



RODGERS & COMPANY

Axis Well Installation Submittal Information
EW-005, EW-006, and IW-636R
Filter Sand – 8-12 Gradation Silica Sand

Date: December 11, 2014
Submitted by: Rodgers & Company, Inc.
Spec. Reference: SECTION 2680 2.01

2.01 FILTER SAND PACK

Rodgers proposes to supply Colorado Silica Sand gradation 8-12 as produced by Premiere Silica, Colorado Springs CO. The material source is an aeolian deposit, mined, washed clean of silt, sand, dirt. The material is available packaged in 50# bags and 3,000 lb. super sacks. The filter pack material is well rounded and has a uniformity coefficient of 1.7. Representative product gradations and information on physical properties is presented on the following page.

Filter sand pack will be installed through tremie pipe from bottom of the bore to design setting depth of approximately 15 ft above top of well screen. Depth of sand placement will be measured and recorded regularly. Sand will be disinfected with chlorine as it is installed.

Colorado Sand - Typical Specifications & Properties

All Markets

Products	Sieves																
	5	6	7	8	10	12	14	16	18	20	25	30	35	40	45	50	60
6/9	0-5	0-5	10-20	49-59	10-25	0-3											
8/12		0-1		0-5	20-40	32-42	0-10	0-1									
8/16				0-5	15-30	30-50	15-30	5-15	0-5								
10/16				0-1	0-5	25-50	15-50	10-20	0-1								
10/20				0-1	0-5	3-18	30-40	30-45	10-25	0-5	0-1						
12/20					0-1	5-15	30-50	20-40	10-20	0-5	0-1						
16/30							0-1	0-5	25-45	23-33	15-20	5-15	0-5				
20/40								0-1		0-1	0-10	28-57	30-40	15-27	5-10		
30/70											0-1	0-5		5-20		40-70	10-30
100 Mesh														15-40		5-15	10-20
Traction Sand												50-70		0-40		0-30	5-20

Colorado Sand - Typical Chemical Analysis

All Markets

Chemical	Products								
	6/9	8/12	8/16	10/20	12/20	16/30	20/40	30/70	100 Mesh
SiO ₂ (Silicon Dioxide)	99.48%	99.48%	99.48%	96.11%	94.66%	94.06%	90.32%	82.69%	80.11%
Fe ₂ O ₃ (Iron Oxide)	0.06%	0.06%	0.06%	0.07%	0.08%	0.12%	0.18%	0.41%	1.06%
Al ₂ O ₃ (Aluminum Oxide)	0.21%	0.21%	0.21%	1.40%	1.91%	2.7%	5.06%	9.86%	10.7%
TiO ₂ (Titanium Dioxide)	< 0.01%	< 0.01%	< 0.01%	0.01%	0.02%	0.04%	0.03%	0.14%	0.55%
CaO (Calcium Oxide)	< 0.01%	< 0.01%	< 0.01%	0.02%	0.03%	0.04%	0.06%	0.12%	0.25%
MgO (Magnesium Oxide)	< 0.01%	< 0.01%	< 0.01%	0.02%	0.03%	0.02%	0.02%	0.03%	0.05%
K ₂ O (Potassium Oxide)	n/a	n/a	n/a	0.87%	0.87%	1.44%	2.73%	3.8%	6.92%
Na ₂ O (Sodium Oxide)	n/a	n/a	n/a	0.22%	0.22%	0.29%	0.42%	0.57%	0.73%

AWWA Acid Solubility	<1.0%	<1.0%	<1.0%	<1.0%	<1.0%	<1.0%	<1.0%	<1.0%	<1.0%
Porosity	44%+	44%+	44%+	44%+	44%+	44%+	44%+	44%+	44%+
Close									

Colorado Sand			
All Markets			
Product	AFS	Effective Size (mm)	Coef. Of Unif.
6/9		2.00 - 3.00	< 1.40
8/12		1.70 - 2.00	< 1.40
8/16		1.40 - 1.65	< 1.40
10/16		1.25 - 1.45	< 1.30
10/20		1.10 - 1.15	< 1.50
12/20		0.95 - 1.15	< 1.40
16/30		0.60 - 0.75	< 1.60
20/40		0.40 - 0.50	< 1.45
30/70		0.15 - 0.25	< 2.50
100 Mesh		0.09 - 0.15	< 2.00
Close			

Colorado Sand - Typical Physical Analysis	
All Markets	
Mineral	Quartz
pH	Neutral (7.0)
Color	Tan
Roundness	0.6+
Sphericity	0.7+
Hardness	7.0
Specific Gravity	2.62+
Melting Point	n/a
LOI (Loss on Ignition)	< 0.4
Unit Weight	100 lbs = 1 cu ft
Close	