

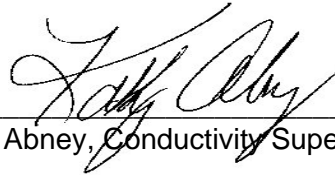
**Conductivity and Permeability of Four Submitted
Samples of Fores MgLight Ceramic Proppant
#120809 20/40, 120810 30/50, 120811 20/40 and
120812 30/50 from Fores Ltd @ 2 lb/ft² and
At 2,000 - 10,000 psi Closure Stresses at 250 °F
For 50 hours each on Ohio Sandstone
and ISO 13403-2/APIRP-19C**

Prepared For:

Mr. Denis Rozhkov
Fores, Ltd
11A Seleznevskaya Street
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Moscow, Russia 103030

Prepared By:

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Kathy Abney, Conductivity Supervisor

P.O. Number: Pre-Payment 1-8-09
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File Number: SL 8293

January 2009

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Kathy Abney

December 22, 2008

Mr. Denis Rozhkov
Fores, Ltd
11A Seleznevskaya Street
Bldg. 2, Rm 303
Moscow, Russia 10303

Dear Mr. Rozhkov:

STIM-LAB, Inc. has completed the long-term conductivity evaluations of the samples submitted by your firm labeled 20/40 MgLight No. 120809, 30/50 MgLight No. 120810, 20/40 MgLight No. 120811, 30/50 MgLight No. 120812 ceramic proppant samples, which arrived at Stim-Lab on December 31, 2008. The samples were evaluated at 2.0 lb/ft² at 250°F and 2000, 4000, 6000, 8000, and 10,000 psi closure stresses for 50 hours each. The complete identification of the sample can be located at the top of each conductivity data table.

Figure 1 contains a summary of conductivity and permeability vs. stress. This data is presented in Tables 1 through 4. The sieve analysis of the sample is provided in Table 5. Table 6-9 #120809 - #120812 respectively, contains the remaining ISO 13503-2:2006/APIRP19C evaluations using these procedures. The crush was specified to be tested at 10,000 psi only. The procedures utilized are outlined in the following section of this report.

Thank you for having STIM-LAB, Inc. to perform this test series. Should you have any questions regarding the testing or results, please do not hesitate to give me a call.

Sincerely,

Kathy Abney
Conductivity Supervisor



PROCEDURE FOR CONDUCTIVITY AND LIQUID PERMEABILITY MEASUREMENTS

- 1 The equipment used for the measurement of conductivity and liquid permeability included:
 - a. 75 ton Dake Press with air oil intensifier. API SS316 or Monel K-500 flow cells with 10 sq in. flow paths.
 - b. Rosemont (smart family) 40:1 pressure transducers for measuring pressure drop and rate plumbed with ¼ in. lines and calibrated with the smart system computer and set at the 0-5 inch of water span range.
 - c. Two gallon nitrogen driven fluid reservoirs filled with 2% KCl and deoxygenated with nitrogen.
 - d. Internal gauges and calipers for measuring widths.
 - e. IBM PC to process data and calculate conductivity and permeability.
 - f. Two - 10 sq in. Ohio Sandstone.
- 2 An API cell was loaded with proppant sample to be tested. The proppant was leveled with a blade device.
- 3 The proppant sample was placed between the core slabs and was made a part of a four-cell stack.
- 4 The cells were stacked to within 0.002 in. from top to bottom and positioned between the platens of the Dake Press. Pressure was increased to 500 psi and the system was evacuated and saturated with water at 70-75 °F.
- 5 Once saturated, the closure pressure was increased to 1,000 psi, at a rate of 100 psi/min. The proppant was allowed to equilibrate as outlined in the data tables.
- 6 The flow rate, pressure differential, and average width were measured at each pressure in order to calculate conductivity and permeability. Five measurements were taken and averaged to arrive at each conductivity. Flow rate was measured with a LiquiFlow meter, which was calibrated with a Mettler balance to 0.01 ml/min. Darcy's Law was used for the calculations to determine the conductivity and permeability.
- 7 The test temperature was increased to 250 °F and allowed to equilibrate. The temperature was left at 250 °F for 12 hours prior to increasing the closure.
- 8 The conductivity and permeability of the proppant were collected at 1,000 psi at both room temperature and 250 °F as stated in the data tables.

