5.0 kg/m²	1.17 lb/ft² 5.7 kg/m²
Core Shear Yield	ASTM C393	101 psi 0.70 MPa	96 psi 0.66 MPa	88 psi 0.61 MPa
Max Load	ASTM C393	357.5 lbs 162.2 kg	513.4 lbs 232.9 kg	551.1 lbs 250.0 kg
Core Shear ULT	ASTM C393	113 psi 0.78 MPa	109 psi 0.75 MPa	94 psi 0.65 MPa
Face Bend Stress	ASTM C393	9,008 psi 62.11 MPa	8,725 psi 60.16 MPa	7,542 psi 52.00 MPa

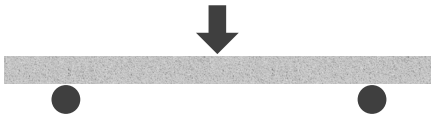
* Additional core density panels are available in 5 lb/ft³ (80 kg/m³) and 8 lb/ft³ (135 kg/m³). Please contact Avient.

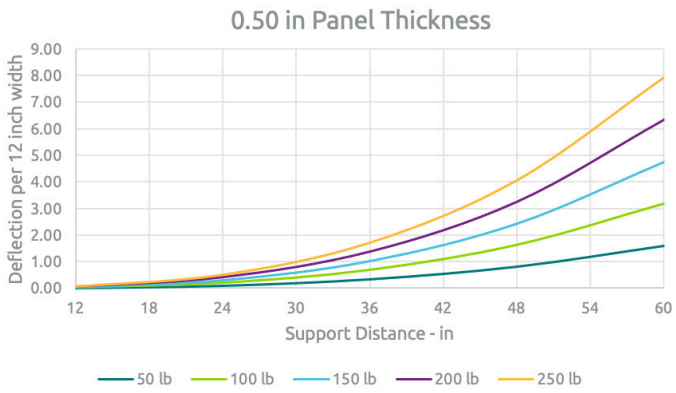
SUPPORT SPAN DEFLECTION

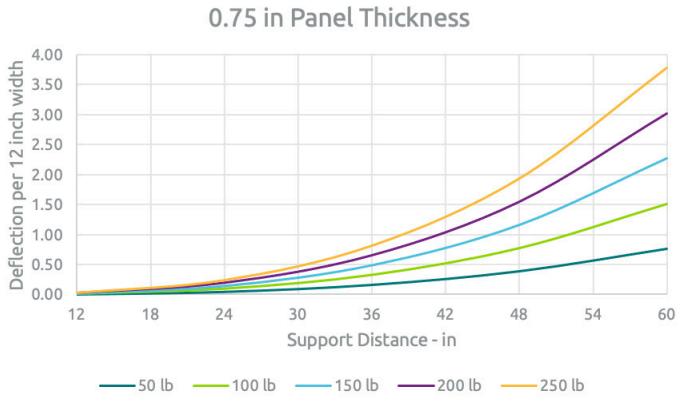
Meets performance required for marine applications

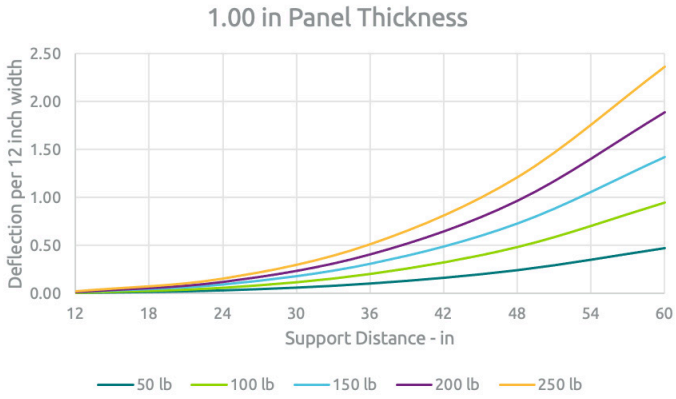
Predictive deflection in various load cases. Deflection is dependent on support span distance.

