

### ISO 5011 Test Report for 75-5045

May 2, 2011

#### Test Summary

Filter Tested	Improvement in Airflow vs Stock		Efficiency Rate
	Resistance to Flow @ 643 CFM	Resistance to Flow During Dust Loading @ Approx 145 grams	Conducted at Vehicle's Max Rated Flow (643 CFM)
75-5045 (w/ Cleanable Filter)	42.7%	33.7%	99.48%
75-5045D (w/ Dry Disposable Filter)	42.7%	31.5%	99.70%
OE - Stock System	-	-	99.81%

Airflow Analysis			
Filter Mfg. & Part No.	Air Flow scfm	Net Restriction (Inches of H2O)	% Less Restrictive than OE
Filter #1	0.0	0.0	0.0%
S&B (Cleanable)	319.7	4.8	40.7%
75-5045	482.3	10.6	41.8%
	643.7	18.8	42.7%
	803.4	29.6	47.0%
	831.3	32.3	49.9%

Filter #2	Air Flow scfm	Net Restriction (Inches of H2O)
OE	0.0	0.0
Stock System	323.0	8.1
	480.6	18.2
	643.8	32.8
	804.5	55.8
	838.7	64.5

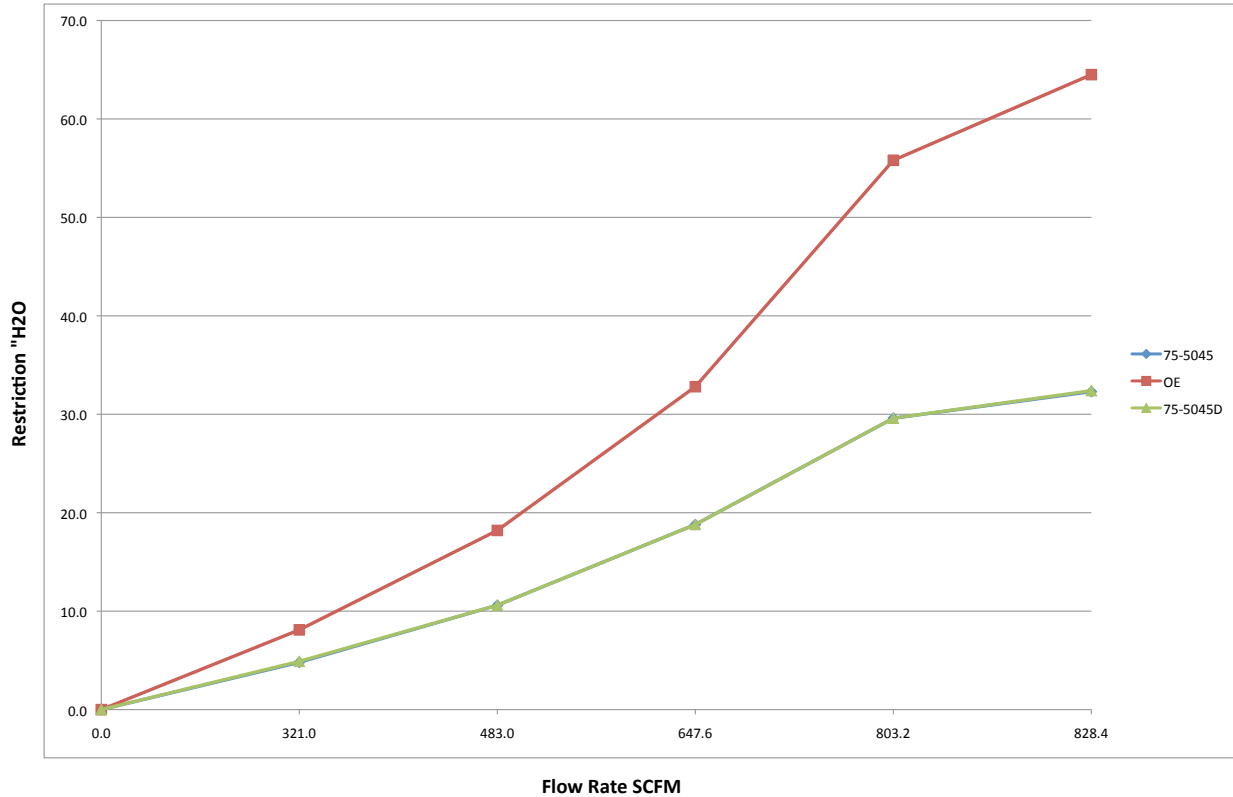
Filter #3	Air Flow scfm	Net Restriction (Inches of H2O)	% Less Restrictive than OE
OE	0.0	0.000	0.0%
S&B (Dry)	321.0	4.900	39.5%
	483.0	10.600	41.8%
	647.6	18.800	42.7%
	803.2	29.600	47.0%
	828.4	32.400	49.8%

#### Average Environmental Conditions & Test Specifications

Temperature	71.28	deg F
Relative Humidity	51.78	%
Baro Pressure	28.97	mmHg
Test Stand	#1	
Inlet Size		Inches
Housing	Intake	
Contaminant	Course	
Contam. Lot #	10569C	
Dust Feed Rate	18	grams/minute
Rated Flow	643	cfm

This report represents results of airflow, efficiency and capacity testing conducted at S&B Filters' climate controlled laboratory. Testing was in accordance with the internationally accepted ISO 5011 Filtration Test Standard.