- 9 The pressure was increased at 100 psi per minute at 1,000 psi increments and the above measuring technique repeated.
- 10 The conductivity and permeability of the proppant were continuously monitored at 2,000 psi and 250 °F for 50 hours.
- 11 The conductivity and permeability of the proppant were continuously monitored at 4,000 psi and 250 °F for 50 hours.
- 12 The conductivity and permeability of the proppant were continuously monitored at 6,000 psi and 250 °F for 50 hours.
- 13 The conductivity and permeability of the proppant were continuously monitored at 8,000 psi and 250 °F for 50 hours.
- 14 The conductivity and permeability of the proppant were continuously monitored at 10,000 psi and 250 °F for 50 hours.

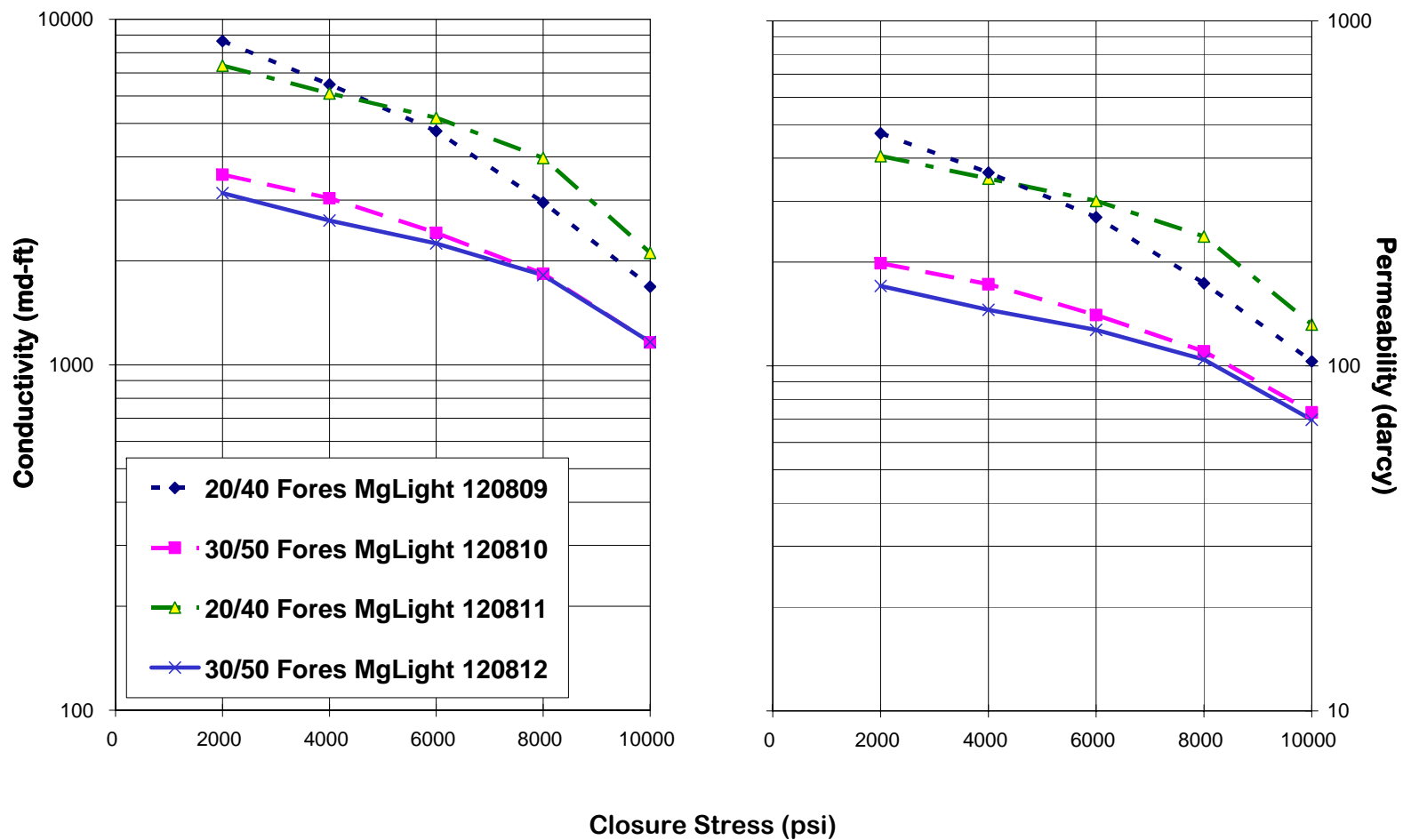
Figure 1

Long-term Conductivity and Permeability

2.0 lb/ft² 20/40 Fores MgLight 120809 and 120811 and 30/50 Fores MgLight 120810 and 120812

Arrived at Stim-Lab on 12-31-08

in 2% KCl between Ohio Sandstone at 250°F



SL 8293

Table 1
 Conductivity and Permeability of
 2.0 lb/ft² 20/40 Fores MgLight #120809
 Submitted by Fores Ltd to SL on December 31, 2008
 Between Ohio Sandstone core

Hrs at Closure & Temperature	Closure (psi)	Temp (° F)	Conductivity (md-ft)	Width (in)	Permeability (Darcy)
-14	1000	75	10441	0.227	552
-2	1000	250	9507	0.225	507
0	2000	250	9078	0.223	489
10	2000	250	8910	0.221	484
20	2000	250	8776	0.220	479
30	2000	250	8713	0.220	475
40	2000	250	8686	0.220	474
50	2000	250	8656	0.220	472
0	4000	250	7245	0.217	401
10	4000	250	6898	0.216	383
20	4000	250	6699	0.215	374
30	4000	250	6537	0.214	367
40	4000	250	6497	0.214	364
50	4000	250	6477	0.214	363
0	6000	250	5489	0.214	308
10	6000	250	4976	0.212	282
20	6000	250	4891	0.211	278
