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Sandia National Laboratories
Small-Scale Sensitivity Testing (SSST) Report:

Calcium Nitrate Mixtures with Various Fuels

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1 Test Methods

1.1 Impact Sensitivity Testing

Impact sensitivity testing was performed using a modified Bureau of Mines (MBOM) impactor manufactured by Safety Management Services, Inc. Type-12 tooling was utilized on this machine with a 2.5kg impactor and matching intermediate mass. This particular machine is capable of a maximum drop height of 115cm with 0.1cm increments, though 1cm increments are typically used. Sample material was placed (35 ± 2mg) onto 1 inch squares of Norton brand 180A Garnet sandpaper. Positive results were detected visually or audibly by the operator as smoke, flash, report, charring/tearing of the sandpaper, etc. The test was conducted using the Bruceton technique to calculate the height at which there is a 50% chance of initiation (H_{50}) [1].

1.2 Friction Sensitivity Testing

Friction sensitivity testing was performed on a BAM machine manufactured by UTEC Corp, LLC (Riverton, KS) using porcelain pins and plates manufactured by Reichel & Partner, GmbH (Steinweiler, Germany). Stimulus levels are shown in Table 1.

Table 1. Stimulus levels (kg) for the BAM friction tester

0.5	0.6	0.7	0.8	0.9	1.0
1.2	1.4	1.6	1.8	2.0	2.4
2.8	3.0	3.2	3.6	4.0	4.2
4.8	5.4	5.6	6.0	6.4	7.2
8.0	8.4	9.6	10.8	11.2	12.0
12.8	14.4	16.0	16.8	18.0	19.2
21.6	24.0	25.2	28.8	32.4	36.0

Positive results were detected visually or audibly by the operator as smoke, flash, pops, crackles, etc. Testing was conducted using the TIL (threshold initiation level) method, which is the load (N) at which zero reactions occur during twenty or fewer trials with at least one positive reaction at the next higher level. The load in Newtons is calculated by multiplying the stimulus level (kg) by ten.

1.3 ESD Sensitivity Testing

Electrostatic discharge (ESD) testing was conducted using an ABL (Alleghany Ballistics

Laboratory) machine manufactured by Safety Management Services, Inc. Voltage was held constant at 5000 ± 20V while capacitance was varied to adjust the energy levels. Typically used energy levels are shown in Table 2.

Table 2. Energy levels (J) for the ABL-ESD tester

Capacitance (µF)	Energy at 5000V (J)
0.75	9.375
0.5	6.25
0.25	3.125
0.1	1.25
0.05	0.625
0.02	0.25
0.012	0.15
0.006	0.075
0.002	0.025
0.001	0.0125
0.0005	0.00625
0.0002	0.0025

For organic fuels (sugar, sawdust), results were determined through the use of an infrared gas analyzer (CO_2/CO) - a 600 Series manufactured by California Analytical Instruments, Inc. A change in concentration greater than 40ppm for either gas is considered a positive reaction. A digital photograph was taken of each run as a supplemental record [2]. The specific camera used was a Nikon D90 DSLR camera utilizing a 200mm Nikkor lens. A one second exposure was taken during each trial. This camera system was utilized for reaction detection when testing inorganic fuels (Al powder). Testing was conducted using the TIL method as described above for friction testing.

1.4 Thermal Sensitivity Testing

Thermal sensitivity testing was conducted using a Q2000 differential scanning calorimeter (DSC), manufactured by TA Instruments. This method exposes a material to a ramping temperature while monitoring heat flow to/from the sample. This can reveal temperatures of phase changes, glass/crystalline transitions, as well as decomposition or ignition. TA Instruments stainless steel high pressure capsules utilizing gold plated copper seal disks were used for this testing. Sample mass varies, but typically ranges from <1mg for energetics such as PETN to approximately 4-6mg for less energetic fuel-oxidizer mixtures.

2 Test Materials

Test materials consisted of various calcium nitrate (Calcinit) + fuel mixtures. The calcium nitrate consisted of solution grade Calcinit fertilizer manufactured by Yara (Figure 1). The fertilizer prills were ground in a blender and not dried prior to mixing by hand. The Calcinit fertilizer was found to have an average moisture content of 16.5% by mass.

Figure 1. Calcinit fertilizer

According to Skylighter specifications, the sawdust (wood meal) average particle size is approximately 140 mesh (~105µm). The H-2 aluminum is a spherical (atomized) powder with a particle size range of 6-9µm. The sugar consisted of the powdered confectioner's variety. All fuels were mixed as received and are shown in Figure 2.

A specific test matrix is shown in Table 3. Mixing ratios included three oxygen balance ratios: 1.4 (under fueled), 1.0 (stoichiometric), and 0.6 (overfueled) [3].

Table 3. Test matrix of Calcinit + Fuel mixtures. Stoichiometric ratios shown in bold.

Mixture	Fuel Wt. %	Fuel Manufacturer
Calcinit + Aluminum (H-2)	49.9, **35.4**, 26.5	Valimet, Inc.
Calcinit + Sugar	52.9, **30.3**, 20.2	C&H Sugar Company, Inc.
Calcinit + Sawdust	44.2, **25.8**, 17.3	Skylighter, Inc.

Figure 2. Aluminum, sawdust/wood meal, and powdered sugar fuels

In order to conduct large-scale testing (>500g) with these mixtures, a phased scale-up process was applied. Phase I consisted of mixing 10g batches and conducting SSST. Once the results were reviewed, Phase II mixing and SSST was completed at the 500g batch level. The results contained within this report will be reviewed prior to scale-up to Phase III (>500g).

PETN (pentaerythritol tetranitrate) was used as a reference material [4].

