

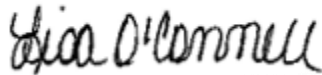
**“Measurement of Properties for Proppants
Used in Hydraulic Fracturing and Gravel-Packing
Operations” Evaluations on Two Sand Samples
For MS Industries II, LLC – Submitted April 23, 2018**

Prepared For:

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P.O. Number: Pre-Invoice 325180486-1Q

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May 11, 2018

John Christmas
MS Industries II, LLC
2489 County Road 236
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Dear Mr. Christmas:

Stim-lab, Inc. has completed the ISO 13503-2:2006/API RP19C:2016 evaluations requested on the submitted sand samples labeled MSI 40/70 and MSI 70/200. The samples were received at Stim-Lab, Inc. on April 23, 2018.

The sieve analysis results for the samples are provided in Table 1. The sphericity and roundness (Krumbein Shape Factor), acid solubility (15% HCl), turbidity, bulk density, apparent density, and crush with K-Value results for the samples are provided in Tables 2 and 3. Pictures of the samples are provided following Table 3, for you to review. The procedures followed are as stated in ISO 13503-2:2006/API RP19C:2016.

Thank you for choosing Stim-Lab, Inc. to perform these analyses. We hope you will consider us for your future testing needs. If you have any questions regarding the testing or results, please do not hesitate to give me a call.

Sincerely,

Lisa O'Connell
Laboratory Supervisor
Conductivity Laboratory



Table 1

**Sieve Analysis of Submitted Proppant Samples
MS Industries II, LLC**

ISO 13503-2:2006/API RP19C:2008, Section 6, "Sieve Analysis"

Sample I.D. US Standard Sieve No.	MSI 40/70		MSI 70/200	
	Weight %		Weight %	
	Retained	Cumulative	Retained	Cumulative
4	-	-	-	-
5	-	0.0	-	0.0
6	-	0.0	-	0.0
7	-	0.0	-	0.0
8	-	0.0	-	0.0
10	-	0.0	-	0.0
12	-	0.0	-	0.0
14	-	0.0	-	0.0
16	-	0.0	-	0.0
18	-	0.0	-	0.0
20	-	0.0	-	0.0
25	-	0.0	-	0.0
30	0.0	0.0	-	0.0
35	0.0	0.0	-	0.0
40	0.0	0.0	-	0.0
45	4.1	4.1	-	0.0
50	15.2	19.3	0.0	0.0
60	34.9	54.2	0.0	0.0
70	40.9	95.1	0.7	0.7
80	4.8	99.9	18.2	18.9
100	0.0	100.0	19.0	37.8
120	-	100.0	14.0	51.8
140	-	100.0	20.6	72.4
170	-	100.0	14.5	86.9
200	-	100.0	11.5	98.4
230	-	100.0	1.6	100.0
270	-	100.0	0.0	100.0
pan	0.1	100.0	0.0	100.0
total	100.0		100.0	
in-size	95.1	= as 40/70	97.7	= as 70/200
ISO Mean Dia. (mm)	0.266		0.136	
Median Dia. (mm)	0.261		0.130	

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Table 2

Sample ID: MSI 40/70
MS Industries II, LLC
April 23, 2018

Measurement of Properties of Proppants
Used In Hydraulic Fracturing and Gravel-Packing Operations

ISO 13503-2:2006/API RP19C:2008, Section 7, "Proppant Sphericity and Roundness"

* mean of a 20 count

Sphericity = 0.7
Roundness = 0.5
Clusters = None Observed in Field of Count

*This sample does not meet the minimum recommended roundness per API RP19C:2008

Recommended Sphericity and Roundness for proppants = 0.6 or greater (ISO/DIS 13503-2/Amd.1:2009)

ISO 13503-2:2006/API RP19C:2008, Section 8, "Acid Solubility"

* mean of 3 analyses

Acid Sol. Percent (15% HCl) = 0.4%

Recommended Maximum Acid Solubility for proppants 40/70 to 70/140 = 3.0% (ISO/DIS 13503-2/Amd.1:2009)

Tested as per ISO 13503-2:2006/API RP19C:2008, 100ml of 12:3 HCl:HF* with 5 grams of sand or proppant at 150°F for 30 minutes,

*Other acids may be specified, depending on desired application

ISO 13503-2:2006/API RP19C:2008, Section 9, "Turbidity Test"

Turbidity = 110 NTU

Method 1: Turbidity, suggested maximum proppant turbidity = equal or less than 250 NTU (ISO/DIS 13503-2/Amd.1:2009)

ISO 13503-2:2006/API RP19C:2008, Section 10,
"Procedures for Determining Proppant Bulk Density, Apparent Density"

Bulk Density = 1.33 g/cm³
Bulk Density = 83.0 lb/ft³
Apparent Density = (Oil) = 2.63 g/cm³