30	6000	250	4818	0.211	274
40	6000	250	4779	0.211	272
50	6000	250	4744	0.211	270
0	8000	250	3828	0.210	219
10	8000	250	3363	0.207	195
20	8000	250	3129	0.205	183
30	8000	250	3054	0.204	180
40	8000	250	2998	0.204	176
50	8000	250	2952	0.204	174
0	10000	250	2491	0.201	149
10	10000	250	1946	0.198	118
20	10000	250	1839	0.197	112
30	10000	250	1728	0.196	106
40	10000	250	1692	0.196	104
50	10000	250	1683	0.196	103

	Sieve	% Retained
January 7 -18, 2009	16	0.0
	18	0.0
	20	0.6
	25	38.6
	30	57.3
	35	3.5
	40	0.0
	45	0.0
	50	0.0
	pan	0.0
	Total	100.0
Median Dia.= 0.691 mm	% In Size	99.4



SL 8293

Table 2
 Conductivity and Permeability of
 2.0 lb/ft² 30/50 Fores MgLight #120810
 Submitted by Fores Ltd to SL on December 31, 2008
 Between Ohio Sandstone core

Hrs at Closure & Temperature	Closure (psi)	Temp (° F)	Conductivity (md-ft)	Width (in)	Permeability (Darcy)
-14	1000	75	5372	0.220	293
-2	1000	250	4157	0.218	229
0	2000	250	3970	0.217	220
10	2000	250	3816	0.216	212
20	2000	250	3711	0.215	207
30	2000	250	3620	0.215	202
40	2000	250	3587	0.215	200
50	2000	250	3552	0.215	198
0	4000	250	3213	0.214	180
10	4000	250	3125	0.212	177
20	4000	250	3073	0.211	175
30	4000	250	3066	0.211	174
40	4000	250	3049	0.211	173
50	4000	250	3032	0.211	172
0	6000	250	2722	0.209	156
10	6000	250	2553	0.207	148
20	6000	250	2489	0.206	145
30	6000	250	2445	0.206	142
40	6000	250	2417	0.206	141
50	6000	250	2408	0.206	140
0	8000	250	2135	0.204	126
10	8000	250	1960	0.201	117
20	8000	250	1911	0.201	114
30	8000	250	1865	0.200	112
40	8000	250	1856	0.200	111
50	8000	250	1835	0.200	110
0	10000	250	1526	0.194	94
10	10000	250	1220	0.192	76
20	10000	250	1199	0.191	75
30	10000	250	1177	0.191	74
40	10000	250	1167	0.190	74
50	10000	250	1160	0.190	73