Simply Supported Beam Deflection
7 lb/ft³ core density at various panel thicknesses



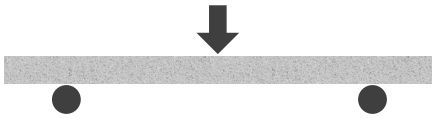


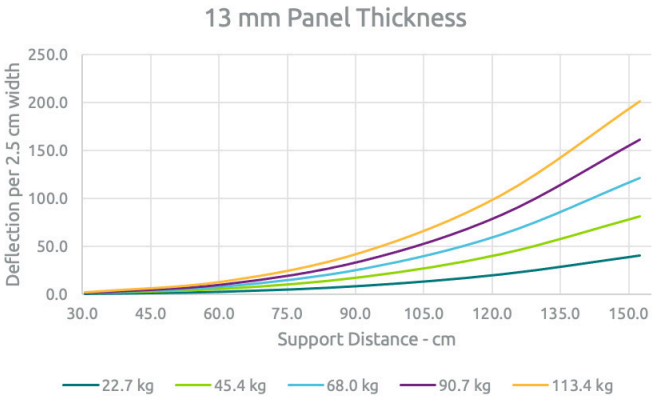


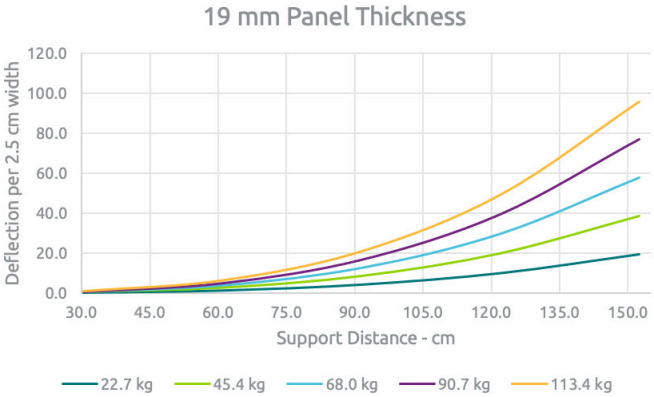


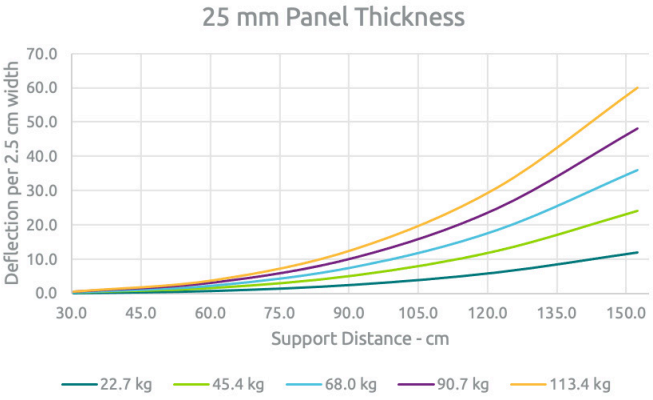
* To calculate deflection for different panel widths, use the following formula: Deflection = Chart value* [12 / panel width]. Example: Deflection for 24 inch panel = Chart value *[12 / 24]

Simply Supported Beam Deflection - Metric
115 kg/m³ core density at various panel thicknesses









