

<b>ASTM Data for Grancrete A</b>			
<b>Testing performed by ASTM Certified Laboratory</b>			
<b>ASTM Test</b>	<b>Protocol #</b>	<b>GC-A</b>	<b>Laboratory</b>
<b>Compressive Strength (psi)</b>	<b>ASTM C109</b>		Argonne Labs
2 Hours		~3000	
24 Hours		~6000	
7 Days		~6500	
28 Days		~7000	
<b>Flexural Strength (psi)</b>	<b>ASTM C78</b>		Argonne Labs
28 Days		~1700	
<b>Fracture Toughness (mgm)</b>	<b>ASTM</b>		Argonne Labs
28 Days		0.6 to 0.7	
<b>Thermal Conductivity (w/m.k)</b>	<b>ASTM C882</b>		Argonne Labs
28 Days		0.53	
<b>Freeze Thaw Resistance</b>	<b>ASTM C157</b>		Argonne Labs
28 Days		81%@300 Cycles	
<b>Water Absorption</b>	<b>ASTM</b>		Argonne Labs
28 Days		<1%	
<b>pH Resistance</b>	<b>ASTM</b>		Argonne Labs
28 Days		No Effect: 3 to 11	

**Testing Labs:**

Argonne National Labs, TEC Labs (Lawrenceville, Ga.)  
 CFL (Constructed Facilities Laboratory, NCSU)  
 PSI-Fl (PSI Laboratory, Pensacola, Fl.)  
 PSI-Pitt (PSI Laboratory, Pittsburgh, Pa.)  
 VTEC Labs (Bronx, NY)

<b>ASTM Data for Grancrete A</b>			
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<b>ASTM Test</b>	<b>Protocol #</b>	<b>GC-A</b>	<b>Laboratory</b>
<b>Compressive Strength (psi)</b>	<b>ASTM C109</b>		<b>CFL</b>
2 Days		6033	
7 Days		6114	

<b>ASTM Data for Grancrete A</b>				
<b>Testing performed by ASTM Certified Labs</b>				
<b>ASTM Test</b>	<b>Protocol #</b>	<b>*Flowability %</b>	<b>Set Time</b>	<b>Lab</b>
<b>Compression Strength (psi) after 3 Days</b>	<b>ASTM C109</b>	<b>ASTM C1437</b>	<b>Touch</b>	<b>PSI-FI</b>
<b>@ 13% Water</b>	8100	24	7.3	
<b>@ 14% Water</b>	8140	68	7.8	
<b>@ 15% Water</b>	8380	84	8.0	
<b>@ 16% Water</b>	8540	108	9.0	
<b>@ 17% Water</b>	8690	140	9.0	
<b>@ 18% Water</b>	8420	>160	9.0	
<b>@ 19% Water</b>	8430	>160	9.0	
<b>@ 20% Water</b>	8420	>160	9.3	
<b>@ 24% Water</b>	4500	>160	9.8	
<b>@ 28% Water</b>	3270	>160	9.8	

\* Flowability – Workable range 60% to 120%, optimal = 100%

<b>ASTM Data for Grancrete A + Slate</b>			
Testing performed by a ASTM Certified Laboratory			
ASTM Test	Protocol #	GC-A + Slate	Laboratory
<b>Compressive Strength (psi)</b>	<b>ASTM C190</b>		<b>CFL</b>
6 Days @ 2:1		3758	
6 Days @ 1:1		2010	
6 Days @ 1:2		848	

<b>ASTM Data for Grancrete B</b>				
Testing performed by ASTM Certified Labs				
ASTM Test	Protocol #	*Flowability %	Set Time	Lab
<b>Compression Strength (psi) after 3 Days</b>	<b>ASTM C109</b>	<b>ASTM C1437</b>	<b>Touch</b>	<b>PSI-FI</b>
@ 14% Water	8370	16	9.3	
@ 15% Water	11310	72	9.3	
@ 16% Water	12590	84	9.3	
@ 17% Water	11390	102	9.3	
@ 18% Water	11230	106	9.3	
@ 19% Water	10040	111	9.5	
@ 20% Water	9600	130	10.0	
@ 21% Water	8340	148	11.3	
@ 22% Water	6410	>160	12.0	