	Sieve	% Retained
January 7 -18, 2009	20	0.0
	25	0.0
	30	1.0
	35	57.9
	40	39.8
	45	1.3
	50	0.0
	60	0.0
	70	0.0
	pan	0.0
	Total	100.0
Median Dia.= 0.508 mm	% In Size	99.0



SL 8293

Table 3
 Conductivity and Permeability of
 2.0 lb/ft² 20/40 Fores MgLight #120811
 Submitted by Fores Ltd to SL on December 31, 2008
 Between Ohio Sandstone core

Hrs at Closure & Temperature	Closure (psi)	Temp (° F)	Conductivity (md-ft)	Width (in)	Permeability (Darcy)
-14	1000	75	8590	0.216	477
-2	1000	250	8354	0.221	454
0	2000	250	7786	0.219	427
10	2000	250	7516	0.218	414
20	2000	250	7434	0.217	411
30	2000	250	7403	0.217	409
40	2000	250	7364	0.217	407
50	2000	250	7339	0.217	406
0	4000	250	6556	0.214	368
10	4000	250	6352	0.212	360
20	4000	250	6246	0.211	355
30	4000	250	6178	0.210	353
40	4000	250	6140	0.210	351
50	4000	250	6103	0.210	349
0	6000	250	5631	0.209	323
10	6000	250	5339	0.208	308
20	6000	250	5281	0.207	306
30	6000	250	5244	0.207	304
40	6000	250	5205	0.207	302
50	6000	250	5188	0.207	301
0	8000	250	4493	0.205	263
10	8000	250	4146	0.203	245
20	8000	250	4050	0.202	241
30	8000	250	4006	0.201	239
40	8000	250	3986	0.201	238
50	8000	250	3970	0.201	237
0	10000	250	3053	0.196	187
10	10000	250	2422	0.194	150
20	10000	250	2288	0.192	143
30	10000	250	2233	0.192	140
40	10000	250	2135	0.192	133
50	10000	250	2108	0.192	132

	Sieve	% Retained
January 7 -18, 2009	16	0.0
	18	0.0
	20	0.2
	25	16.6
	30	65.5
	35	17.5
	40	0.2
	45	0.0
	50	0.0
	pan	0.0
	Total	100.0
Median Dia.= 0.648 mm	% In Size	99.8



SL 8293

Table 4
 Conductivity and Permeability of
 2.0 lb/ft² 30/50 Fores MgLight #120812
 Submitted by Fores Ltd to SL on December 31, 2008
 Between Ohio Sandstone core

Hrs at Closure & Temperature	Closure (psi)	Temp (° F)	Conductivity (md-ft)	Width (in)	Permeability (Darcy)
-14	1000	75	4889	0.228	257
-2	1000	250	3593	0.225	192
0	2000	250	3353	0.224	180
10	2000	250	3267	0.223	176
20	2000	250	3222	0.222	174
30	2000	250	3190	0.221	173
40	2000	250	3151	0.221	171
50	2000	250	3138	0.221	170
0	4000	250	2831	0.218	156
10	4000	250	2730	0.217	151
20	4000	250	2689	0.216	149
30	4000	250	2658	0.216	148
40	4000	250	2633	0.216	146
50	4000	250	2615	0.216	145
0	6000	250	2468	0.214	138
10	6000	250	2357	0.213	133
20	6000	250	2319	0.212	131
30	6000	250	2293	0.212	130
40	6000	250	2256	0.212	128
50	6000	250	2245	0.212	127
0	8000	250	2081	0.212	118
10	8000	250	1947	0.210	111
20	8000	250	1898	0.209	109
30	8000	250	1882	0.209	108
40	8000	250	1842	0.209	106
50	8000	250	1818	0.209	104
0	10000	250	1620	0.204	95
10	10000	250	1367	0.202	81
20	10000	250	1280	0.201	76
30	10000	250	1229	0.200	74
40	10000	250	1204	0.200	72
50	10000	250	1164	0.200	70