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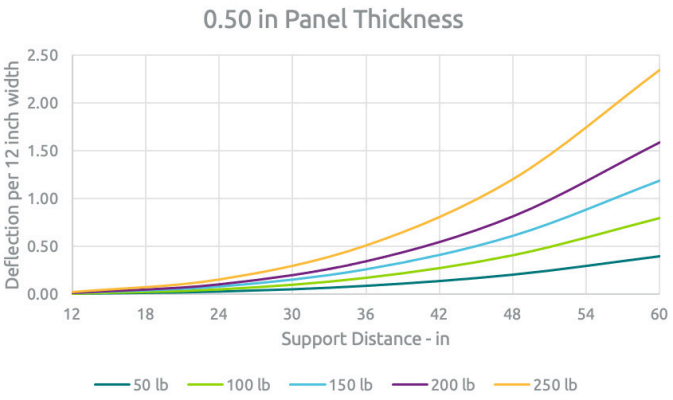
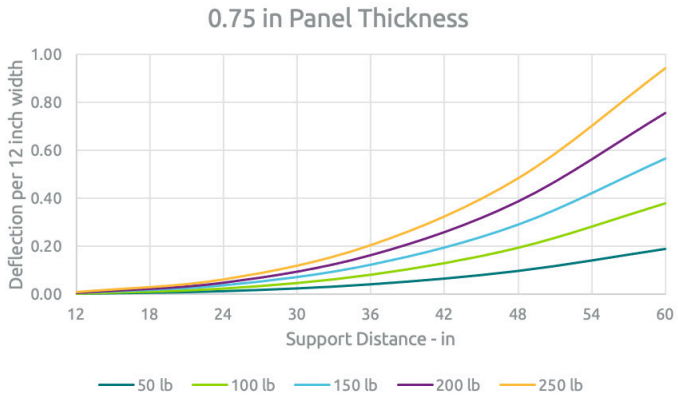
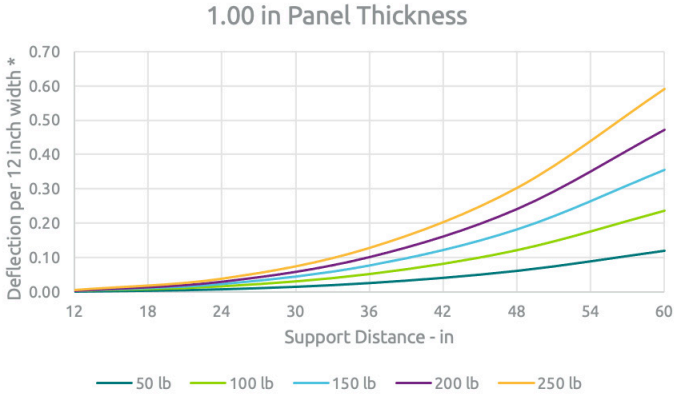
SUPPORT SPAN DEFLECTION (continued)