#### Resistance to Flow



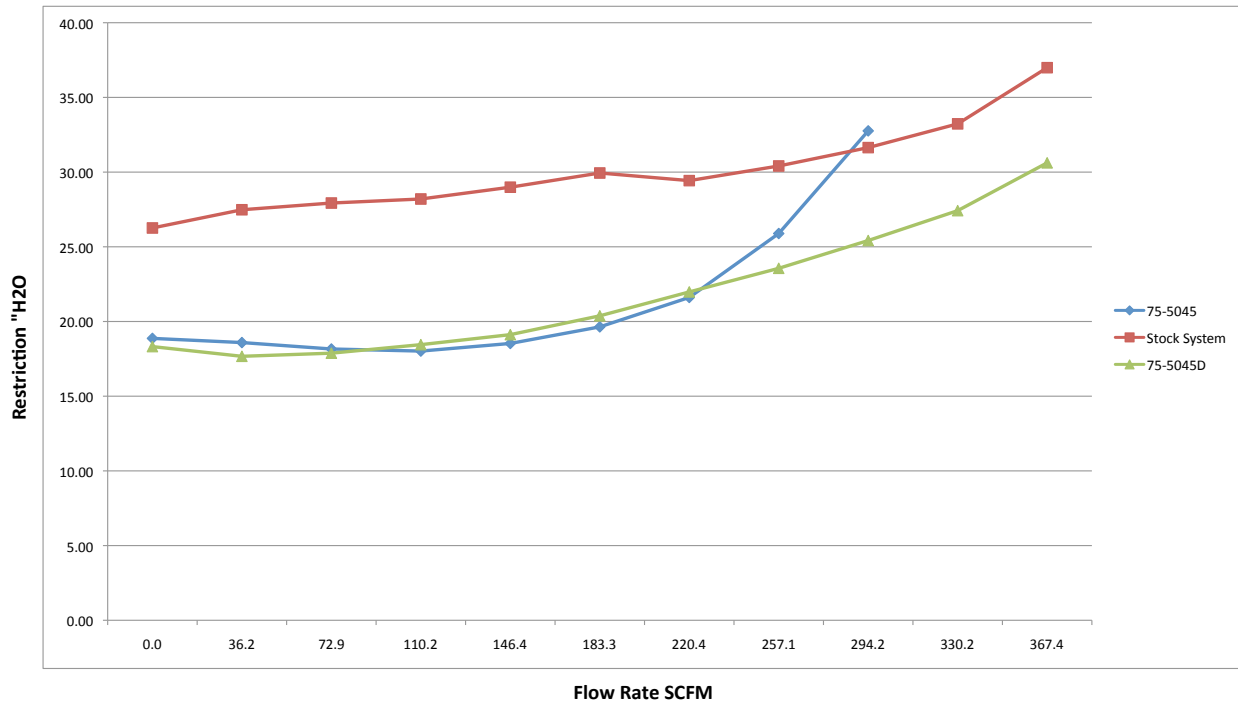
Comments:



### Air Filter Capacity & Efficiency Test Report

Filter Mfg. & Part No.	Initial Restriction ("H2O)	Capacity (grams)	Efficiency (%)	Restriction (H2O)	Dust Fed (grams)	Time (minutes)
Filter #1 S&B (Cleanable) 75-5045	18.87	286.8	99.48	18.87	0.0	0
				18.59	35.6	2
				18.16	72.6	4
				18.02	108.3	6
				18.53	144.4	8
				19.64	180.7	10
				21.61	217.2	12
				25.89	252.9	14
				32.76	288.3	16
				Filter #2 OE Stock System	26.26	723.9
27.48	73.0	4				
27.93	145.8	8				
28.20	218.0	12				
28.99	291.0	16				
29.94	362.5	20				
29.43	435.1	24				
30.41	508.5	28				
31.64	580.7	32				
33.23	653.3	36				
Filter #3 S&B (Dry) 75-5045D	18.32	366.3	99.70	18.32	0.0	0
				17.67	36.2	2
				17.88	72.9	4
				18.45	110.2	6
				19.12	146.4	8
				20.38	183.3	10
				21.98	220.4	12
				23.56	257.1	14
				25.42	294.2	16
				27.42	330.2	18
30.62	367.4	20				

### Resistance to Flow During Dust Loading



Comments:

# Supporting Documentation



## Determination of Gasoline and Diesel Engine Air Consumption

### CFM Calculator: Enter Data in Blue Shaded Areas

Engine Displacement (cubic inches)	396.6
RPM at maximum horse power	3,200
Cycle Factor:	2
Enter "2" for 4 Cycle Diesel and Gasoline	
Enter "1" for 2 Cycle Diesel and Gasoline	
Volumetric Efficiency:	1.75
Naturally Aspirated Gasoline & Diesel Engines Enter "0.8"	
Super Charged Engines Enter "1.30"	
Turbocharged Engines Enter "1.75"	

### Liters to CID Converter

Liters:	6.5
Cubic Inches:	396.6

### Vehicle Information

Model Year	92-'96'
Make	GM
Model	C&K 2500, 3500
Engine Specs	6.5L Turbo Diesel

<b>Based on the information entered above, the estimated CFM of the vehicle at maximum Horse Power is:</b>	<b>643</b>
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CYCLE FACTOR	
4 Cycle Gasoline and Diesel Engine	Cycle Factor 2
2 Cycle Gasoline and Diesel Engine	1

VOLUMETRIC EFFICIENCY	
	Volumetric Efficiency (Approximate)
Naturally Aspirated Gasoline & Diesel Engines	0.8
Supercharged Engines	1.30
Turbocharged Engines	1.75
<i>Note: The 1.75 volumetric efficiency is applicable only at top governed engine speed under full load conditions.</i>	

EQUATION	
The following is a method of determining approximated gasoline and diesel engine air flow requirement:	
$\text{Air Flow (CFM)} = \frac{\text{Displacement (cubic inches)}}{1728} \times \frac{\text{RPM}}{\text{Cycle Factor}} \times \text{Volumetric Efficiency}$	

EXAMPLE	
Information necessary to calculate air consumption:	
Ford F250 7.3L V8 Diesel Truck	
4 cycle, 2800 RPM@Maximum HP, 445.4 (cubic inches) displacement, turbocharged	
$\text{Air Flow (CFM)} : \frac{445.4}{1728} \times \frac{2800}{2} \times 1.75 = 631 \text{ CFM}$	



### Air Flow Test Report

Test Number: 317  
Sample Number: 3  
Filter Description: OE  
Test Description:

Report Date: 5/21/2009  
Tech: Bert

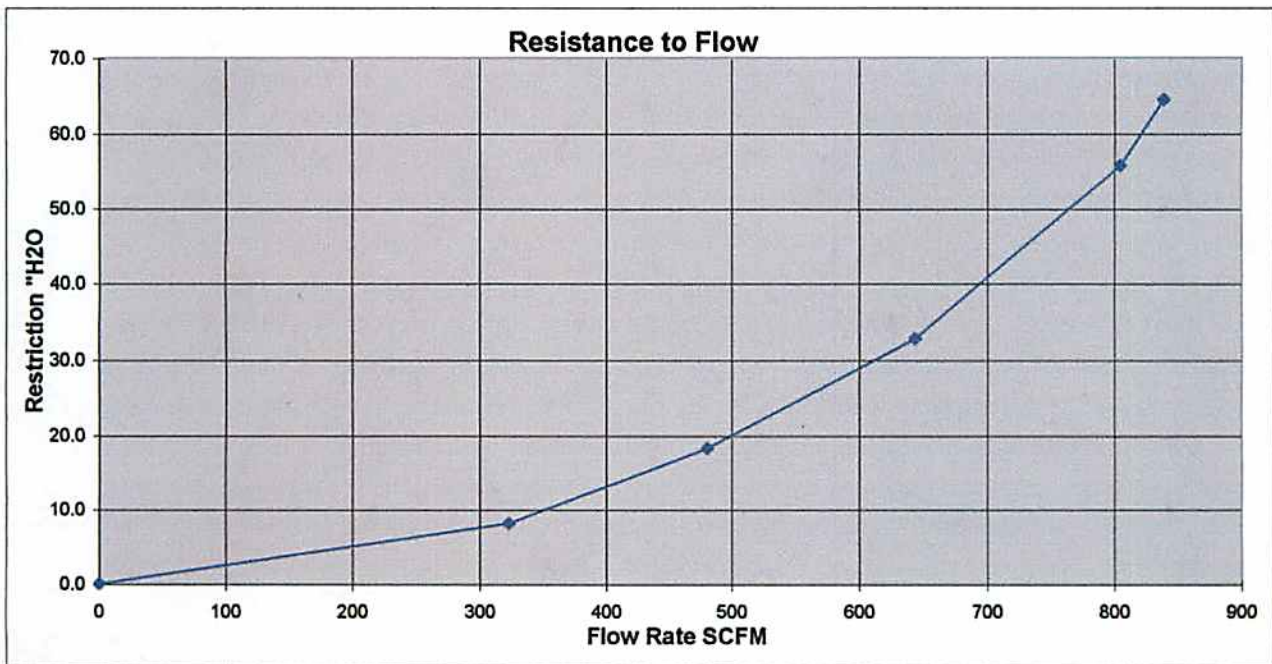
92'-96' GM 6.5L Diesel: 3.275 flange, HP trans. settings

### Test Conditions

Flow: 643 SCFM                      Temperature: 70.9 DEG. F  
Barometric Pressure: 28.87 IN. Hg                      Humidity: 50.4 %

### Test Results

Flow SCFM	Restriction IN. H2O		
	Gross	Tare	Net
0	0	0	0.0
323.013	8.098	0	8.1
480.624	18.241	0	18.2
643.775	32.762	0	32.8
804.487	55.778	0	55.8
838.654	64.457	0	64.5





### Air Flow Test Report

Test Number: 317  
Sample Number: 14  
Filter Description: KF-1047  
Test Description:

Report Date: 3/8/2011  
Tech: Craig

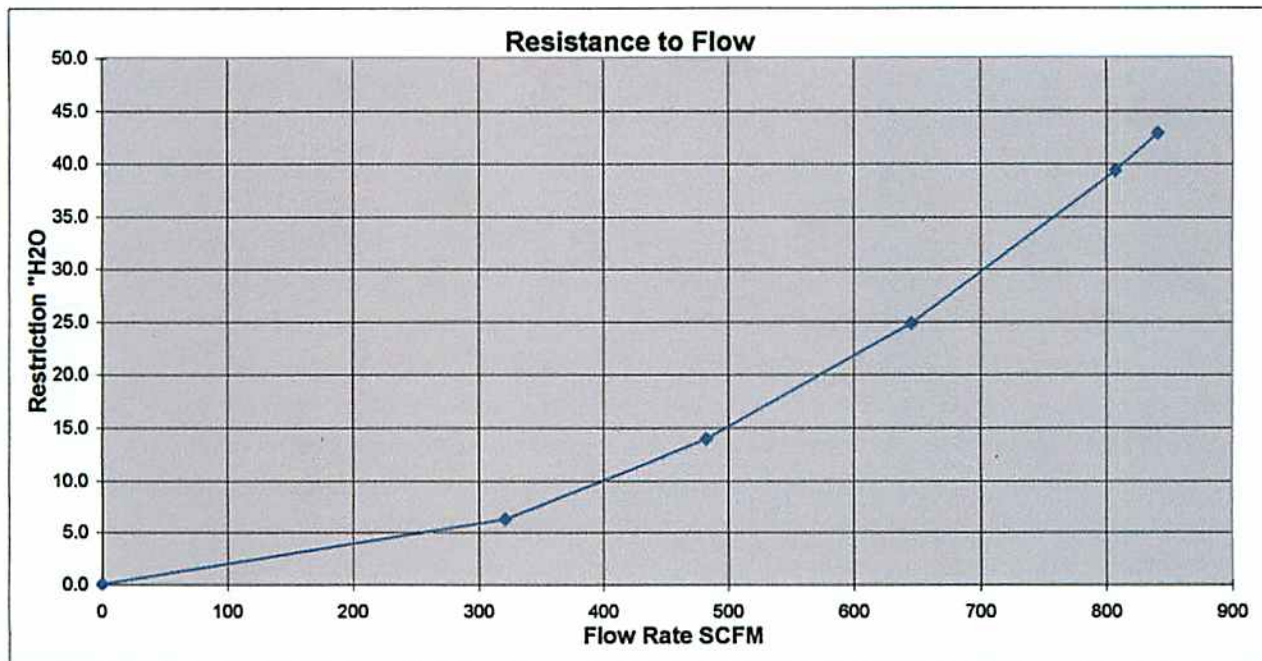
S&B Intake 75-5045, w/box plug, 3.275"

### Test Conditions

Flow: 643 SCFM                      Temperature: 70.76 DEG. F  
Barometric Pressure: 29.08 IN. Hg                      Humidity: 50.2 %

### Test Results

Flow SCFM	Restriction IN. H2O		
	Gross	Tare	Net
0	0	0	0.0
321.128	6.232	0	6.2
482.423	13.887	0	13.9
645.577	24.815	0	24.8
806.761	39.361	0	39.4
840.777	42.868	0	42.9





### Air Flow Test Report

Test Number: 317  
Sample Number: 15  
Filter Description: KF-1047  
Test Description:

Report Date: 3/8/2011  
Tech: Craig

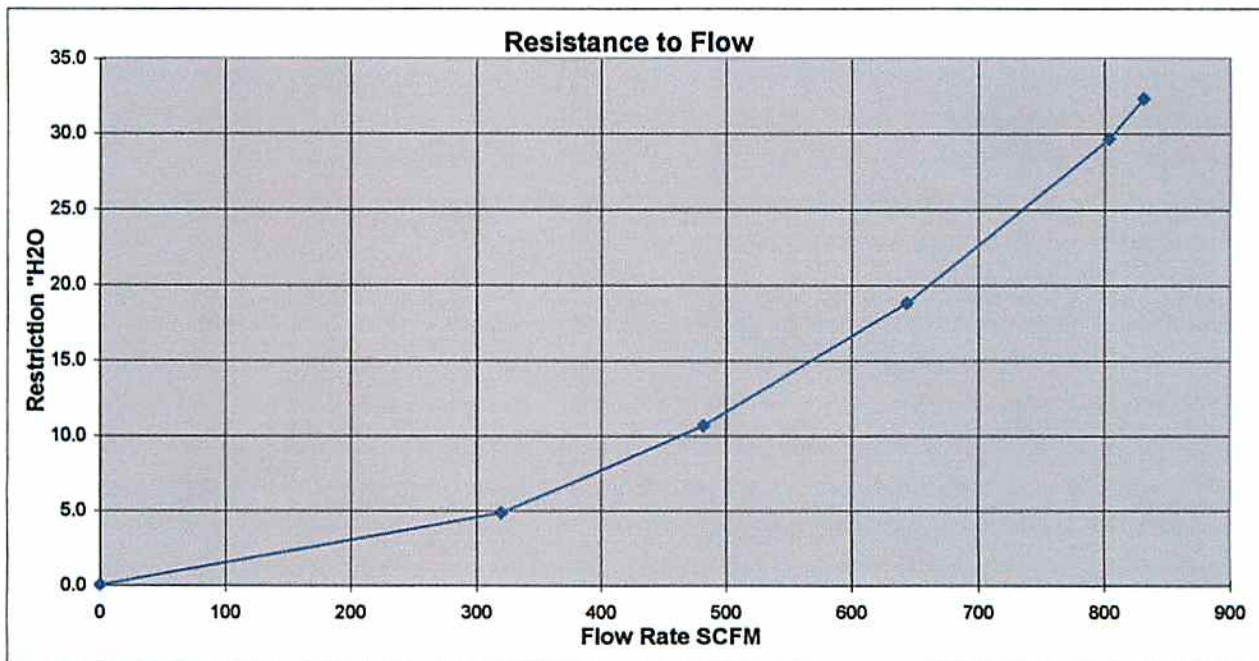
S&B Intake 75-5045, no plug, 3.275"

### Test Conditions

Flow: 643 SCFM      Temperature: 70.85 DEG. F  
Barometric Pressure: 29.08 IN. Hg      Humidity: 50.8 %

### Test Results

Flow SCFM	Restriction IN. H2O		
	Gross	Tare	Net
0	0	0	0.0
319.664	4.824	0	4.8
482.286	10.615	0	10.6
643.745	18.783	0	18.8
803.421	29.629	0	29.6
831.344	32.296	0	32.3





### Air Flow Test Report

Test Number: 317  
Sample Number: 16  
Filter Description: KF-1047D  
Test Description:

Report Date: 3/8/2011  
Tech: Craig

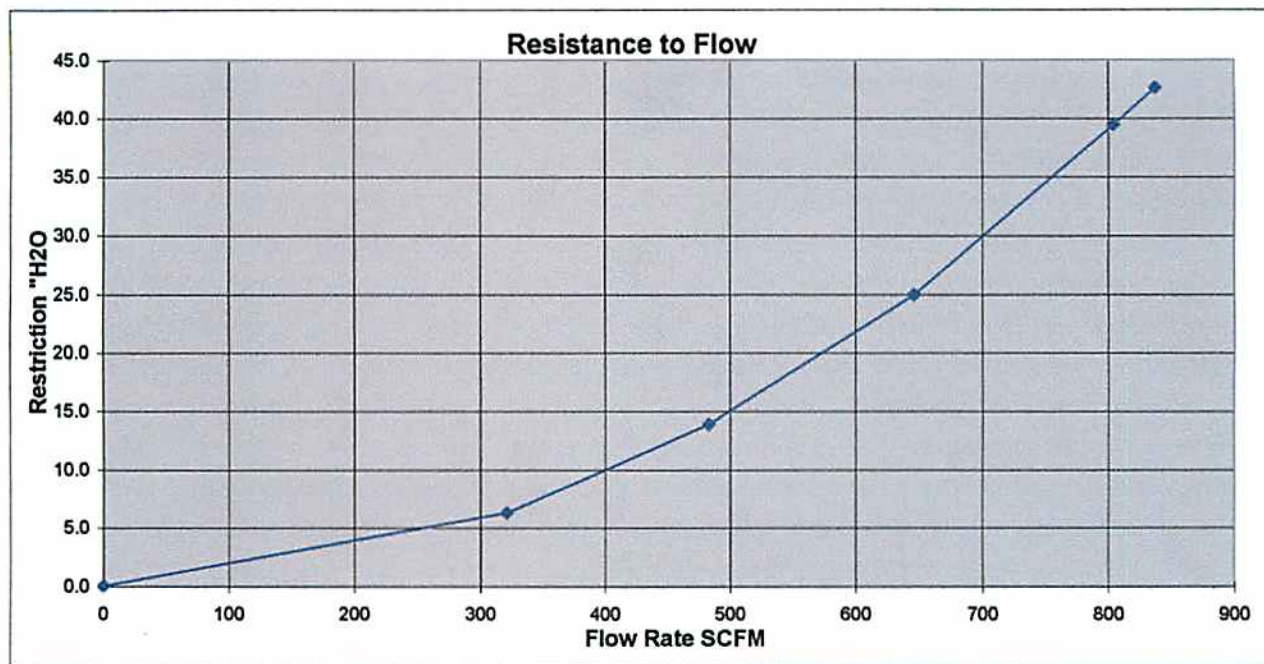
S&B Intake 75-5045D, w/Box Plug, 3.275"

### Test Conditions

Flow: 643 SCFM      Temperature: 70.58 DEG. F  
Barometric Pressure: 28.96 IN. Hg      Humidity: 49.6 %

### Test Results

Flow SCFM	Restriction IN. H2O		
	Gross	Tare	Net
0	0	0	0.0
321.048	6.255	0	6.3
483.23	13.89	0	13.9
645.978	24.897	0	24.9
804.011	39.402	0	39.4
837.534	42.624	0	42.6







### Air Flow Test Report

Test Number: 317  
Sample Number: 17  
Filter Description: KF-1047D  
Test Description:

Report Date: 3/8/2011  
Tech: Craig

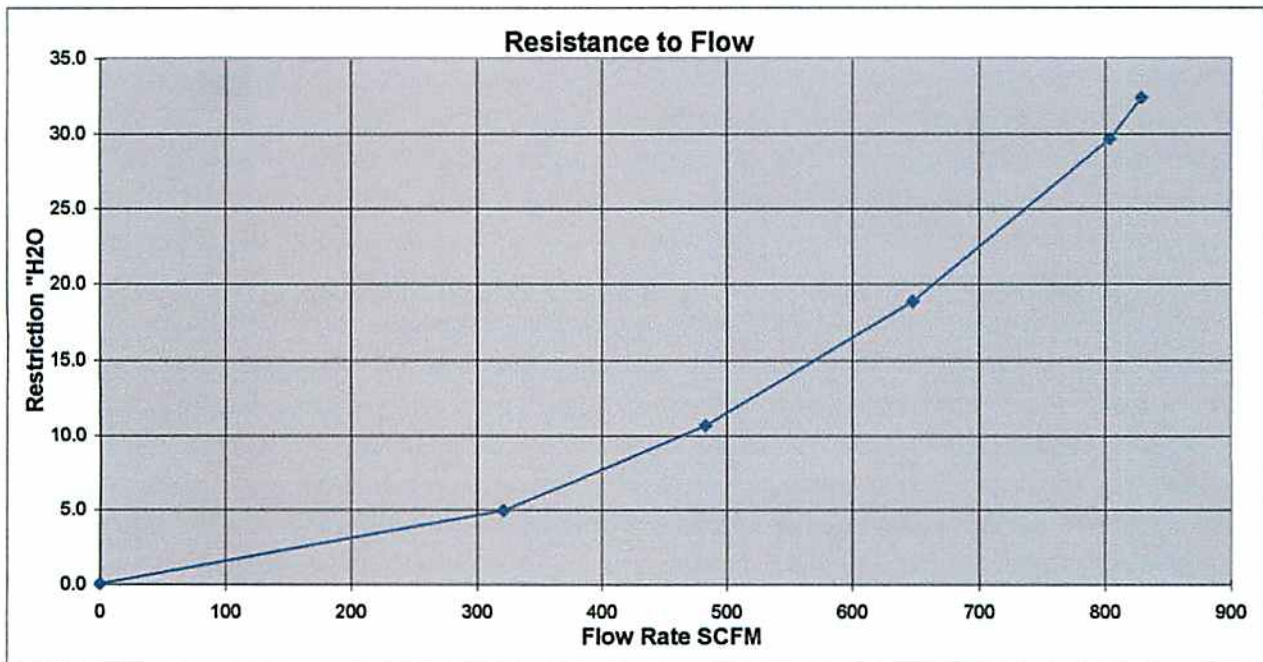
S&B Intake 75-5045D, no box plug, 3.275"

### Test Conditions

Flow: 643 SCFM                      Temperature: 70.77 DEG. F  
Barometric Pressure: 29.06 IN. Hg                      Humidity: 50.4 %

### Test Results

Flow SCFM	Restriction IN. H2O		
	Gross	Tare	Net
0	0	0	0.0
321.003	4.922	0	4.9
482.996	10.603	0	10.6
647.597	18.838	0	18.8
803.222	29.634	0	29.6
828.403	32.372	0	32.4



# Air Filter Capacity & Efficiency Test Report



**Test Number:** 317  
**Sample Number:** 26  
**Filter Description:** A1236C

**Tech:** Craig  
**Report Date:** 4/27/2011

**Test Description:** AC Delco part #: A1236C, Chevy 6.5L Diesel

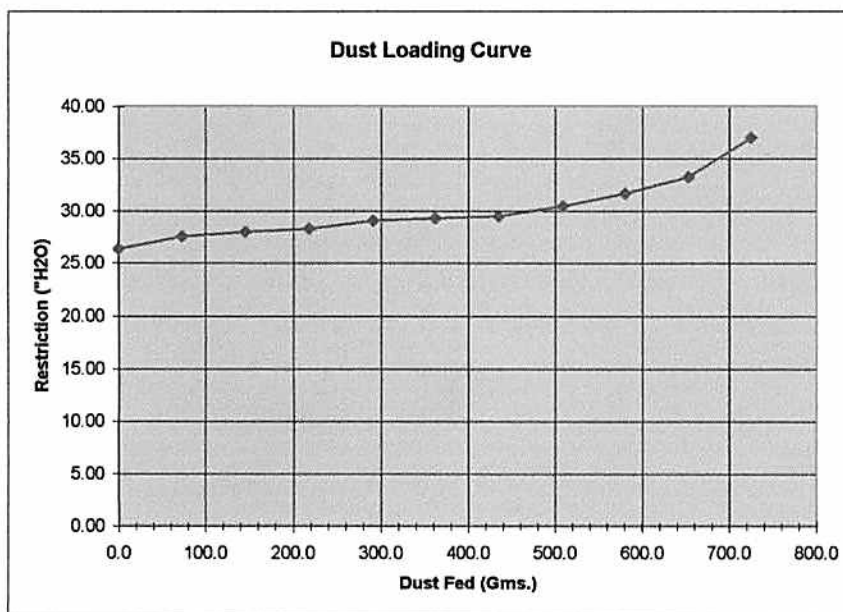
## Test Conditions

<b>Barometric Pressure:</b> 28.81 IN. Hg	<b>Relative Humidity:</b> 50.1 %
<b>Air Flow Setpoint:</b> 643 SCFM	<b>Type Of Dust:</b> Coarse
<b>Test Procedure:</b> ISO 5011	<b>Batch #:</b> 10569C
<b>Air Flow Type:</b> Steady	<b>Temperature:</b> 70.99 DEG. F
<b>Test Endpoint:</b> 36.26 IN. H2O	<b>Dust Feed Rate:</b> 18 Gms/Min

## Test Results

**Initial Restriction:** 26.26 IN. H2O      **Accumulative Capacity:** 723.948 Grams

	Accumulative						
	Assembly	Blanket					
<b>Start</b>	3017.5	162.500					
<b>End</b>	3739.8	163.900					
<b>Gain</b>	722.3	1.400	0	0	0	0	0
<b>Efficiency</b>	99.81						



Restriction IN. H2O	Time	Dust Fed Gms.
26.26	0	0.0
27.48	4	73.0
27.93	8	145.8
28.20	12	218.4
28.99	16	291.0
29.24	20	362.5
29.43	24	435.1
30.41	28	508.5
31.64	32	580.7
33.23	36	653.3
36.99	40	725.3