\* Flowability – Workable range 60% to 120%, optimal = 100%

<b>ASTM Data for Grancrete B</b>			
<b>Testing performed by ASTM Certified Labs</b>			
<b>ASTM Test</b>	<b>Protocol #</b>	<b>GC-B</b>	<b>Laboratory</b>
<b>Flexural Strength (psi)</b>	<b>ASTM C78</b>		TEC Labs
7 days		325	
28 days		455	
<b>Splitting Tensile Strength (psi)</b>	<b>ASTM C496</b>		TEC Labs
7 days		185	
28 days		TBD	
<b>Slant Bond Strength (psi)</b>	<b>ASTM C882</b>		TEC labs
1 day		1350	
7days		1220	
<b>Modulus of Elasticity (psi)</b>	<b>ASTM C469</b>		TEC Labs
28 days		1,615,000	
<b>Coefficient of Thermal Expansion (1/°C)</b>	<b>ASTM 531</b>		TEC Labs
28 days		8.975E-06	

<b>ASTM Data for Grancrete B</b>			
<b>Testing performed by ASTM Certified Lab</b>			
<b>ASTM Test</b>	<b>Protocol #</b>	<b>GC-B</b>	<b>Comments</b>
<b>Length Change (%)</b>	<b>ASTM C157</b>		TEC Labs
28 days (soak/dry)		0.111%	
56 days (soak/dry)		-0.024%	
<b>Direct Tensile Strength (psi)</b>	<b>ASTM C190</b>		TEC Labs
1 day		285	
7 days		260	
28 days		270	
<b>ICRI Pull-off Test (psi)</b>	<b>ICRI 3739</b>		TEC Labs *(Broke @ Epoxy Bond)
1 day		205	
7 days		240	
14 days		*154	
28 days		*125	
<b>pH Resistance</b>	<b>ASTM D1308</b>		TEC Labs
(@28 days)			
pH = 0.25		Significant scarring	
pH = 3.0		No effect	
pH = 5.0		No effect	
pH = 10.0		No effect	

<b>ASTM Data for Grancrete B + VR (1:1) (Steel Plate)</b>			
<b>Testing performed by ASTM Certified Laboratory</b>			
<b>ASTM Test</b>	<b>Protocol #</b>	<b>GC-B + VR</b>	<b>Laboratory</b>
<b>Modified Fire Rating (Hrs)</b>	<b>ASTM E 119</b>		<b>VTEK Labs</b>
1.5" Sample Fire Rating		>3 Hrs	

<b>ASTM Data for Grancrete B + Sand (2:1)</b>				
<b>Testing performed by ASTM Certified Labs</b>				
<b>ASTM Test</b>	<b>Protocol #</b>	<b>*Flowability %</b>	<b>Set Time</b>	<b>Lab</b>
<b>Compression Strength (psi) after 3 Days</b>	<b>ASTM C109</b>	<b>ASTM C1437</b>	Touch	<b>PSI-FI</b>
<b>@ 10% Water</b>	5640	<10	8.8	
<b>@ 11% Water</b>	10730	42	8.8	
<b>@ 12% Water</b>	9360	68	9.5	
<b>@ 13% Water</b>	8040	88	9.5	
<b>@ 14% Water</b>	6920	108	9.5	
<b>@ 15% Water</b>	6290	128	9.3	
<b>@ 16% Water</b>	4970	148	10.3	
<b>@ 17% Water</b>	3950	>160	12.0	
<b>@ 18% Water</b>	3160	>160	13.3	

- Flowability – Workable range 60% to 120%, optimal = 100%

<b>ASTM Data for Grancrete B + Sand (2:1)</b>			
<b>Testing performed by ASTM Certified Laboratory</b>			
<b>ASTM Test</b>	<b>Protocol #</b>	<b>GC-B + Sand</b>	<b>Laboratory</b>
<b>Flexural Strength (psi)</b>	<b>ASTM C78</b>		TEC Labs
7 days		395	
28 days		670	
<b>Splitting Tensile Strength (psi)</b>	<b>ASTM C496</b>		TEC Labs
7 days		365	
28 days		465	
<b>Slant Bond Strength (psi)</b>	<b>ASTM C882</b>		TEC Labs
1 day		460	
7days		650	
<b>Length Change (%)</b>	<b>ASTM C157</b>		TEC Labs
28 days (soak/dry)		0.024%	
56 days (soak/dry)		-0.113%	