3 Results

3.1 Impact Sensitivity Testing Results

Test results for impact sensitivity are shown below (Tables 4-5).

Table 4. Impact sensitivity test results and conditions; Phase I (10g mix batches)

Mixture - Phase I (10g batch)	Test Date	H_{50} (cm)	Temp. (°C)	RH (%)
PETN*	Multiple	12.5 ± 0.8	22.3	35.1
Calcinit + Sugar (52.9%)	4/14/14	> 115	24.6	15.2
Calcinit + Sugar (30.3%)	12/3/13	> 115	20.4	22.1
Calcinit + Sugar (20.2%)	12/4/13	> 115	21.3	21.7
Calcinit + Al (49.7%)	4/18/14	> 115	20.9	27.1
Calcinit + Al (35.4%)	4/15/14	> 115	22.2	17.3
Calcinit + Al (26.5%)	4/17/14	> 115	23.4	20.7
Calcinit + Sawdust (44.2%)	4/24/14	> 115	21.9	17.8
Calcinit + Sawdust (25.8%)	4/21/14	> 115	21.1	37.7
Calcinit + Sawdust (17.3%)	4/22/14	> 115	21.1	31.4

***Results averaged from multiple test series**

Table 5. Impact sensitivity test results and conditions; Phase II (500g mix batches)

Mixture - Phase II (500g batch)	Test Date	H_{50} (cm)	Temp. (°C)	RH (%)
PETN*	Multiple	12.5 ± 0.8	22.3	35.1
Calcinit + Sugar (52.9%)	5/20/14	> 115	22.9	12.8
Calcinit + Sugar (30.3%)	5/15/14	> 115	23.3	12.9
Calcinit + Sugar (20.2%)	5/19/14	> 115	21.8	13.9
Calcinit + Al (49.7%)	5/16/14	> 115	20.8	20.5
Calcinit + Al (35.4%)	5/13/14	> 115	21.9	21.7
Calcinit + Al (26.5%)	5/14/14	> 115	21.6	24.9
Calcinit + Sawdust (44.2%)	5/23/14	> 115	21.3	37.4
Calcinit + Sawdust (25.8%)	5/21/14	> 115	21.1	19.5
Calcinit + Sawdust (17.3%)	5/22/14	> 115	24.4	25.7

***Results averaged from multiple test series**

All of the mixtures were found to have very little impact sensitivity. A single reaction (spark) occurred when testing Calcinit + Al (49.7%) at the Phase II level. Three reactions occurred (sparks) during testing of Calcinit + Sawdust (44.2%) at the Phase I level. Since all of these reactions occurred infrequently, as well as at the maximum drop height of the impactor, they had no effect on the H_{50}.

3.2 Friction Sensitivity Testing Results

Test results for friction are tabulated below (Tables 6-7).

Table 6. Friction sensitivity test results and conditions; Phase I (10g mix batches)

Mixture - Phase I (10g batch)	Test Date	TIL, 0 of 20 (N)	Temp. (°C)	RH (%)
PETN*	Multiple	33	20.9	37.5
Calcinit + Sugar (52.9%)	4/14/14	324	21.6	16.3
Calcinit + Sugar (30.3%)	12/3/13	> 360	22.4	18.4
Calcinit + Sugar (20.2%)	12/4/13	> 360	21.7	21.1
Calcinit + Al (49.7%)	4/18/14	160	23.6	20.7
Calcinit + Al (35.4%)	4/15/14	180	21.8	18.4
Calcinit + Al (26.5%)	4/17/14	160	21.2	26.0
Calcinit + Sawdust (44.2%)	4/24/14	192	22.7	14.0
Calcinit + Sawdust (25.8%)	4/21/14	324	24.1	27.9
Calcinit + Sawdust (17.3%)	4/22/14	252	25.1	24.1

***Results averaged from multiple test series**

Table 7. Friction sensitivity test results and conditions; Phase II (500g mix batches)

Mixture - Phase II (500g batch)	Test Date	TIL, 0 of 20 (N)	Temp. (°C)	RH (%)
PETN*	Multiple	33	20.9	37.5
Calcinit + Sugar (52.9%)	5/20/14	240	24.1	11.8
Calcinit + Sugar (30.3%)	5/15/14	192	23.3	12.9
Calcinit + Sugar (20.2%)	5/19/14	> 360	21.7	11.7
Calcinit + Al (49.7%)	5/16/14	192	20.0	20.5
Calcinit + Al (35.4%)	5/13/14	160	20.0	25.9
Calcinit + Al (26.5%)	5/14/14	180	23.6	21.8
Calcinit + Sawdust (44.2%)	5/23/14	240	20.9	45.9
Calcinit + Sawdust (25.8%)	5/21/14	288	20.4	17.2
Calcinit + Sawdust (17.3%)	5/22/14	240	22.5	25.0

***Results averaged from multiple test series**

The majority of these mixtures displayed far less friction sensitivity than PETN. Positive reactions were indicated by small orange/white flashes. No flames, pops/crackles, jetting, or smoke was observed during testing.

3.3 ESD Sensitivity Testing Results

Test results for ESD are tabulated below (Tables 8-9).