	Sieve	% Retained
January 7 -18, 2009	20	0.0
	25	0.0
	30	0.0
	35	10.6
	40	56.2
	45	32.4
	50	0.8
	60	0.0
	70	0.0
	pan	0.0
	Total	100.0
% In Size	100.0	

Median Dia.= 0.440 mm



SL-8293

Table 5
 Pre-Test Sieve Analysis of Submitted Samples
 From Fores Ltd Samples Arrived at SL December 31, 2008

Sample I.D. US Standard Sieve No.	Sample #MgLight 120809 20/40		Sample #MgLight 120811 20/40		Sample #MgLight 120810 30/50		Sample #MgLight 120812 30/50	
	Weight %		Weight %		Weight %		Weight %	
	Retained	Cumulative	Retained	Cumulative	Retained	Cumulative	Retained	Cumulative
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	0.6	0.6	0.2	0.2	0.0	0.0	0.0	0.0
25	38.6	39.2	16.6	16.8	0.0	0.0	0.0	0.0
30	57.3	96.5	65.5	82.3	1.0	1.0	0.0	0.0
35	3.5	100.0	17.5	99.8	57.9	58.9	10.6	10.6
40	0.0	100.0	0.2	100.0	39.8	98.7	56.2	66.8
45	0.0	100.0	0.0	100.0	1.3	100.0	32.4	99.2
50	0.0	100.0	0.0	100.0	0.0	100.0	0.8	100.0
60	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
70	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
80	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
100	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
pan	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
total	100.0		100.0		100.0		100.0	
in-size	99.4		99.8		99.0		100.0	
Median Dia. (mm)	0.691		0.648		0.508		0.440	

January 2009

Table 6
Submitted 20/40 MgLight 120809 Ceramic Proppant Sample
Submitted by Fores Ltd to SL on December 31, 2008

ISO 13503-2/APIRP-19C = Measurement of Properties of Proppants
Used in Hydraulic Fracturing and Gravel-Packing Operations

ISO 13503-2/APIRP19C, Section 11, "Proppant Crush Resistance Test"
Mean of 3 evaluations

<u>PSI</u>	<u>% Fines of -20+40</u>
10000	3.1

K-Value Not Requested

ISO specification: Determine the highest stress level at which proppant generates no more than 10% crushed material and round this value down to the nearest 1000 psi or K-value.

API RP-60 suggested fines limit for proppant size designation: 10% for 20/40, 25% for 16/20 or greater

ISO 13503-2/APIRP19C Section 7, "Proppant Sphericity and Roundness"

<u>Sphericity =</u>	0.89
<u>Roundness =</u>	0.89
<u>Clusters =</u>	<u>None Observed in Field of Count</u>

ISO 13503-2 - Ceramic Proppant 0.7 or greater

API RP-60 - minimum recommended sphericity and roundness average should be 0.7 or greater

ISO 13503-2/APIRP19C Section 8, "Acid Solubility"
Mean of 3 evaluations

<u>Acid Sol. Percent =</u>	Percent % 10.1
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ISO 13503-2 - Ceramic Proppant and Resin Coated Ceramic Proppants, 7.0% or less

API RP-60, none recommended, referenced procedure for API RP-56

ISO 13503-2/APIRP19C Section 10, "Bulk Density, Apparent Density and Absolute Density"

ISO Methods

<u>Bulk Density =</u>	1.58	<u>g/cm³</u>
<u>Bulk Density =</u>	98.6	<u>lb/ft³</u>
<u>Specific Gravity = (Oil per ISO or Apparent Density)</u>	2.81	<u>g/cm³</u>

ISO 13503-2/APIRP19C Section 9, "Turbidity Test"

68 FTU

ISO 13503-2 - All Proppants Shall not Exceed 250FTU (NTU) or Less

API RP-56, suggested maximum frac sand turbidity should be 250FTU or less.

January 2009

Table 7
Submitted 30/50 MgLight 120810 Ceramic Proppant Sample
Submitted by Fores Ltd to SL on December 31, 2008

ISO 13503-2/APIRP-19C = Measurement of Properties of Proppants
Used in Hydraulic Fracturing and Gravel-Packing Operations

ISO 13503-2/APIRP19C, Section 11, "Proppant Crush Resistance Test"
Mean of 3 evaluations

<u>PSI</u>	<u>% Fines of -30+50</u>
10000	1.6

K-Value Not Requested

ISO specification: Determine the highest stress level at which proppant generates no more than 10% crushed material and round this value down to the nearest 1000 psi or K-value.