Fixed End Beam Deflection
7 lb/ft³ core density at various panel thicknesses

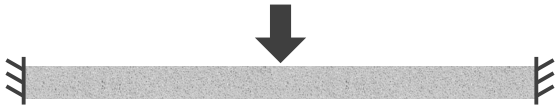


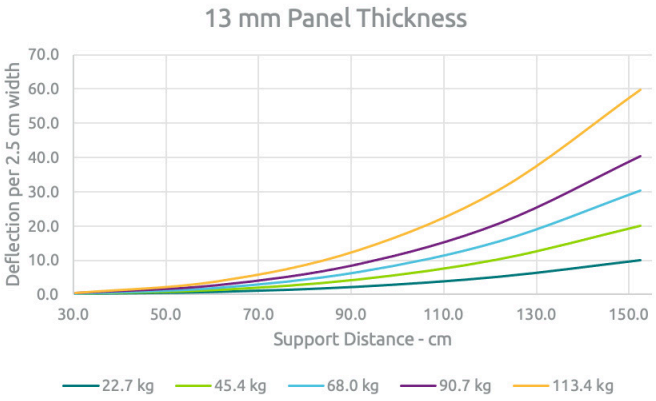


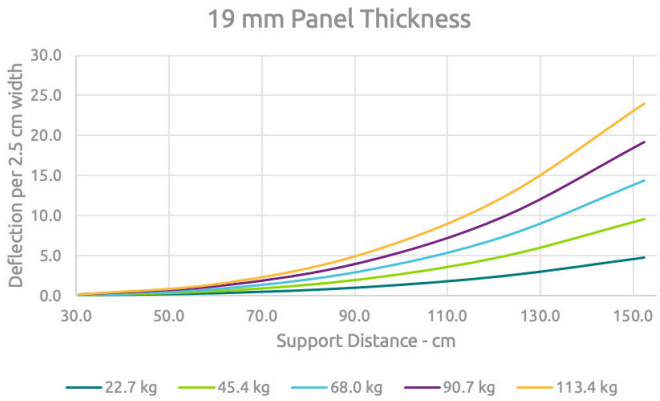


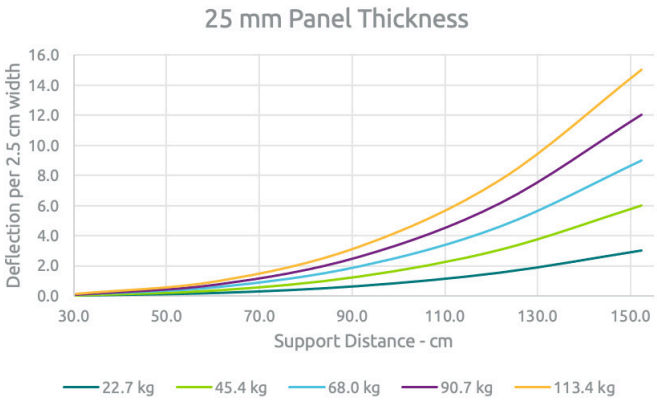
* To calculate deflection for different panel widths, use the following formula: Deflection = Chart value* [12 / panel width]. Example: Deflection for 24 inch panel = Chart value *[12 / 24]

Fixed End Beam Deflection - Metric
115 kg/m³ core density at various panel thicknesses









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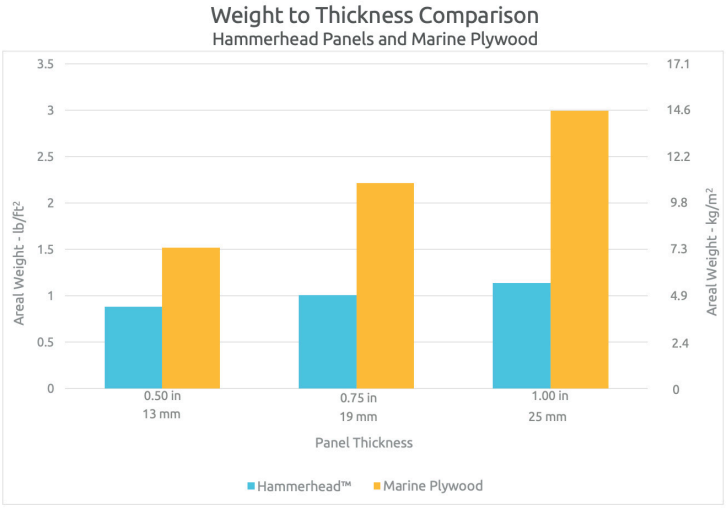
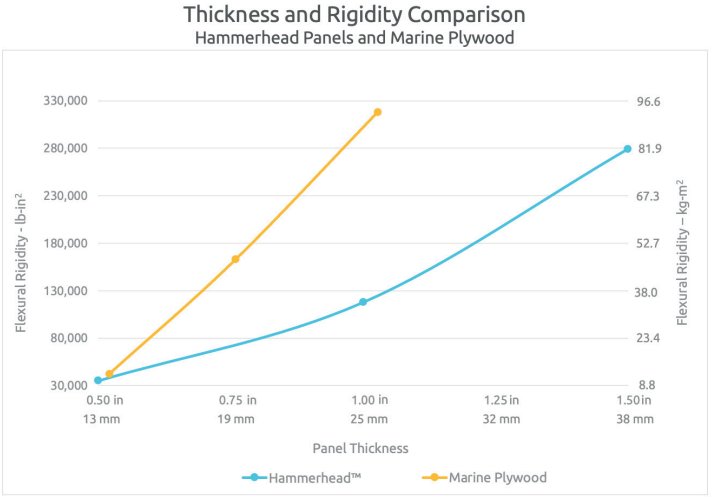
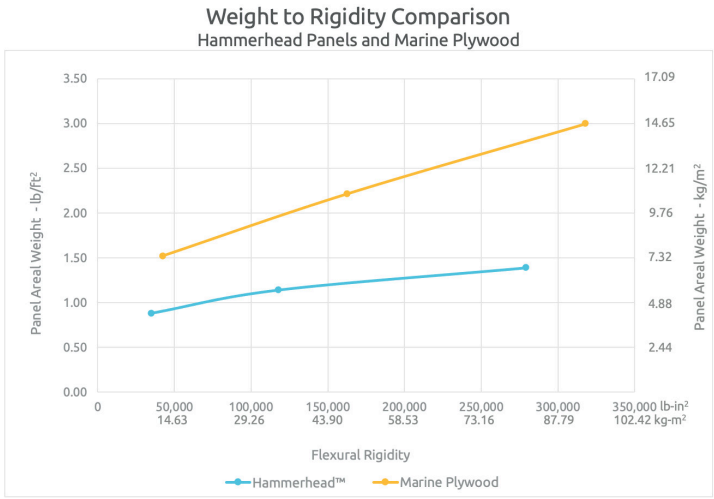
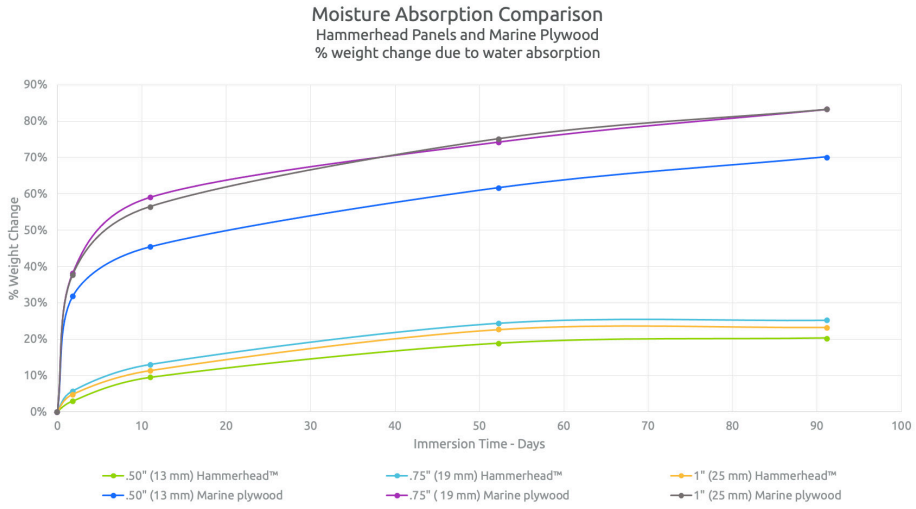
Performance Comparison
Hammerhead Panels and Marine Plywood