# Air Filter Capacity & Efficiency Test Report



**Test Number:** 317  
**Sample Number:** 27  
**Filter Description:** KF-1047

**Tech:** Craig  
**Report Date:** 5/2/2011

**Test Description:** KF-1047 Tested in 75-5045

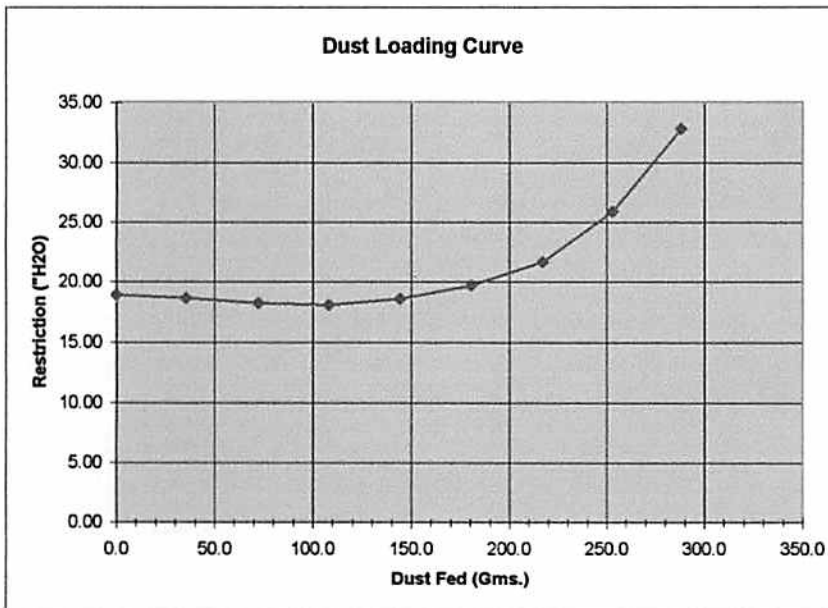
## Test Conditions

<b>Barometric Pressure:</b> 29.25 IN. Hg	<b>Relative Humidity:</b> 50.4 %
<b>Air Flow Setpoint:</b> 643 SCFM	<b>Type Of Dust:</b> Coarse
<b>Test Procedure:</b> ISO 5011	<b>Batch #:</b> 10569C
<b>Air Flow Type:</b> Steady	<b>Temperature:</b> 71.69 DEG. F
<b>Test Endpoint:</b> 28.87 IN. H2O	<b>Dust Feed Rate:</b> 18 Gms/Min

## Test Results

**Initial Restriction:** 18.87 IN. H2O      **Accumulative Capacity:** 286.791 Grams

		Accumulative					
	Assembly	Blanket					
<b>Start</b>	3998.1	156.200					
<b>End</b>	4284.4	157.700					
<b>Gain</b>	286.3	1.500	0	0	0	0	0
<b>Efficiency</b>	99.48						



Restriction IN. H2O	Time	Dust Fed Gms.
18.87	0	0.0
18.59	2	35.6
18.16	4	72.4
18.02	6	108.3
18.53	8	144.4
19.64	10	180.7
21.61	12	217.2
25.89	14	252.9
32.76	16	288.3

# Air Filter Capacity & Efficiency Test Report



**Test Number:** 317  
**Sample Number:** 28  
**Filter Description:** KF-1047D

**Tech:** Craig  
**Report Date:** 5/4/2011

**Test Description:** S&B Intake 75-5045 w/ KF-1047D

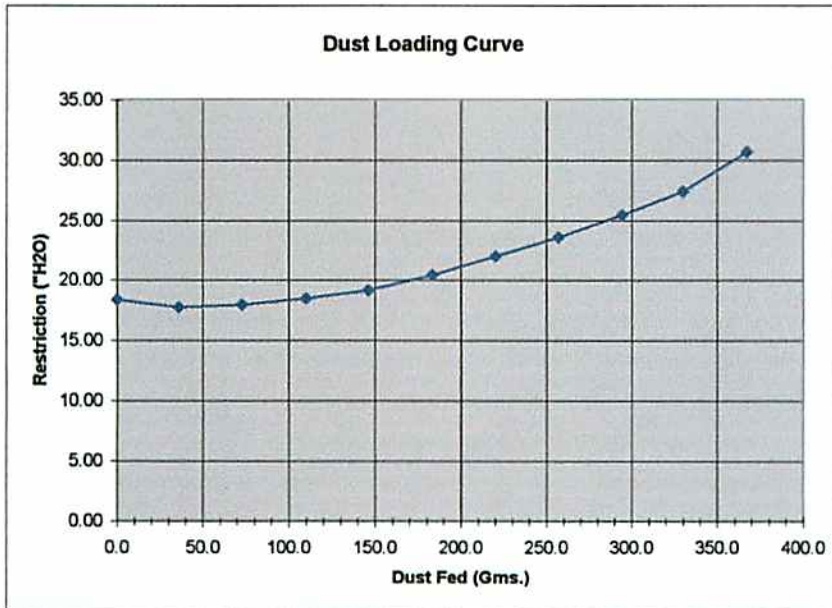
## Test Conditions

<b>Barometric Pressure:</b> 28.73 IN. Hg	<b>Relative Humidity:</b> 51.2 %
<b>Air Flow Setpoint:</b> 643 SCFM	<b>Type Of Dust:</b> Coarse
<b>Test Procedure:</b> ISO 5011	<b>Batch #:</b> 10569C
<b>Air Flow Type:</b> Steady	<b>Temperature:</b> 72.48 DEG. F
<b>Test Endpoint:</b> 28.32 IN. H2O	<b>Dust Feed Rate:</b> 18 Gms/Min

## Test Results

**Initial Restriction:** 18.32 IN. H2O      **Accumulative Capacity:** 366.303 Grams

		Accumulative					
	Assembly	Blanket					
<b>Start</b>	3759.3	159.840					
<b>End</b>	4125.3	160.930					
<b>Gain</b>	366.0	1.090	0	0	0	0	0
<b>Efficiency</b>	99.70						