API RP-60 suggested fines limit for proppant size designation: 10% for 20/40, 25% for 16/20 or greater

ISO 13503-2/APIRP19C Section 7, "Proppant Sphericity and Roundness"

<u>Sphericity =</u>	0.89
<u>Roundness =</u>	0.88

Clusters = [None Observed in Field of Count](#)

ISO 13503-2 - Ceramic Proppant 0.7 or greater

API RP-60 - minimum recommended sphericity and roundness average should be 0.7 or greater

ISO 13503-2/APIRP19C Section 8, "Acid Solubility"
Mean of 3 evaluations

<u>Acid Sol. Percent =</u>	Percent %
	10.2

ISO 13503-2 - Ceramic Proppant and Resin Coated Ceramic Proppants, 7.0% or less

API RP-60, none recommended, referenced procedure for API RP-56

ISO 13503-2/APIRP19C Section 10, "Bulk Density, Apparent Density and Absolute Density"

ISO Methods

<u>Bulk Density =</u>	1.54	<u>g/cm³</u>
<u>Bulk Density =</u>	96.1	<u>lb/ft³</u>
<u>Specific Gravity = (Oil per ISO or Apparent Density)</u>	2.78	<u>g/cm³</u>

ISO 13503-2/APIRP19C Section 9, "Turbidity Test"

48 FTU

ISO 13503-2 - All Proppants Shall not Exceed 250FTU (NTU) or Less

API RP-56, suggested maximum frac sand turbidity should be 250FTU or less.

January 2009

Table 8
Submitted 20/40 MgLight 120811 Ceramic Proppant Sample
Submitted by Fores Ltd to SL on December 31, 2008

ISO 13503-2/APIRP-19C = Measurement of Properties of Proppants
 Used in Hydraulic Fracturing and Gravel-Packing Operations

ISO 13503-2/APIRP19C, Section 11, "Proppant Crush Resistance Test"
 Mean of 3 evaluations

<u>PSI</u>	<u>% Fines of -20+40</u>
10000	1.6

K-Value Not Requested

ISO specification: Determine the highest stress level at which proppant generates no more than 10% crushed material and round this value down to the nearest 1000 psi or K-value.

API RP-60 suggested fines limit for proppant size designation: 10% for 20/40, 25% for 16/20 or greater

ISO 13503-2/APIRP19C Section 7, "Proppant Sphericity and Roundness"

<u>Sphericity =</u>	0.87
<u>Roundness =</u>	0.87
<u>Clusters =</u>	<u>None Observed in Field of Count</u>

ISO 13503-2 - Ceramic Proppant 0.7 or greater

API RP-60 - minimum recommended sphericity and roundness average should be 0.7 or greater

ISO 13503-2/APIRP19C Section 8, "Acid Solubility"
 Mean of 3 evaluations

<u>Acid Sol. Percent =</u>	Percent % 6.3
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ISO 13503-2 - Ceramic Proppant and Resin Coated Ceramic Proppants, 7.0% or less

API RP-60, none recommended, referenced procedure for API RP-56

ISO 13503-2/APIRP19C Section 10, "Bulk Density, Apparent Density and Absolute Density"

ISO Methods

<u>Bulk Density =</u>	1.64	<u>g/cm³</u>
<u>Bulk Density =</u>	102.3	<u>lb/ft³</u>
<u>Specific Gravity = (Oil per ISO) or Apparent Density</u>	2.83	<u>g/cm³</u>

ISO 13503-2/APIRP19C Section 9, "Turbidity Test"

25 FTU

ISO 13503-2 - All Proppants Shall not Exceed 250FTU (NTU) or Less

API RP-56, suggested maximum frac sand turbidity should be 250FTU or less.

