HEXCEL® **Civil Engineering & Construction Systems**

Hex-3R ® Composite Strengthening Systems

Hex-3R Wrap 115™

The Hex-3R ® Composite Strengthening Systems provide construction industry professionals with a viable alternative to traditional repair methods through the application of composite materials science. This carefully designed portfolio of high strength, high modulus, externally applied reinforcing elements represent a cost-effective and efficient alternative to strengthen or stiffen a structure without resorting to remove and replace methods or invasive internal rebuilding techniques.

Hex-3R Wrap 115™ is an 18.7 oz/yd^2 0/90 degree carbon fabric. This fabric is primarily used to provide high levels of shear strength enhancement with minimal installation labor. Material is field laminated using Hex-3R Epoxy™ epoxy to form a carbon fiber reinforced polymer used to strengthen structural elements.

Where to Use

- Loading increases
- Seismic strengthening
- Temporary strengthening
- Change in structural system
- Design or construction defects

Advantages

- Used for shear, confinement or flexural strengthening
- Flexible, can be wrapped around complex shapes
- Lightweight
- Non-corrosive
- Acid resistant
- Low aesthetic impact
- Economical

Packaging

- Rolls: 50 in. x 300 linear feet

Carbon Fiber Properties

Tensile strength	560,000 psi
Tensile modulus	33.0 msi
Density	1.77 g/cc
Elongation	1.6 %

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Hex-3R Epoxy 300™ and Hex-3R Wrap 115™ Laminate Properties

Properties after standard cure followed by standard post cure (70-75°F – 5 days, 48 hours at 140°F)

	Average Value[1]		Design Value[2]		ASTM Test
Property	**US Units**	**SI Units**	**US Units**	**SI Units**	**Method**
	psi	MPa	psi	MPa	
Tensile Strength*	83,980	579	70,870	489	D638
Tensile Modulus*	7,017,555	48,351	6,149,730	42,468	D638
Tensile % Elongation *	1.14	1.14	0.975	0.975	D638
140F - Tensile Strength	74,195	511	64,790	447	D638
140F - Tensile Modulus	6,340,680	43,688	6,203,025	42,739	D638
140F - % Elongation	1.12	1.12	0.955	0.955	D638
Compressive Strength	54,245	373	38,570	267	D695
Compressive Modulus	6,707,855	46,218	6,496,100	44,759	D695
90 deg Tensile Strength	83,980	579	70,870	489	D638
90 deg Tensile Modulus	7,017,555	48,351	6,930,773	47,753	D638
90 deg %Tensile Elongation	1.14	1.14	0.975	0.975	D638
Shear Strength-+/-45 In Plane	14,630	101	12,920	89	D3518
Shear Modulus +/-45 In Plane	0	0	0	0	D3518
Ply Thickness (inch/mm)	0.01	0.241			

Hex-3R Epoxy 306XR™ and Hex-3R Wrap 115™ Laminate Properties

Properties after standard cure followed by standard post cure (70-75°F – 5 days, 48 hours at 140°F)

	Average Value[1]		Design Value[2]		ASTM Test
Property	**US Units**	**SI Units**	**US Units**	**SI Units**	**Method**
	psi	MPa	psi	MPa	
Tensile Strength*	82,080	565	69,825	481	D638
Tensile Modulus*	6,320,350	43,547	5,198,875	35,821	D638
Tensile % Elongation *	1.19	1.19	0.935	0.935	D638
140F - Tensile Strength	54,435	375	45,315	312	D638
140F - Tensile Modulus	4,704,875	32,417	3,779,765	26,044	D638
140F - % Elongation	1.13	1.13	0.755	0.755	D638
Compressive Strength	46,835	323	36,005	248	D695
Compressive Modulus	5,505,155	37,931	4,693,190	32,336	D695
90 deg Tensile Strength	82,080	565	69,825	481	D638
90 deg Tensile Modulus	6,320,350	43,547	5,198,875	35,821	D638
90 deg %Tensile Elongation	1.19	1.19	0.935	0.935	D638
Shear Strength-+/-45 In Plane	12,160	84	11,020	77	D3518
Shear Modulus +/-45 In Plane	416,480	2,870	380,570	2,623	D3518
Ply Thickness (inch/mm)	0.01	0.241			

* 24 sample coupons per test series; all other values based on 6 coupon test series

[1] Average value of test series – based on year 2000 testing program

[2] Average value minus 3 standard deviations calculated from the year 2000 testing program