Table 8. ESD sensitivity test results and conditions; Phase I (10g mix batches)

Mixture - Phase I (10g batch)	Test Date	TIL, 0 of 20 (J)	Temp. (°C)	RH (%)
PETN*	Multiple	0.125	23.1	43.2
Calcinit + Sugar (52.9%)	12/5/13	0.150	22.8	19.5
Calcinit + Sugar (30.3%)	12/3/13	0.150	21.7	21.1
Calcinit + Sugar (20.2%)	12/4/13	0.150	22.9	18.4
Calcinit + Al (49.7%)	4/18/14	0.0125	20.8	23.8
Calcinit + Al (35.4%)	4/15/14	0.0125	18.3	19.3
Calcinit + Al (26.5%)	4/17/14	0.025	20.1	24.8
Calcinit + Sawdust (44.2%)	4/24/14	> 9.375	24.0	12.9
Calcinit + Sawdust (25.8%)	4/21/14	> 9.375	17.0	35.7
Calcinit + Sawdust (17.3%)	4/22/14	> 9.375	20.6	32.4

***Results averaged from multiple test series**

Table 9. ESD sensitivity test results and conditions; Phase II (500g mix batches)

Mixture - Phase II (500g batch)	Test Date	TIL, 0 of 20 (J)	Temp. (°C)	RH (%)
PETN*	Multiple	0.125	23.1	43.2
Calcinit + Sugar (52.9%)	5/20/14	0.25	19.8	13.3
Calcinit + Sugar (30.3%)	5/15/14	1.25	21.9	13.9
Calcinit + Sugar (20.2%)	5/19/14	6.25	19.3	14.9
Calcinit + Al (49.7%)	5/16/14	0.0125	18.0	17.1
Calcinit + Al (35.4%)	5/13/14	0.0125	22.2	20.6
Calcinit + Al (26.5%)	5/14/14	0.0125	22.5	19.5
Calcinit + Sawdust (44.2%)	5/23/14	0.625	20.4	47.9
Calcinit + Sawdust (25.8%)	5/21/14	1.25	18.2	14.9
Calcinit + Sawdust (17.3%)	5/22/14	3.125	19.5	29.1

***Results averaged from multiple test series**

All of the mixtures, except those containing aluminum, showed lower ESD sensitivity than PETN. The relatively high sensitivity of the aluminized mixtures is very likely a result of the inherent ESD sensitivity of the aluminum fuel, and is likely to misrepresent the ESD sensitivity of the mixture, itself. Regardless, large amounts of fine aluminum powder do represent a fire and/or dust explosion hazard that should be addressed. The possibility of an explosion resulting from unintentional ESD ignition of these mixtures has not yet been investigated, but is planned for Phase III testing.

Photographs were taken of all trials. Several photographs of the positive reactions (via the gas analyzer) for both the sugar and sawdust mixtures show that ignition seems to begin as the material is dispersed into the air and does not propagate into the solid material (Figure 3). It is important to note only the highest magnitude reactions displayed these ignitions. All other reactions showed little difference (visually) from the non-reactions for these two fuel mixtures. All positive reactions (via the camera system) of the aluminized mixtures were too bright to discern this amount of detail. Non-reactions at the same energy levels (Joules) are shown in Figure 4.

Figure 3. Positive reactions of sugar (52.9%, 1.25J), sawdust (44.2%, 1.25J), and Al (26.5%, 0.025J) mixtures

Figure 4. Negative reactions of sugar (52.9%, 1.25J), sawdust (44.2%, 1.25J), and Al (26.5%, 0.025J) mixtures

3.4 Thermal Sensitivity Testing Results

DSC results are shown below. Testing was completed on the stoichiometric mixtures. All samples were heated at a rate of 10°C/min. Each plot includes the mixtures run in triplicate along with separate scans of the fuel (neat) and ground calcium nitrate (neat). DSC scans could not exceed 300°C due to manufacturer's limitations on the stainless steel pressure capsules. All scans clearly show endotherms at ~100°C due to vaporization of water due to 16.5% water content of the calcium nitrate in both the neat fertilizer form and in the mixture. Initial exotherm onsets vary between 150-170°C.

As when testing any physical mixture at such small sample scales, inconsistencies between duplicate runs are likely due to sample inhomogeneity. Triplicate testing is performed in order to more clearly discern the lowest possible onset of exothermic behavior.