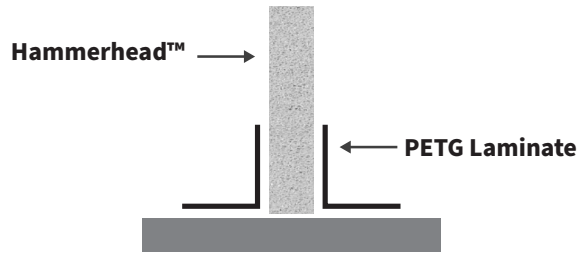






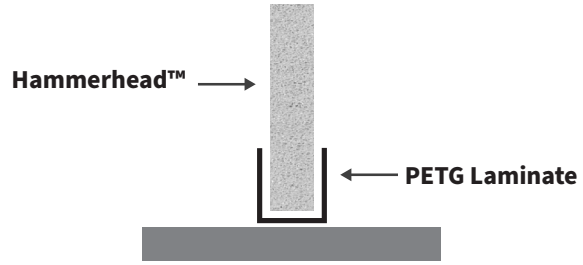


TAB TESTING OF VARIOUS INSTALLATION METHODS



L-Bracket Installation

BOTTOM PANEL	LEG LENGTH	BREAK STRENGTH
PETG Skins with Plywood Core	1 in/25 mm 1.5 in/38 mm 2 in/51 mm	2400 lbs/1089 kg 2820 lbs/1279 kg 2748 lbs/1246 kg
Hammerhead with 5 lb/ft³ (80 kg/m³) Core Density	2 in 51 mm	665 lbs 302 kg
Hammerhead with 7 lb/ft³ (115 kg/m³) Core Density	2 in 51 mm	881 lbs 400 kg
Hammerhead with 8 lb/ft³ (135 kg/m³) Core Density	2 in 51 mm	1084 lbs 492 kg
Marine Plywood	2 in 51 mm	770 lbs 349 kg
Glass/Epoxy with Plywood Core	2 in 51 mm	1055 lbs 479 kg
Glass/Polyester with Balsa Core	2 in 51 mm	919 lbs 417 kg