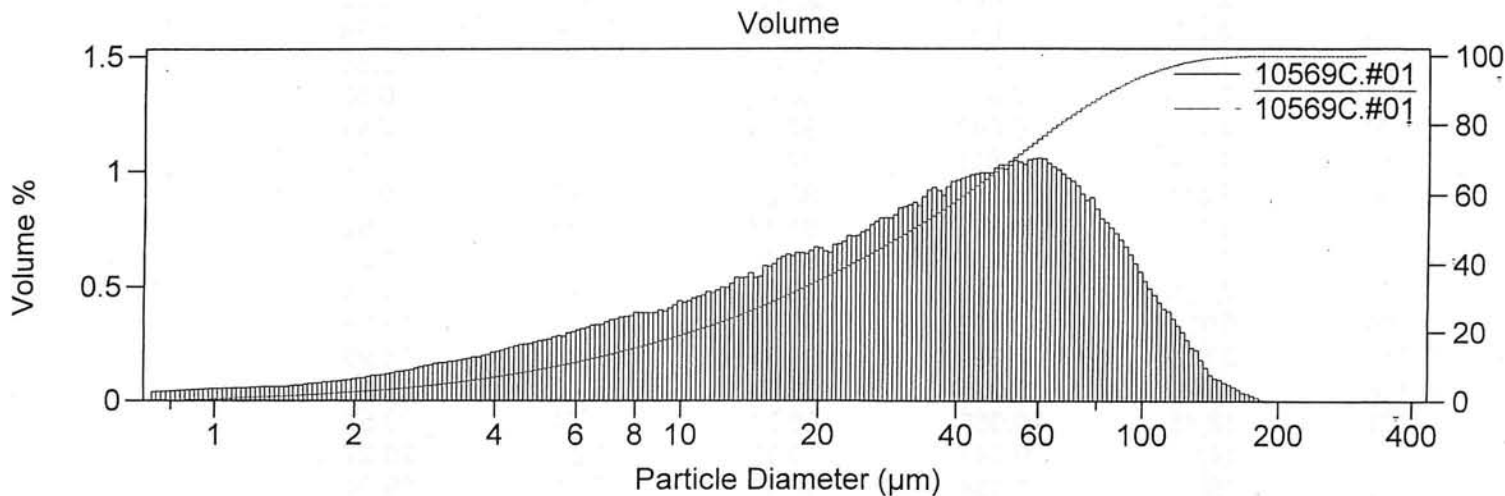


Restriction IN. H2O	Time	Dust Fed Gms.
18.32	0	0.0
17.67	2	36.2
17.88	4	72.9
18.45	6	110.2
19.12	8	146.4
20.38	10	183.3
21.98	12	220.4
23.56	14	257.1
25.42	16	294.2
27.42	18	330.2
30.62	20	367.4



14331 Ewing Avenue South Burnsville, Minnesota 55306  
Phone: 952-894-8737

Filename: 10569C.#01 Sample Number: 200  
 Group ID: 10569C  
 Sample ID: ISO 12103-1, A4 COARSE TEST DUST  
 Comment: SAE COARSE TEST DUST, NIST TRACEABLE  
 Operator: LHA  
 Electrolyte: ISOTON II  
 Dispersant: TYPE IC  
 Aperture Size: 400 µm 10569b.#01  
 200 µm 10569b.#02  
 100 µm 10569b.#03  
 30 µm 10569b.#04  
 Acquired: 21:59 9 Mar 2010  
 Serial Number: 123  
 Edited size data



Volume Statistics (Geometric)

10569C.#01

Calculations from 0.729 µm to 310.7 µm

Volume: 6.257e9 µm<sup>3</sup>  
 Mean: 25.44 µm S.D.: 49.3 µm  
 Median: 31.67 µm Variance: 2430 µm<sup>2</sup>  
 Mean/Median Ratio: 0.803  
 Mode: 60.03 µm  
 Spec. surf. area: 0.486 m<sup>2</sup>/ml

% >	10	25	50	75	90
Size µm	84.86	58.29	31.67	13.29	5.371

Micron Size	Cumulative Volume % less than
1	0.6
2	2.6
3	4.7
4	6.9
5	9.2
7	13.5
10	19.3
20	35.5
40	59.0
80	88.0
120	97.9
180	99.9
200	100.0

## POWDER TECHNOLOGY, INC.

10569c.#01

Channel Number	Particle Diameter µm	Diff Number %	Cum < Number %	Diff Volume %	Cum < Volume %
1	0.729	21.82	0	0.200	0
6	0.820	17.51	21.82	0.229	0.200
11	0.923	13.72	39.33	0.255	0.429
16	1.039	10.17	53.04	0.270	0.684
21	1.169	7.73	63.21	0.292	0.953
26	1.316	5.66	70.94	0.305	1.25
31	1.481	4.59	76.60	0.354	1.55
36	1.667	3.72	81.19	0.408	1.91
41	1.877	3.02	84.90	0.474	2.31
46	2.112	2.48	87.93	0.553	2.79
51	2.377	2.02	90.40	0.642	3.34
56	2.676	1.67	92.42	0.758	3.98
61	3.012	1.31	94.08	0.850	4.74
66	3.390	1.02	95.40	0.943	5.59
71	3.816	0.817	96.42	1.08	6.53
76	4.295	0.647	97.24	1.21	7.61
81	4.834	0.498	97.88	1.33	8.82
86	5.441	0.386	98.38	1.47	10.15
91	6.124	0.300	98.77	1.63	11.62
96	6.893	0.231	99.07	1.79	13.25
101	7.758	0.173	99.30	1.91	15.05
106	8.732	0.127	99.47	2.00	16.96
111	9.828	0.099	99.60	2.21	18.96
116	11.06	0.075	99.70	2.40	21.17
121	12.45	0.058	99.77	2.64	23.57
126	14.01	0.043	99.83	2.83	26.21
131	15.77	0.034	99.87	3.14	29.04
136	17.75	0.025	99.91	3.27	32.17
141	19.98	0.018	99.93	3.35	35.45
146	22.49	0.013	99.95	3.61	38.79
151	25.32	0.010	99.96	3.90	42.40
156	28.49	0.008	99.97	4.16	46.30
161	32.07	0.006	99.98	4.46	50.46
166	36.10	0.004	99.99	4.67	54.93
171	40.63	0.003	99.99	4.91	59.60
176	45.73	0.002	99.99	5.04	64.51
181	51.47	0.002	100.00	5.19	69.55
186	57.94	0.001	100.00	5.21	74.73
191	65.21	0.001	100.00	4.86	79.95
196	73.40	0.0046	100.00	4.31	84.81
201	82.61	0.0028	100.00	3.66	89.12
206	92.99	0.0015	100.00	2.83	92.78
211	104.7	7.6E-5	100.00	2.05	95.61
216	117.8	3.5E-5	100.00	1.35	97.66
221	132.6	1.2E-5	100.00	0.626	99.01
226	149.2	3.8E-6	100.00	0.293	99.63
231	168.0	7.2E-7	100.00	0.074	99.93
236	189.1	0	100.00	0	100.00
241	212.8	0	100.00	0	100.00

# MATERIAL SAFETY DATA SHEET

## Section 1: Product/Company Information

**Identity:** Arizona sand including Arizona Test Dust, Arizona Road Dust, Arizona Silica, AC Fine and AC Coarse Test Dusts, SAE Fine and Coarse Test Dusts, J726 Test Dusts, ISO 12103-1, A1 Ultrafine Test Dust, ISO 12103-1, A2 Fine Test Dust, ISO 12103-1, A3 Medium Test Dust and ISO 12103-1, A4 Coarse Test Dust, MIL STD 810 Blowing Dust.