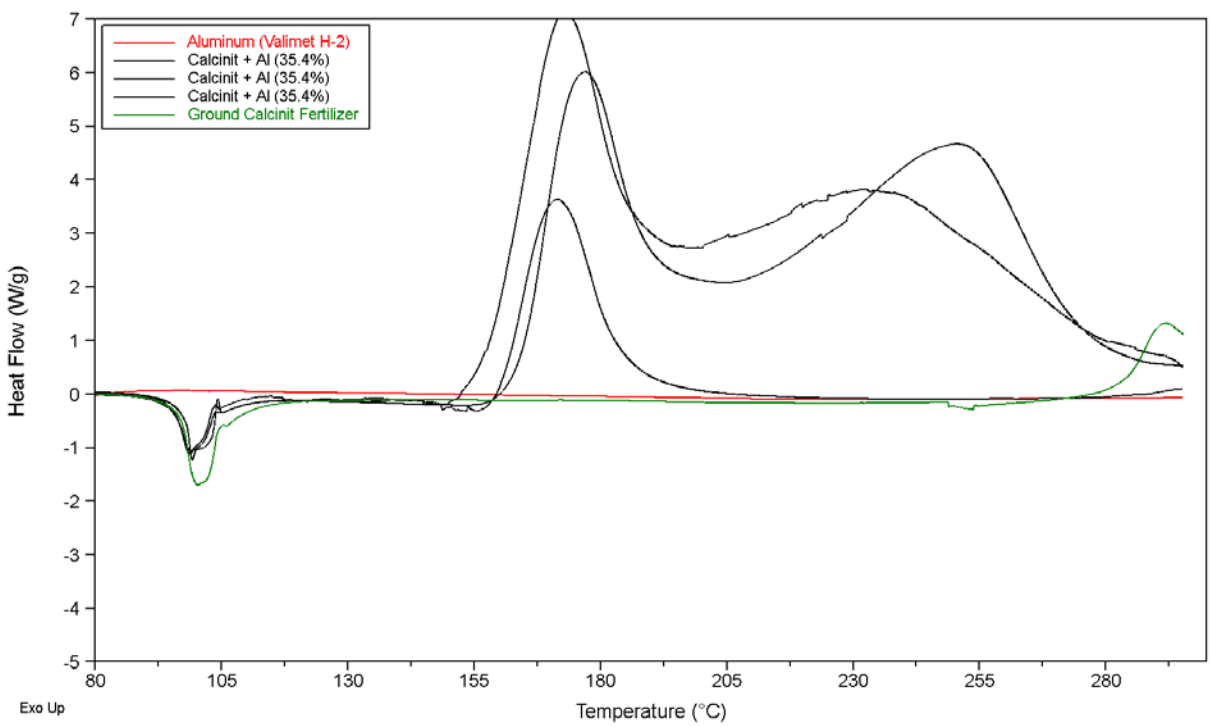

Figure 5. DSC results for Calcium Nitrate + Al (35.4%)

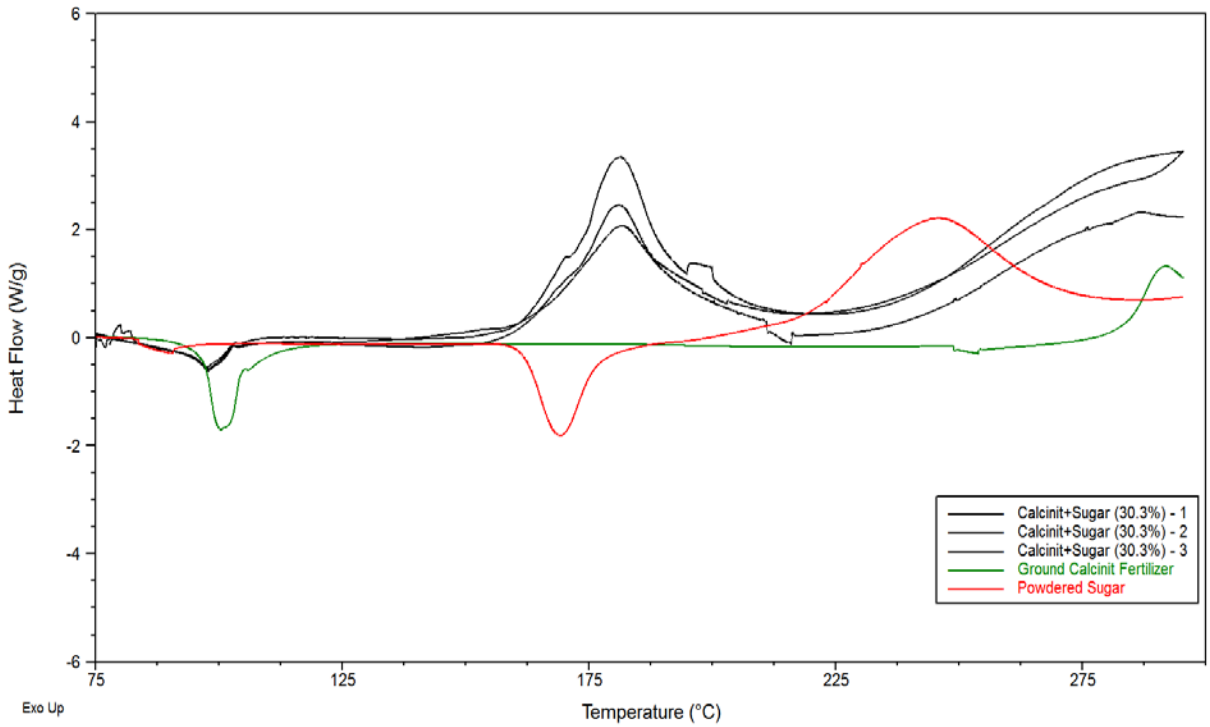

Figure 6. DSC results for Calcium Nitrate + Sugar (30.3%)