U-Channel Installation

BOTTOM PANEL	LEG LENGTH	BREAK STRENGTH
PETG Skins with Plywood Core	2 in 51 mm	2375 lbs 1077 kg
Marine Plywood	2 in 51 mm	770 lbs 349 kg
Glass/Polyester with Balsa Core	2 in 51 mm	797 lbs 362 kg

Mixed Conditions

	BOTTOM PANEL	LEG LENGTH	BREAK STRENGTH
GLASS/EPOXY TAB MATERIAL	Hammerhead with 5 lb/ft³ (80 kg/m³) Core Density	2 in 51 mm	420 lbs 191 kg
	Hammerhead with 7 lb/ft³ (115 kg/m³) Core Density	2 in 51 mm	370 lbs 168 kg
	Hammerhead with 8 lb/ft³ (135 kg/m³) Core Density	2 in 51 mm	332 lbs 151 kg
	Marine Plywood	2 in 51 mm	984 lbs 446 kg
	Glass/Polyester with Balsa Core	2 in 51 mm	1298 lbs 589 kg
NO TAB	Hammerhead with 5 lb/ft³ (80 kg/m³) Core Density - ITW Plexus MA420 Adhesive	NA	501 lbs 227 kg
	Hammerhead with 7 lb/ft³ (115 kg/m³) Core Density - ITW Plexus MA420 Adhesive	NA	839 lbs 381 kg
	Hammerhead with 8 lb/ft³ (135 kg/m³) Core Density - ITW Plexus MA420 Adhesive	NA	1156 lbs 524 kg
	Hammerhead with 8 lb/ft³ (135 kg/m³) Core Density - Crestomer 1152PA Adhesive	NA	1530 lbs 694 kg
	Hammerhead with 8 lb/in³ (135 kg/m³) Core Density - Crestomer M1-30 Adhesive	NA	1471 lbs 667 kg

ITW Plexus MA420 adhesive was used in all tab testing installations except where noted.

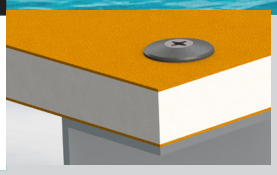
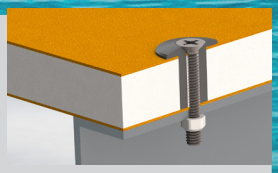
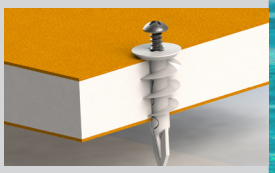
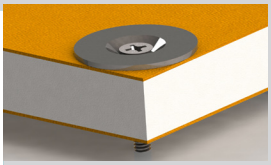
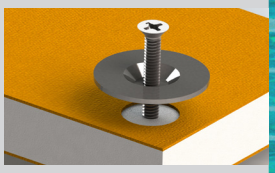
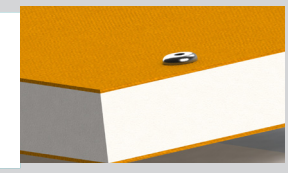
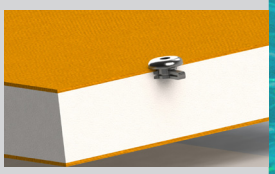
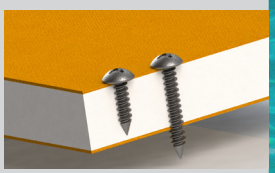
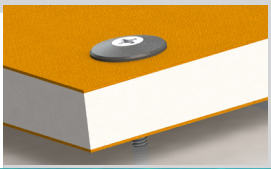
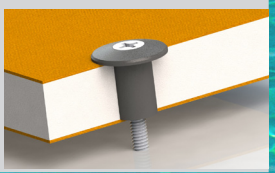
ADHESIVE SELECTION

