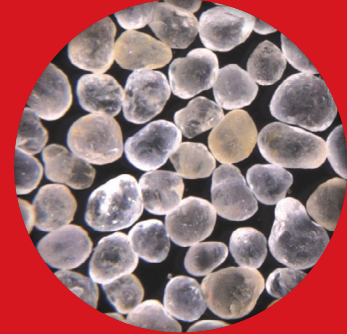


# CARBO NORTHERN-WHITE

## Premium sand

### Features

- Northern White monocrystalline sand
- Exceptionally round grains with spherical structure
- High purity and superior quality
- Available in grain size distributions 16/30, 20/40, 30/50, 30/70, 40/70 and 100 mesh
- All sand meets or exceeds API requirements and CARBO strict quality assurance and quality control standards
- Origin of sand supply is available on majority of Class 1 railroads



### Physical properties

#### Typical sieve analysis (weight % retained)

U.S. Mesh (mesh)	Microns	16/30	20/40	30/50	30/70	40/70	100 Mesh
-16+20 mesh	-1180+850	100	100	100	100	100	100
-20+30 mesh	-850+600	100	100	100	100	100	100
-30+40 mesh	-600+425	100	100	100	100	100	100
-40+50 mesh	-425+300	100	100	100	100	100	100
-50+70 mesh	-300+212	100	100	100	100	100	100
-70+100 mesh	-212+150	100	100	100	100	100	100
-100+140 mesh	-150+106	100	100	100	100	100	100
-140+200 mesh	-106+75	100	100	100	100	100	100
% in size		>90	>90	>90	>90	>90	>90
Median particle diameter (microns)		762	575	410	321	276	192
Crush resistance (K-value)		5K	6K	7K	8K	8K	10K
Bulk density (g/cm <sup>3</sup> )		1.58	1.54	1.53	1.53	1.50	1.49
(lb/ft <sup>3</sup> )		99	96	95	95	94	93

### Long-term conductivity

Closure stress (psi)	Reference conductivity*, md-ft					
	16/30	20/40	30/50	30/70	40/70	100 mesh
2,000	4478	3975	2099	1649	844	682
4,000	2738	2430	1941	1109	674	550
6,000	1511	1178	735	470	408	294
8,000	484	476	306	242	196	111
10,000	280	260	166	132	104	56

#### Typical additional properties

Roundness	0.8
Sphericity	0.8
Apparent density (g/cm <sup>3</sup> )	2.65
Absolute volume (gal/lb)	0.045
Solubility in 12/3 HCl/HF acid (% weight loss)	1.0

#### Chemical composition (weight %)

SiO <sub>2</sub>	100
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Data obtained from procedures compliant with API RP 19C.

\*Reference conductivity is measured with a single phase fluid under laminar flow conditions in accordance with API RP 19D. In an actual fracture, the effective conductivity will be much lower due to non-Darcy and multiphase flow effects. For more information, please refer to SPE Paper #106301.

Talk to CARBO to find out how we can help you enhance your production.

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