January 2009

Table 9
Submitted 30/50 MgLight 120812 Ceramic Proppant Sample
Submitted by Fores Ltd to SL on December 31, 2008

**ISO 13503-2/APIRP-19C = Measurement of Properties of Proppants
Used in Hydraulic Fracturing and Gravel-Packing Operations**

ISO 13503-2/APIRP19C, Section 11, "Proppant Crush Resistance Test"
Mean of 3 evaluations

<u>PSI</u>	<u>% Fines of -30+50</u>
10000	1.4

K-Value Not Requested

ISO specification: Determine the highest stress level at which proppant generates no more than 10% crushed material and round this value down to the nearest 1000 psi or K-value.

API RP-60 suggested fines limit for proppant size designation: 10% for 20/40, 25% for 16/20 or greater

ISO 13503-2/APIRP19C Section 7, "Proppant Sphericity and Roundness"

<u>Sphericity =</u>	0.89
<u>Roundness =</u>	0.89

Clusters = **None Observed in Field of Count**

ISO 13503-2 - Ceramic Proppant 0.7 or greater

API RP-60 - minimum recommended sphericity and roundness average should be 0.7 or greater

ISO 13503-2/APIRP19C Section 8, "Acid Solubility"
Mean of 3 evaluations

<u>Acid Sol. Percent =</u>	Percent % 6.9
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ISO 13503-2 - Ceramic Proppant and Resin Coated Ceramic Proppants, 7.0% or less

API RP-60, none recommended, referenced procedure for API RP-56

ISO 13503-2/APIRP19C Section 10, "Bulk Density, Apparent Density and Absolute Density"

ISO Methods

<u>Bulk Density =</u>	1.60	<u>g/cm³</u>
<u>Bulk Density =</u>	99.8	<u>lb/ft³</u>
<u>Specific Gravity = (Oil per ISO) or Apparent Density</u>	2.81	<u>g/cm³</u>

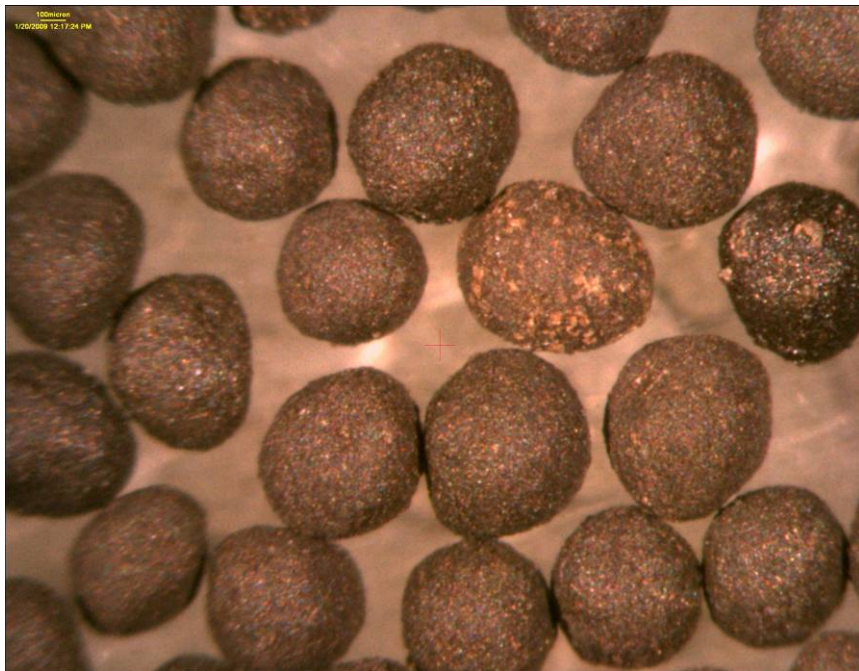
ISO 13503-2/APIRP19C Section 9, "Turbidity Test"

25 FTU

ISO 13503-2 - All Proppants Shall not Exceed 250FTU (NTU) or Less

API RP-56, suggested maximum frac sand turbidity should be 250FTU or less.

January 2009



20/40 Fores MgLight #120809



20/40 Fores MgLight #120811



30/50 Fores MgLight #120810



30/50 Fores MgLight #120812

Comments:

Photo comparisons made at dial setting 10 and 15 for the 20/40 proppants and 10 and 20 for the 30/50 proppant samples. The light setting was the same for all samples. Scale on photo not set for accurate measurement of magnification.