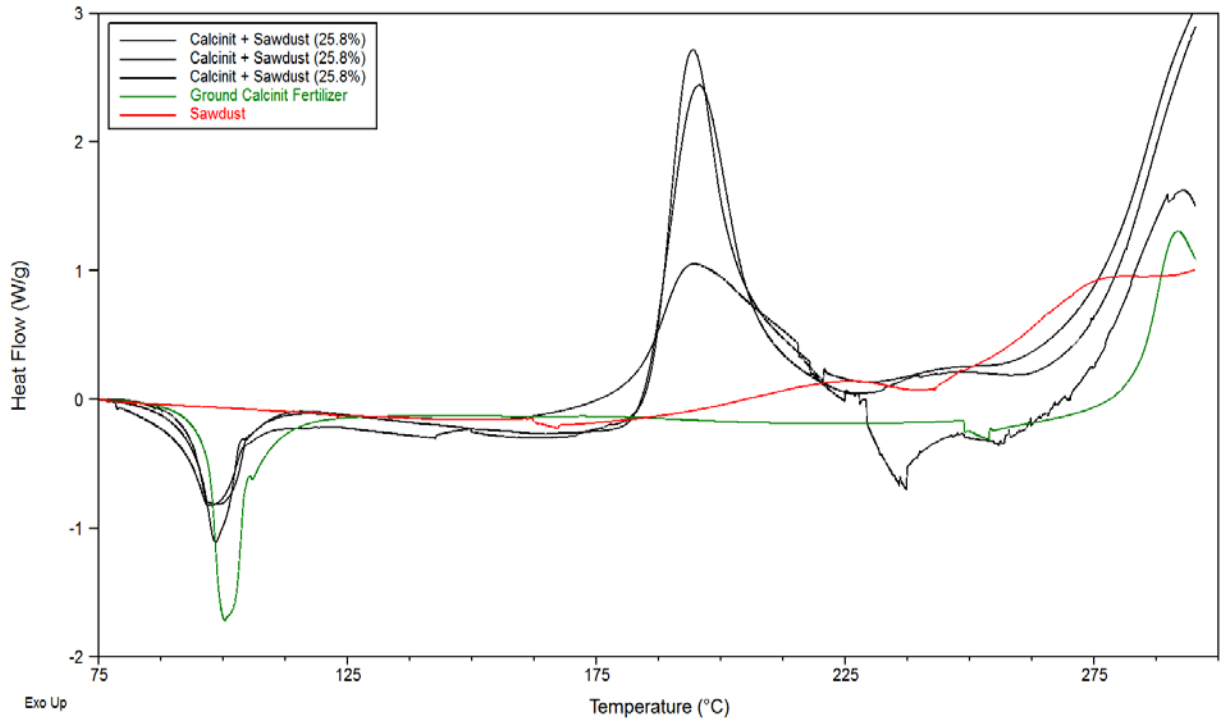

Figure 7. DSC results for Calcium Nitrate + Sawdust (25.8%)

4 Summary

Based upon the presented sensitivity data for the examined calcium nitrate mixtures using sugar and sawdust, contact handling/mixing of these materials does not present hazards greater than those occurring during handling of dry PETN powder.

The aluminized calcium nitrate mixtures present a known ESD fire hazard due to the fine aluminum powder fuel. These mixtures may yet present an ESD explosion hazard, though this has not been investigated at this time. The detonability of these mixtures will be investigated during Phase III testing.

5 References

1. Dixon, WJ and AM Mood. A Method for Obtaining and Analyzing Sensitivity Data. *Journal of the American Statistical Association*, 43 (241), pp. 109-126. 1948.

2. Whinnery, L, A Nissen, P Keifer, and A Tyson. Imaging Indicator for ESD Safety Testing, SAND Report SAND2013-3630, May 2013.

3. Chavez, V, B Gutierrez, A Nissen, and J Parmeter. Elemental Compositions and Densities of Homemade Explosive Formulations (SSI), NEXESS Center Report 2011-0084, 2011.

4. MIL-P-387C, Pentaerythritol Tetranitrate (PETN), 1976.

Appendix A: Impact Sensitivity Test Data

Impact Sensitivity Test Results

Tools: Type-12A
Striker: 2.5kg
Impactor: 2.5kg
Sandpaper: 180A Garnet

Date: 12-3-13
Operator: J. Phillips
Temp.: 20.4°C
RH: 22.1%

Material: Calcinit + Sugar (30.3%)
Sample size: 35 ± 2 mg
Notes:
- Calcinit ground
- powdered sugar

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				
12				$H_{50} > 115$ cm
13				
14				
15				
16				
17				
18				
19				
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21				
22				
23				
24				
25				
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27				
28				
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30				
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32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: TYPE 12
Striker: 2.5 Kg
Impactor: 2.5 Kg
Sandpaper: 180A Garnet

Date: 5-19-2014
Operator: Jason Phillips
Temp.: 21.8°C
RH: 13.9%

Material: Calcinit + Sugar 20.2%
Sample size: 35 mg ± 2
Notes: Phase 2 Batch, ground not dried (500g)

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				
12				
13				
14				
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33				
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35				
36				
37				
38				
39				
40				

> 115 CM

Impact Sensitivity Test Results

Tools: Type 12 A
Striker: 2.5kg
Impactor: 2.5kg
Sandpaper: 180A Garnet

Date: 12-4-13
Operator: J. Phillips
Temp.: 21.3 °C
RH: 21.7 %

Material: Calcinit + Sugar (20.2%)
Sample size: 35 ± 2mg
Notes:
- Calcinit ground
- powdered sugar

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				
12				
13				
14				$H_{50} > 115$ cm
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: Type-12	**Date:** 4-20-14	**Material:** Calcinit + Sugar (52.9 %)
Striker: 2.5 kg	**RH (%):** 12.8	**Sample size:** 35 ± 2 mg
Impactor: 2.5 kg	**Temp (°C):** 22.9	**Notes:**
Sandpaper: 180 A Garnet	**Operator:** J. Phillips	~Calcinit ground; not dried

Run #	Ht. (cm)	Go	No Go	Comments
1	115		0	
2	115		0	
3	115		0	
4	115		0	
5	115		0	
6	115		0	
7	115		0	
8	115		0	
9	115		0	
10	115		0	$H_{50} > 115$ cm
11				
12				
13				
14				
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39				
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Impact Sensitivity Test Results

Tools: Type-12
Striker: 2.5kg
Impactor: 2.5kg
Sandpaper: 180A Garnet

Date: 4-14-14
Operator: J. Phillips
Temp.: 24.6°
RH: 15.2%

Material: Calcinit + sugar ~52.9%
Sample size: 35 ± 2mg
Notes:

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				
12				
13				
14				
15				
16				
17				H_{50} > 115 cm
18				
19				
20				
21				
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39				
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Impact Sensitivity Test Results

Tools: 12A
Striker: 2.5 Kg
Impactor: 2.5 Kg
Sandpaper: 180 A garnet

Date: 5-15-2014
Operator: Jason Phillips
Temp.: 23.3
RH: 12.9%

Material: Calcinit & sugar 30.5%
Sample size: 35 ± 2 Kg
Notes:
- Calcinit ground; not dried
- Phase II batch (500g)