<b>ASTM Data for Grancrete B + Sand (2:1)</b>			
<b>Testing performed by a ASTM Certified Laboratory</b>			
<b>ASTM Test</b>	<b>Protocol #</b>	<b>GC-B + Sand</b>	<b>Laboratory</b>
<b>Direct Tensile Strength (psi)</b>	<b>ASTM C190</b>		<b>TEC Labs</b>
1 day		170	
7 days		160	
28 days		195	
<b>pH Resistance</b>	<b>ASTM D1308</b>		<b>TEC Labs</b>
(@28 days)			
pH = 0.25		Significant scarring	
pH = 3.0		No effect	
pH = 5.0		No effect	
pH = 10.0	No effect		
<b>Freeze Thaw Resistance</b>	<b>ASTM C666</b>		<b>TEC Labs</b>
158 cycles		92%	
309 cycles		89%	
<b>Flame Spread</b>	<b>ASTM 84</b>		<b>VTEC Labs</b>
Fire/Smoke		0/20	
Overall Rating		Class A	

<b>ASTM Data for Grancrete B + Sand (1:1)</b>				
<b>Testing performed by ASTM Certified Labs</b>				
<b>ASTM Test</b>	<b>Protocol #</b>	<b>*Flowability %</b>	<b>Set Time</b>	<b>Lab</b>
<b>Compression Strength (psi) after 3 Days</b>	<b>ASTM C109</b>	<b>ASTM C1437</b>	Touch	PSI-FI
<b>@ 9% Water</b>	9370	24	9.0	
<b>@ 10% Water</b>	7680	51	9.0	
<b>@ 11% Water</b>	5970	82	10.0	
<b>@ 12% Water</b>	4800	88	10.5	
<b>@ 13% Water</b>	3720	117	11.0	
<b>@ 14% Water</b>	2990	124	11.0	
<b>@ 15% Water</b>	2360	>160	11.5	

- Flowability – Workable range 60% to 120%, optimal = 100%

<b>ASTM Data for Grancrete HFR</b>			
<b>Testing performed by ASTM Certified Labs</b>			
<b>ASTM Test</b>	<b>Protocol #</b>	<b>GC HFR</b>	<b>Laboratory</b>
<b>Compressive Strength (psi) @ 20% Water</b>	<b>ASTM C109</b>		<b>CFL</b>
1 Hour		4238	
3 Hours		6361	
1 Day		6574	
3 Days		7257	
7 Days		7419	
14 Days		8197	
28 Days		8380	
90 Days		10,750	
<b>Compressive Strength (psi) @ 25% Water</b>		<b>ASTM C109</b>	
1 Hour	2683		
3 Hours	3468		
1 Day	3584		
3 Days	3949		
7 Days	4546		
14 Days	5628		
28 Days	6100		
90 Days	6400		

<b>ASTM Data for Grancrete HFR</b>			
<b>Testing performed by ASTM Certified Labs</b>			
<b>ASTM Test</b>	<b>Compression Strength</b>	<b>*Flowability</b>	<b>Laboratory</b>
<b>ASTM C109 &amp; C1437 (3 Days)</b>	<b>(psi)</b>	<b>(%)</b>	<b>CFL</b>
<b>@ 17% Water</b>	9868	21	
<b>@ 18% Water</b>	8925	88	
<b>@ 19% Water</b>	8852	88	
<b>@ 20% Water</b>	8575	101	
<b>@ 21% Water</b>	6328	124	
<b>@ 22% Water</b>	4797	119	
<b>@25% Water</b>	4444	150	
<b>@28% Water</b>	3357	>160	
<b>@30% Water</b>	2766	>160	
<b>@33% Water</b>	1381	>160	
<b>@35% Water</b>	1107	>160	