**Mfg. Name:** Powder Technology Inc.  
14331 Ewing Avenue S.  
Burnsville, MN 55306

**Emergency Number:** (952) 894-8737  
**Number for Info:** (952) 894-8737  
**Date Updated:** 9 January 2008

## Section 2: Emergency and First Aid

**Eyes:** Immediately flush eye thoroughly with water. Get medical attention if irritation persists.

**Skin:** N/A

**Inhalation:** Remove person to fresh air. If breathing is difficult, administer oxygen. If not breathing, give artificial respiration. Seek medical help if coughing and other symptoms do not subside.

**Ingestion:** Do not induce vomiting. If conscious, have the victim drink plenty of water and call a physician if discomfort is experienced.

## Section 3: Composition Information

### Typical chemical composition:

Chemical	CAS Number	Percent of Weight
SiO <sub>2</sub>	14808-60-7	68-76%
Al <sub>2</sub> O <sub>3</sub>	1344-28-1	10-15%
Fe <sub>2</sub> O <sub>3</sub>	1309-37-1	2-5%
Na <sub>2</sub> O	1313-59-3	2-4%
CaO	1305-78-8	2-5%
MgO	1309-48-4	1-2%
TiO <sub>2</sub>	13463-67-7	0.5-1.0%
K <sub>2</sub> O	12136-45-7	2-5%

Loss on Ignition 2 - 5 %

All components of this material are included on the TSCA Inventory.

#### Section 4: Hazardous Ingredients/Identity Information

This product contains free silica. Inhalation of dust may be harmful to your health. NIOSH has recommended a PEL of 0.05 mg/m<sup>3</sup> as determined by a full shift sample up to 10 hours working day, 40 hours per week.

**H.M.I.S. ratings:** Health – \*      Flammability – 0      Reactivity - 0

\* see Section 5 of this MSDS for further information on health effects

#### Section 5: Hazard Identification

**Potential Health Effects:** Potential health effects may vary depending upon the duration and degree of exposure. To reduce or eliminate health hazards associated with this product, use exposure controls or personal protection methods as described in Section 12.

**Eye Contact:** (Acute/Chronic) Exposure to airborne dust may cause immediate or delayed irritation or inflammation of the cornea.

**Inhalation:** (Chronic) Inhalation exposure to free silica may cause delayed lung injury, including silicosis, a disabling and potentially fatal lung disease, and/or cause or aggravate other lung diseases or conditions.

**Carcinogenic Potential:** This product contains free silica, which IARC classifies as a known human carcinogen. The NTP, in its Ninth Annual Report on Carcinogens, classified “silica, crystalline (respirable)” as a known carcinogen.

#### Section 6: Accidental Release Measures

Use clean-up methods that do not disperse dust into the air. Avoid inhalation of dust and contact with eyes. Use exposure control and personal protection methods as described in Section 12.

#### Section 7: Physical/Chemical Data

<b>Boiling Point:</b>	4040 <sup>0</sup> F
<b>Specific Gravity (H<sub>2</sub>O = 1.0):</b>	2.65
<b>Vapor Pressure:</b>	Not applicable
<b>Solubility in Water:</b>	Insoluble
<b>Appearance:</b>	Tan, Brown, Light Brown, Reddish Brown.
<b>Odor:</b>	No Odor
<b>Physical State:</b>	Solid
<b>Vapor Density:</b>	Not applicable



### Section 8: Fire and Explosion Hazard Data

**Flash Point:** None

**Lower Explosive Limit:** None

**Auto ignition Temperature:** Not combustible

**Upper Explosive Limit:** None

**Flammable Limits:** N/A

**Special Fire Fighting Procedures:** None

**Extinguishing Media:** Not Combustible

**Unusual Fire and Explosion Hazards:** None

**Hazardous Combustion Products:** None

### Section 9: Stability and Reactivity Data

**Stability:**

Product is stable

**Incompatibility (Materials to Avoid):**

Strong Acids

**Hazardous Decomposition:**

Will not occur

**Hazardous Polymerization:**

Will not occur

### Section 10: Handling and Storage

Handle and store in a manner so that airborne dust does not exceed applicable exposure limits. Use adequate ventilation and dust collection. Use exposure control and personal protection methods as described in Section 12.

### Section 11: Toxicological Information

Conditions aggravated by exposure: Eye disease, Skin disorders and Chronic Respiratory conditions.

### Section 12: Exposure Control/Personal Protection

**Respiratory Protection:** Use local exhaust or general dilution ventilation to control dust levels below applicable exposure limits. Minimize dispersal of dust into the air. Use appropriate NIOSH approved respiratory protection for respirable crystalline silica.

**Eye Protection:** Wear safety glasses with side shields or goggles to avoid contact with the eyes. In extremely dusty environments and unpredictable environments, wear tight-fitting unvented or indirectly vented goggles to avoid eye irritation or injury.

### Section 13: Disposal Considerations

All disposal methods must be in accordance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterization and compliance with applicable laws are the responsibility solely of the waste generator.

### Section 14: Transportation Data

Arizona Test Dust is not hazardous under U.S. DOT or TDG regulations.

### Section 15: Other Regulatory Information

**Status under US OSHA Hazard**

**Communications Rule 29 CFR 1910.1200:**

Silica sand is considered a hazardous chemical under this regulation and should be included in the employer's hazard communication program.

**Status under CERCLA/Superfund, 40 CFR 117 and 302:**

Not listed

**Hazard Category under SARA (Title III), Sections 311 and 312:**

Silica sand qualifies as a hazardous substance with delayed health effects.

**Status under SARA (Title III), Section 313:**

Not subject to reporting requirements under Section 313

**Status under Canadian Environmental Protection Act:**

Not listed.

### Section 16: Other Information

The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, express or implied, is made with respect to the information contained herein. It is the user's obligation to determine the conditions of safe use of this product.