Run #	Ht. (cm)	Go	No Go	Comments
1	115		X	
2	115		X	
3	115		X	$H_{50} > 115$ cm
4	115		X	
5	115		X	
6	115		X	
7	115		X	
8	115		X	
9	115		X	
10	115		X	
11				
12				
13				
14				
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Impact Sensitivity Test Results

Tools: Type-12A
Striker: 2.5kg
Impactor: 2.5kg
Sandpaper: 180A Garnet

Date: 5-14-14
Operator: J. Phillips
Temp.: 21.6°C
RH: 24.9%

Material: Calcinit + Al (26.5%)
Sample size: 35±2mg
Notes:
- Valimet H-2 Al
- Calcinit ground; not dried

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				$H_{50} > 115$ cm
12				
13				
14				
15				
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35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: Type-12
Striker: 2.5kg
Impactor: 2.5kg
Sandpaper: 180A Garnet

Date: 4-17-14
Operator: J. Phillips
Temp.: 23.4°C
RH: 20.7%

Material: Calcinit + Al (26.5%) Valinet H-2
Sample size: 35 ± 2mg
Notes:

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				
12				$H_{50} > 115$ cm
13				
14				
15				
16				
17				
18				
19				
20				
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22				
23				
24				
25				
26				
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39				
40				

Impact Sensitivity Test Results

Tools: 12-Type
Striker: 2.5 Kg
Impactor: 2.5 Kg
Sandpaper: 180 A Garnet

Date: 5-16-2014
Operator: Jason Phillips
Temp.: 20.8°C
RH: 20.5%

Material: Calcinit + Al (H-2) - 49.7%
Sample size: 35 ± 2 mg
Notes: Ground not dried Calcinit Phase 2 Batch

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115	X		Spark
6	114		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				
12				
13				H50 > 115cm
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: Type-12
Striker: 2.5 kg
Impactor: 2.5 kg
Sandpaper: 180A Garnet

Date: 4-18-14
Operator: J. Phillips
Temp.: 20.9°C
RH: 27.1%

Material: Calcinit + Al (49.7%)
Sample size: 35±2 mg
Notes:
- Calcinit ground (not dried)
- Valimet H-2 Al

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				
12				
13				$H_{50} > 115$ cm
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: Type 12A
Striker: 2.5 kg
Impactor: 2.5 kg
Sandpaper: 180 A Garnet

Date: 5-13-14
Operator: J. Phillips
Temp.: 21.9°C
RH: 21.7%

Material: Calcinit + Al (35.4%)
Sample size: 35 ± 2 mg
Notes:
- Calcinit grand (not dried)
- Valinod H-2 Al
- Phase II batch (500 g)

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				$H_{50} > 115$ cm
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
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27				
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30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: Type-12
Striker: 2.5 kg
Impactor: 2.5 kg
Sandpaper: 180A Garnet

Date: 4-15-14
Operator: J. Phillips
Temp.: 22.2 °C
RH: 17.3%

Material: Calcinit + Al (H_2) - 35.4%
Sample size: 35 ± 2 mg
Notes:

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				
12				
13				
14				$H_{50} > 115$ cm
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: Type 12
Striker: 2.5kg
Impactor: 2.5kg
Sandpaper: 180A Garnet

Date: 4-21-14
Operator: J. Phillips
Temp.: 21.1 °C
RH: 37.7%

Material: Calcinit + Sawdust (25.8%)
Sample size: 35 ± 2 mg
Notes:
- Calcinit ground (not dried)
- wood meal not dried

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				$H_{50} > 115$ cm
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
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29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: Type-12	**Date:** 5-22-2014	**Material:** Calcinit + Sawdust (17.3 %)
Striker: 2.5kg	**RH (%):** 25.7	**Sample size:** 35 +/- 2 mg
Impactor: 2.5kg	**Temp (°C):** 24.1	**Notes:**
Sandpaper:	**Operator:**	- Calcinit ground; not dried
180A Garnet	Jason Phillips	- Phase II batch (500g)

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				$H_{50} > 115$ cm
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
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32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: ~~Z~~ Type-12
Striker: 2.5 kg
Impactor: 2.5 kg
Sandpaper: 180A Garnet

Date: 4-22-14
Operator: J. Phillips
Temp.: 21.1°C
RH: 31.4%

Material: Calcinit + Sawdust (17.3%)
Sample size: 35±2 mg
Notes:
- Sawdust not dried
- Calcinit ground (not dried)

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				
12				$H_{50} > 115$ cm
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: Type 12	**Date:** 5-23-2014	**Material:** Calcinit & Sawdust
Striker: 2.5	**RH (%):**	**Sample size:** 35 ±2
Impactor: 2.5	**Temp (°C):**	**Notes:** 44.2% Sawdust, Phase 2 (500g)
Sandpaper: 180A Garnet	**Operator:** Jason Phillips	

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

>115cm

Impact Sensitivity Test Results

Tools: Type 12
Striker: 2.5 kg
Impactor: 2.5 kg
Sandpaper: 180A Garnet

Date: 4-24-14
Operator: J. Phillips
Temp.: 21.9°C
RH: 17.8%

Material: Calcinit + Sawdust (44.2 %)
Sample size: 25 ± 2 mg
Notes:
- Calcinit ground (not dried)
- Sawdust not dried

Run #	Ht. (cm)	Go	No Go	Comments
1	115	X	O	
2	115		O	
3	115	X		spark, sandpaper torn (jetting)
4	114		O	
5	115	X		sandpaper torn (jetting)
6	114		O	
7	115	X		spark + " "
8	114		O	
9	115		O	
10	115		O	
11				
12				
13				$H_{50} > 115$ cm
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: Type-12	**Date:** 5-21-14	**Material:** Calcinit + Sawdust (25.8%)
Striker: 2.5kg	**RH (%):** 19.5	**Sample size:** 35 ± 2mg
Impactor: 2.5kg	**Temp (°C):** 21.1	**Notes:**
Sandpaper: 180A Garnet	**Operator:** J. Phillips	- Calcinit ground, not dried - Phase II batch (500g)

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
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35				
36				
37				
38				
39				
40				

$H_{50} > 115$ cm

Appendix B: Friction Sensitivity Test Data

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	TIL (0 of 20)
																					>360N

Material:	Calcinit + Sugar (20.2%)
Date:	12-4-13

Operator:	J. Phillips

Temp:	21.7°C
RH:	21.1%

Go	X
No Go	O

Notes:
- Calcinit ground, powdered sugar
- brown streaks only - no smoke, reports, etc.