\* Flowability – Workable range 60% to 120%, optimal = 100%

<b>ASTM Data for Grancrete HFR</b>				
<b>Testing performed by ASTM Certified Labs</b>				
<b>ASTM Test</b>	<b>Protocol #</b>	<b>GC HFR</b>		<b>Laboratory</b>
<b>Setting Time (Min)</b>	<b>ASTM C403</b>	Initial	Final	<b>CFL</b>
20% Water		8.5	9.1	
25% Water		9.7	10.7	

<b>ASTM Data for Grancrete HFR</b>				
<b>Testing performed by ASTM Certified Labs</b>				
<b>ASTM Test</b>	<b>Protocol #</b>	<b>GC HFR</b>		<b>Laboratory</b>
<b>Flexural Strength (psi)</b>	<b>ASTM C403</b>	<b>20% W</b>	<b>25% W</b>	<b>CFL</b>
1 Hour		320	---	
3 Hours		788	501	
1 Day		1109	776	
3 Days		1195	994	
7 Days		1312	1275	
14 Days		1077	977	
28 Days		1053	1144	

<b>ASTM Data for Grancrete HFR</b>				
<b>Testing performed by ASTM Certified Labs</b>				
<b>ASTM Test</b>	<b>Protocol #</b>	<b>GC HFR</b>		<b>Laboratory</b>
<b>Modulus of Elasticity (psi)</b>	<b>ASTM C496</b>	<b>20% W</b>	<b>25% W</b>	<b>CFL</b>
3 Hours		400,000	200,000	
1 Day		1,400,000	1,100,000	
3 Days		1,800,000	1,200,000	
7 Days		1,800,000	1,400,000	
14 Days		1,900,000	1,500,000	
28 Days		TBD	TBD	

<b>ASTM Data for Grancrete HFR + VR (1:1)</b>			
<b>(Steel Plate)</b>			
<b>Testing performed by ASTM Certified Laboratory</b>			
<b>ASTM Test</b>	<b>Protocol #</b>	<b>HFR-VR</b>	<b>Laboratory</b>
<b>Modified Fire Rating (Hrs)</b>	<b>ASTM E 119</b>		<b>VTEK Labs</b>
1" Sample Fire Rating		2.7 Hrs	

<b>ASTM Data for Grancrete PCW</b>			
<b>Testing performed by ASTM Certified Laboratory</b>			
<b>ASTM Test</b>	<b>Protocol #</b>	<b>GC-PCW</b>	<b>Laboratory</b>
<b>Compressive Strength (psi)</b>	<b>ASTM C109</b>		<b>CFL</b>
1 Day		4855	
17 Days		8247	
<b>Flexural Strength (psi)</b>	<b>ASTM C78</b>		<b>PSI-Pitt</b>
3 Days		940	
7 Days		995	

<b>ASTM Data for Grancrete PCW</b>				
<b>Testing performed by ASTM Certified Labs</b>				
<b>ASTM Test</b>	<b>Compression Strength</b>	<b>*Flowability</b>	<b>Set Time</b>	<b>Lab</b>
<b>ASTM C109 &amp; C1437 (3 Days)</b>	<b>(psi)</b>	<b>(%)</b>	<b>Touch</b>	<b>PSI-FI</b>
<b>@ 17% Water</b>	10,270	<10	7.5	
<b>@ 18% Water</b>	10,670	<10	7.8	
<b>@ 19% Water</b>	11,550	76	7.8	
<b>@ 20% Water</b>	10,580	80	8.0	
<b>@ 21% Water</b>	9890	91	7.0	
<b>@ 22% Water</b>	9310	99	7.5	
<b>@ 24% Water</b>	8410	128	8.3	
<b>@ 26% Water</b>	7730	152	8.5	
<b>@ 28% Water</b>	6190	>160	9.3	
<b>@ 30% Water</b>	5210	>160	10.3	

