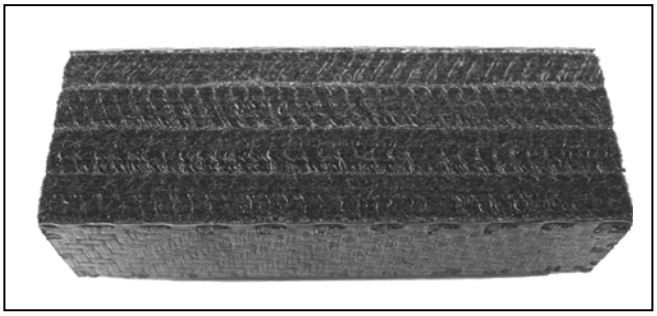
CARBON COMPOSITES INC.

"Innovations in Carbon"

Composite Rigid Board Insulation

Developed to provide all the advantages of conventional vacuum formed board, but withstand the high gas velocities and vibration of modern rapid quench vacuum furnaces. CRB is suitable in most high temperature applications operating up to 2,800°C (5,072°F) in an inert or vacuum environment.



CONSTRUCTION: CRB is produced by laminating multiple layers of rigidized graphite felt between 0.025" thick sheets of Carbon/Carbon Composite (C/C). Optionally, graphite foil may be bonded to one or both faces.

STANDARD SIZES: In addition to these standard sizes, boards can be manufactured to customer specification, eliminating the need for most joints. Panels are available in sizes up to 90" long x 55" wide x 8" thick (2290 x 1400 x 200mm).

Length	Width	Thickness	Thickness Tolerance
1000mm	1500mm	20, 30, 40, 50	± 2mm
1000mm	1000mm	20, 30, 40, 50	± 2mm
24"	42"	1", 1.5", 2"	± 0.08"
24"	48"	1", 1.5", 2"	± 0.08"
24"	52"	1", 1.5", 2"	± 0.08"
48"	60"	1", 1.5", 2"	± 0.08"

MATERIAL ATTRIBUTES:

- Erosion Resistance: C/C exterior provides a robust barrier, protecting the insulating core from damage by dropped parts, melt splatter, or high velocity particle abrasion. Fabricating hot zone panels as single monolithic sheets eliminate most joints; a significant source of particle generation.
- Machinability: CRB is readily machinable with conventional methods such as cutting, drilling, sawing, and milling. Panels may be supplied with pre-machined shiplap joints to facilitate rapid furnace rebuilds.
- Dimensional Stability: Solid C/C composite construction will not bow, warp, or crack as a result of thermal shock or cycling.
- Low Specific Heat: Allows for rapid furnace cycling and improved throughput.
- Purity: Halogen and Vacuum purification available for Semiconductor related applications.

Typical Properties	SI Units		English Units	
Density (see note)	.18	g/cm³	11.2	lb/ft³
Thermal Conductivity (Argon) 1,000°C (1,832°F) (⊥) 2,000°C (3,632°F) (⊥)	 0.47 1.05	 W/mK W/mK	 3.26 7.29	 BTU in/hr ft² BTU in/hr ft²
Thermal Conductivity (Vacuum) 1,000°C (1,832°F) (⊥) 2,000°C (3,632°F) (⊥)	 0.33 0.92	 W/mK W/mK	 2.29 6.39	 BTU in/hr ft² BTU in/hr ft²
CTE: 20 – 1,000°C (//) (68 – 1,832°F) (//)	2.5 x 10^{-6}	1/K	1.4 x 10^{-6}	1/°F
Flexural Strength (⊥)	2.0	MPa	300	psi
Compressive Strength (⊥) @ 10% Deformation	0.276	MPa	40	psi

Note: C/C shell not included in measured density.

Material Grade	Total Ash	Sulfur Content	Total Elemental Impurities	Processing Temp
CRB-220	≤ 0.1%	300 ppm	500 - 1,000 ppm	1,900°C
CRB-220H	≤ 0.01%	25 ppm	≤ 150 ppm	1,900°C
CRB-220HP	N/A	5 ppm	≤ 20 ppm	2,100°C w/ Halogen

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