ADHESIVE DESCRIPTION	ADHESIVE GRADE	MANUFACTURER	AVERAGE BOND STRENGTH	STANDARD DEVIATION	FAILURE MODE
BEST ADHESION					
2k Urethane	7542[1]	Lord	2281 psi 15.73 MPa	184 psi 1.27 MPa	Substrate Cohesive
2k Acrylic	SA1-705 GRY[1]	AccraLock	2211 psi 15.24 MPa	78 psi 0.54 MPa	Substrate
2k Acrylic	Plexus MA420	ITW	2171 psi 14.97 MPa	262 psi 1.81 MPa	Substrate
2k Acrylic	SA10-05 Blk[1]	AccraLock	2102 psi 14.49 MPa	138 psi 0.95 MPa	Substrate
2k Urethane	7545[1]	Lord	2047 psi 14.11 MPa	68 psi 0.47 MPa	Cohesive
2k Acrylic	SA1-705 GRY 1:2	AccraLock	1966 psi 13.56 MPa	68 psi 0.47 MPa	Substrate
2k Acrylic	Scotchweld 8010	3M	1907 psi 13.15 MPa	61 psi 0.42 MPa	Adhesive
Cyanoacrylate	Gorilla Glue	Gorilla Glue	1885 psi 13.00 MPa	432 psi 2.98 MPa	Cohesive
2k Acrylic	Crestabond PP-04	Scott Bader	1873 psi 12.91 MPa	281 psi 1.94 MPa	Substrate
2k Acrylic	SA10-05 Blk 10:2	AccraLock	1779 psi 12.27 MPa	127 psi 0.88 MPa	Cohesive
2k Urethane	7542[2]	Lord	1716 psi 11.83 MPa	190 psi 1.31 MPa	Cohesive Adhesive
2k Urethane	7545[2]	Lord	1535 psi 10.58 MPa	98 psi 0.68 MPa	Adhesive
2k Methacrylate	Polyfuse	Icon Containment	1610 psi 11.10 MPa	98 psi 0.68 MPa	Adhesive
INTERMEDIATE ADHESION					
2k Acrylic	FA10-05 Blk C010817	AccraLock	724 psi 4.99 MPa	58 psi 0.40 MPa	Cohesive
2k Acrylic	FA10-05 Blk[1]	AccraLock	722 psi 4.98 MPa	44 psi 0.30 MPa	Cohesive
2k Epoxy	Loctite Epoxy Instant Mix	Loctite	508 psi 3.50 MPa	81 psi 0.56 MPa	Adhesive
2k Epoxy	Gorilla Glue Epoxy	Gorilla Glue	341 psi 2.35 MPa	198 psi 1.37 MPa	Adhesive
NOT RECOMMENDED					
2k Epoxy	Loctite Epoxy Marine	Loctite	0	0	No bond

Brands identified are owned by the manufacturers of the adhesive products.

[1] surface sanded with 220 grit scuff prep [2] surface primed with 459T

FASTENER SELECTION

FASTENER TYPE	BENEFITS	CONSIDERATIONS		
Through-Bolting	Best mechanical locking system	Need back side access to panel		
Screw-In Anchor	Highest pullout strength	Requires pilot hole		
Cup Washer	Spreads compressive load	Requires relief hole; For substructure and hard point attachment		
Wide Grip (Bulb-Style) Rivet	Ease of use—no installation torque limitations	For lower load attachments		
Sheet Metal or Wood Screw	Readily available, low cost	Penetrate both skins for improved pullout		
Shoulder Washer	Limits compressive load	Requires relief hole; For substructure and hard point attachment		

For more information on installation, adhesives, and fasteners for specific applications, please contact Avient.

To learn more about our advanced composite solutions, contact Avient at +1.844.4AVIENT or visit www.avient.com.

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