\* Flowability – Workable range 60% to 120%, optimal = 100%

<b>ASTM Data for Grancrete PCW</b>			
Testing performed by ASTM Certified Laboratory			
ASTM Test	Protocol #	GC-PCW	Laboratory
Hydraulic Conductivity (Perms)	ASTM D5084	1.5 X10 <sup>-9</sup>	PSI-FI
Water			
Oil	ASTM D5084	5 X 10 <sup>-8</sup>	PSI-FI

<b>ASTM Data for Grancrete PCW + Sand (2:1)</b>				
Testing performed by ASTM Certified Labs				
ASTM Test	Compression Strength	*Flowability	Set Time	Lab
ASTM C109 & C1437 (3 Days)	(psi)	(%)	Touch	PSI-FI
@ 10% Water	2570	<10	10.0	
@ 11% Water	6470	<10	9.8	
@ 12% Water	11960	44	9.5	
@ 13% Water	11230	82	9.0	
@ 14% Water	9180	88	9.0	
@ 15% Water	8770	100	9.5	
@ 16% Water	8720	116	9.8	
@17% Water	8000	120	10.0	
@18% Water	7508	148	10.3	
@19% Water	7230	>160	9.8	
@20% Water	6650	>160	9.8	

\* Flowability – Workable range 60% to 120%, optimal = 100%

<b>ASTM Data for Grancrete PCW + Sand*</b>			
<b>Testing performed by ASTM Certified Laboratory</b>			
<b>ASTM Test</b>	<b>Protocol #</b>	<b>GC-PCW + Sand</b>	<b>Laboratory</b>
<b>Compressive Strength (psi)</b>	<b>ASTM C109</b>		CFL
3 Days (no sand)	<b>ASTM C109</b>	5730	PSI-Pitt
7 Days @ (no sand)		6420	
3 Days @ 1:1.5		2610	
7 Days @ 1:1.5		2920	
<b>Flexural Strength</b>	<b>ASTM C78</b>		PSI-FI
1 Day @ 1:1.5		210	
3 Days @ 1:1.5		325	
<b>Shear Strength (psf) on ICF Block</b>	<b>ASTM</b>		PSI-FI
3 Days @ 1:1		2606	
3 Days @ 1:2		2268	
<b>Pull Off Bond Strength (psf) on ICF Block</b>	<b>ASTM</b>		PSI-FI
3 Days @ 1:1		1909	
3 Days @ 1:2		1919	

\*Sand = 30/50 mesh

<b>ASTM Data for Grancrete PCW + Sand (1:1)</b>			
<b>Testing performed by ASTM Certified Laboratory</b>			
<b>ASTM Test</b>	<b>Protocol #</b>	<b>GC-PCW</b>	<b>Laboratory</b>
<b>Hydraulic Conductivity- Water (Perms)</b>	<b>ASTM D5084</b>	1.2 X10 <sup>-8</sup>	PSI-FI
<b>Water</b>			
<b>Oil</b>	<b>ASTM D5084</b>	2.1 X10 <sup>-7</sup>	PSI-FI

<b>ASTM Data for Grancrete PCW + Slate*</b>			
<b>Testing performed by ASTM Certified Laboratory</b>			
<b>ASTM Test</b>	<b>Protocol #</b>	<b>GC-PCW + Slate (1:1)</b>	<b>Laboratory</b>
<b>Compressive Strength (psi)</b>	<b>ASTM C109</b>		<b>PSI-FI</b>
1 Day		3367	
3 Days		3466	

\* Slate Powder

<b>ASTM Data for Grancrete PCW + Large/Fine Aggregate*</b>			
<b>Testing performed by ASTM Certified Laboratory</b>			
<b>ASTM Test</b>	<b>Protocol #</b>	<b>7 Day compression Strength (psi)</b>	<b>Laboratory</b>
<b>Compressive Strength (psi)</b>	<b>ASTM C109</b>		<b>U. Maine</b>
PCW Only		4270	
PCW + Large Agg (1:2)		5130	
PCW + Fine Agg (1:2)		5040	
PCW + Large Agg + Fine Agg (1:2:1)		5705	

\*Large Aggregate = ¾"; Fine Aggregate = ¼" (gravel)