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	O	O	O	O	X																Flash; orange
32.4	O	O	O	O	O	X															Flash; orange
28.8	O	O	O	O	O	O	O	O	X												Flash; orange
25.2	O	O	O	O	O	O	X														white orange Flashes
24.0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	

(0-20)
24.0 Kg

Material:	Calcinit & Sugar 52.9%
Date:	5-20-2014

Operator:	Jason Phillips

Temp:	24.1 °C
RH:	11.8%

Go	X
No Go	O

Notes: Phase 2 Batch (500g) Lights off, Ground, not dried

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X		orange flash
32.4	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
																					TIL (0 of 20)
																					32.4 kg

Material:	Calcinit + Sugar 52.9 %
Date:	4-14-14

Operator:	J. Phillips

Temp:	21.6°C
RH:	16.3%

Go	X
No Go	O

Notes:

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	O	X																			white/orange Flashes
32.4	X																				white/orange Flashes
28.8	O	O	O	O	O	O	O	O	O	O	O	O	X								white/orange Flash
25.2	O	O	O	O	O	O	O	X													white/orange Flash
24.0	O	O	O	O	O	O	O	O	O	O	O	X									white/orange Flash
21.6	O	X																			white/orange Flash
19.2	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	

TIL
(0-20)
19.2 Kg

Material:	Calcinit + Sugar 30.3%
Date:	5-15-2014

Operator:	Jason Phillips

Temp:	23.3
RH:	12.9%

Go	X
No Go	O

Notes: 30.3% sugar, ~~gas~~ Calcinit ground not dried, Phase 2 Batch 500g

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
24.0	O	O																			
36.0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
																					TIL (0 of 20) at >360 N

Material:	Calcinit + Sugar (30.3%)
Date:	12-3-13

Operator:	J. Phillips

Temp:	22.4°C
RH:	18.4 %

Go	X
No Go	O

Notes:
- Calcinit ground
- Powdered sugar
- No reports, smoke, etc
- Slight brown streaking on pins/plate

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
24.0	0	0	0																		
25.2	0	0	0																		
28.8	0																				
32.4	0																				
36.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

TIL

>36.0Kg

Material:	Calcinit 6 sugar 20.2%
Date:	5-19-2014

Operator:	Jason Phillips

Temp:	21.7°C
RH:	11.7%

Go	X
No Go	O

Notes: Phase 2, Calcinit undried, Ground.
Batch (500g) lights OFF

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
21.6	X																				White Orange Flash
19.2	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	TIL

Material:	Calcinit + H_2 Aluminum 49.7%
Date:	5-16-2014

Operator:	Jason Phillips

Temp:	20°C
RH:	20.5%

Go	X
No Go	O

Notes: Phase 2, Lights OFF

TIC 0-20
19.2 Kg

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	X																				Orange Flash
28.8	X	O	O																		" "
25.2	O	O	O	X																	" "
24.0	X																				" "
21.6	O	X																			" "
19.2	X																				" "
18.0	O	X																			" "
16.8	X																				" "
16.0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	

Material:	Calcinit + Al (49.7%)
Date:	4-18-14

Operator:	J. Phillips

Temp:	23.6 °C
RH:	20.7 %

Go	X
No Go	O

Notes:
- Valimet H-2 Al
- Calcinit ground (not dried)
- Lights OFF

TILO-20
@ 16 kg

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	O	O	X																		O orange/white flashes
32.4	X																				" "
24.0	X																				" "
21.6	O	O	O	O	O	O	O	O	O	O	X										" "
19.2	X																				" "
18.0	O	O	O	O	O	O	O	X													" "
16.8	O	O	X																		" "
16.0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	TIL (0 of 20) at 16.0 kg

Material:	Calcinit + Al (35.4%)
Date:	5-13-14

Operator:	J. Phillips

Temp:	20.0°C
RH:	25.9%

Go	X
No Go	O

Notes: -Valinet #-2 aluminum
-Calcinit ground, not dried
-Lights OFF
- Phase II batch (500g)

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	X																				white/orange flasher
32.4	O	X																			orange flasher
28.8	X																				" "
24.0	X																				" "
21.6	O	O	O	X																	" "
19.2	O	O	O	O	O	O	O	O	O	O	X										" "
18.0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	TIL

Material:	Calcinit + Al (1-5) 35.4 %
Date:	4-15-14

Operator:	J. Phillips

Temp:	21.8 °C
RH:	18.4 %

Go	X
No Go	O

Notes:
- Calcinit tested as received from fertilizer bag, ground
- Lights OFF

TIL 0-20
@ 18.0 kg

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
18.0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O		
19.2	O	O	O	O	O	O	X														orange/white flash
21.6	X																				white flashes
																					TIL (0 of 20) at 180 N