ISO 13503-2:2006/API RP19C:2008, Section 11, "Proppant Crush-Resistance Test"

<u>Stresses Tested (psi)</u>	<u>% Fines</u> <u>-40+70 crush prep</u>
5000	9.6%
6000	16.1%
K-Value =	<u>5K</u>

The highest stress level which proppant generates no more than 10% crushed material, rounded down to the nearest 1000psi = K-Value

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Table 3

Sample ID: MSI 70/200
MS Industries II, LLC
April 23, 2018

Measurement of Properties of Proppants
Used In Hydraulic Fracturing and Gravel-Packing Operations

ISO 13503-2:2006/API RP19C:2008, Section 7, "Proppant Sphericity and Roundness"

* mean of a 19 count

Sphericity = 0.7
Roundness = 0.5
Clusters = None Observed in Field of Count

*This sample does not meet the minimum recommended roundness per API RP19C:2008

Recommended Sphericity and Roundness for proppants = 0.6 or greater (ISO/DIS 13503-2/Amd.1:2009)

ISO 13503-2:2006/API RP19C:2008, Section 8, "Acid Solubility"

* mean of 3 analyses

Acid Sol. Percent (15% HCl) = 0.5%

Recommended Maximum Acid Solubility for proppants 40/70 to 70/140 = 3.0% (ISO/DIS 13503-2/Amd.1:2009)

Tested as per ISO 13503-2:2006/API RP19C:2008, 100ml of 12:3 HCl:HF* with 5 grams of sand or proppant at 150°F for 30 minutes,
*Other acids may be specified, depending on desired application

ISO 13503-2:2006/API RP19C:2008, Section 9, "Turbidity Test"

Turbidity = 337 NTU

*This sample does not meet the minimum recommended turbidity per API RP19C:2008

Method 1: Turbidity, suggested maximum proppant turbidity = equal or less than 250 NTU (ISO/DIS 13503-2/Amd.1:2009)

ISO 13503-2:2006/API RP19C:2008, Section 10,
"Procedures for Determining Proppant Bulk Density, Apparent Density"

Bulk Density = 1.32 g/cm³
Bulk Density = 82.4 lb/ft³
Apparent Density = (Oil) = 2.63 g/cm³

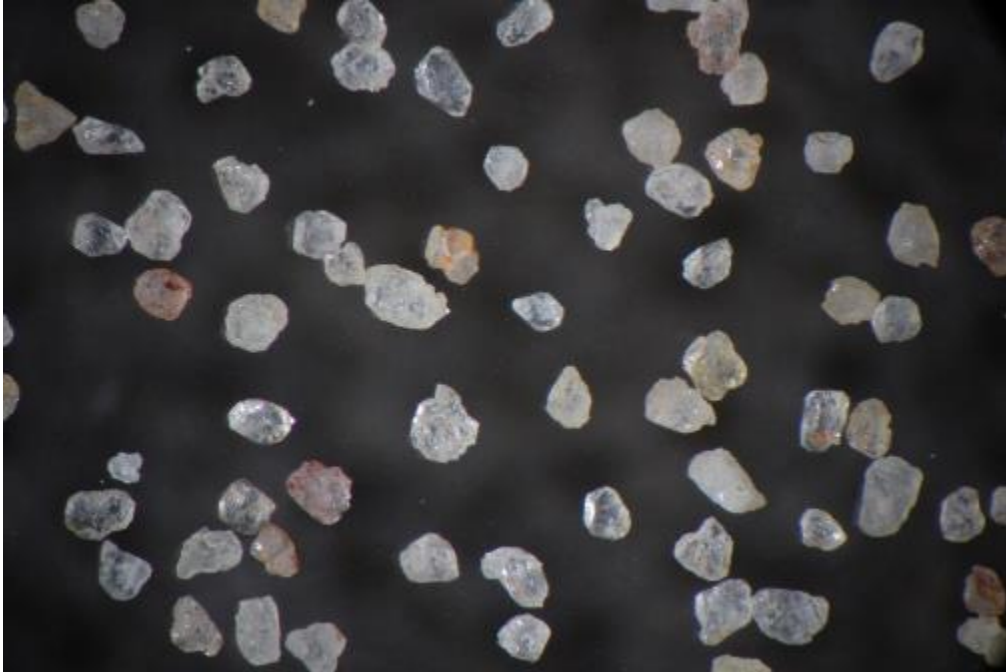
ISO 13503-2:2006/API RP19C:2008, Section 11, "Proppant Crush-Resistance Test"

<u>Stresses Tested (psi)</u>	<u>% Fines</u> <u>-70+200 crush prep</u>
5000	4.0%
8000	8.5%
9000	11.5%
<u>K-Value</u> =	<u>8K</u>

The highest stress level which proppant generates no more than 10% crushed material, rounded down to the nearest 1000psi = K-Value

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MSI 40/70



MSI 70/200