Material:	Calcinit + Al (26.5%)
Date:	5-14-14

Operator:	J. Phillips

Temp:	23.6 °C
RH:	21.8 %

Go	X
No Go	O

Notes: - Calcinit ground; not dried
- Valimet H-2 Al
- Lights OFF

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	X																				Orange flashes
32.4	X																				" "
28.8	O	O	O	O	O	O	O	O	O	O	X										orange flash
25.2	O	O	O	O	O	X															Orange flash
24.0	O	O	O	O	O	O	X														Orange flash
21.6	O	X																			Orange flash
19.2	X																				Orange flash
18.0	O	O	O	O	X																Orange flash
16.8	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X			" "
16.0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	

TIL
0-20 @
16.0 Kg

Material:	Calcinite + AL 26.5%
Date:	17-Apr-2014

Operator:	Jason Phillips

Temp:	21.2
RH:	26.0%

Go	X
No Go	O

Notes: Valinet H-2
– lights OFF

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	O	O	O	O	O	O	O	O	O	X											Orange Flash
32.4	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	

Material:	Calcinit + Sawdust (25.8%)
Date:	4-21-14

Operator:	J. Phillips

Temp:	241.°C
RH:	27.9 %

Go	X
No Go	O

Notes:
Woodmeal tested as received (not dried
- lights off, Calcinit ground. (not dried

TIL
0-20 @ 32.4 kg

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
32.4	O	O	O	O	O	X															Orang w/white flash
36.0	O	O	O	X																	Orange Flash
28.8	X																				Orange w/white flash
25.2	O	O	O	O	O	O	O	O	O	O	O	X									White flash
24.0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	

Material:	Calcinit + Sawdust (17.3%)
Date:	5-22-2014

Operator:	Jason Phillips

Temp:	22.5
RH:	25.0

Go	X
No Go	O

Notes:
- Calcinit ~~+ Sawdust~~ ground; not dried
- Lights OFF

TIL
24.0kg

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	O	O	O	O	O	O	O	O	O	O	O	O	O	X							Orange flash
32.4	O	O	X																		" "
28.8	X																				" "
25.2	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
																					TIL (0 of 20)
																					25.2 kg

Material:	Calcinit + woodmeal (17.3 %)
Date:	4-22-14

Operator:	Jason Phillips

Temp:	25.1
RH:	24.1

Go	X
No Go	O

Notes:
- Woodmeal tested as received (not dried)
- Calcinit ground (not dried)

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	X																				orange & white Flash
32.4	O	O	O	O	O	O	O	X													" "
28.8	O	O	O	O	O	O	O	O	O	X											" "
25.2	O	O	O	O	O	O	O	O	O	O	O	O	X								" "
24.0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	

TIL
(0-2)
24.0 Kg

Material:	Calcinit to Sawdust ~~40.2%~~ 44.2%
Date:	5-23-2014

Operator:	Jason Phillips

Temp:	20.9°C
RH:	45.9%

Go	X
No Go	O

Notes: - Calcinit ground Not dried, Phase II batch (500g) Lights off

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	X																				Orange flash
32.4	X																				" "
28.8	X																				" "
25.2	O	O	O	O	O	O	O	O	O	O	X										" "
24.0	O	X																			" "
21.6	O	O	O	O	O	O	O	O	O	O	O	X									" "
19.2	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	

Material:	Calcinit + Sawdust (44.2%)
Date:	4-24-14

Operator:	Jason Phillips

Temp:	22.7
RH:	14.0

Go	X
No Go	O

Notes:
- Calcinit ground (not dried)
- Sawdus not dried

TIL
1-20 @ 19.2 Kg

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36	O	X																			Orange Flash
32.4	X																				Orange Flash
28.8	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	

TIL
0-20
28.8 Kg

Material:	Calcinit 6 Sawdust 25.8%
Date:	5-21-2014

Operator:	Jason Phillips

Temp:	20.4°C
RH:	17.2%

Go	X
No Go	O

Notes: - lights off - Ground not dried. - Phase2 Batch (500g)
(Calcinit)

Appendix C: ESD Sensitivity Test Data

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Blank Image
0.05	0.625	X																				1
Run Ref. Image →		2																				
0.02	0.25	O	O	O	O	O	O	O	O	O	O	O	X									3
Run Ref. Image →		4	5	6	7	8	9	10	11	12	13	14	15									
0.012	0.15	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	16
Run Ref. Image →		17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
Run Ref. Image →																						
Run Ref. Image →																						
Run Ref. Image →																						
Run Ref. Image →																						
Run Ref. Image →																						
Run Ref. Image →																						

Material:	Calcinit + Sugar (52.9%)
Date:	12-5-13

Temp (°C):	22.8
RH (%):	19.5

Operator:	J. Phillips
Test Type:	Approaching ~~needle~~

Notes:

- ground Calcinit + powdered sugar
- Gas analyzer used for Go-No Go

TIL (0.020) at 0.15 J

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)
0.05	0.625
0.02	0.25
0.012	0.15

	Run #, Pre-shot/Post-shot									
	1	2	3	4	5	6	7	8	9	10
CO_2	426 / >	/	/	/	/	/	/	/	/	/
CO	41.6 / 95.9	/	/	/	/	/	/	/	/	/
CO_2	442 / 448	451 / 455	447 / 450	450 / 455	455 / 461	461 / 464	463 / 472	474 / 481	467 / 471	465 / 473
CO	42.0 / 46.2	41.6 / 47.4	41.2 / 45.5	41.1 / 46.4	40.9 / 45.6	40.6 / 45.2	40.3 / 46.8	40.0 / 46.7	39.3 / 45.7	39.2 / 48.0
CO_2	465 / 468	469 / 508	476 / 479	479 / 484	480 / 484	478 / 480	476 / 480	479 / 485	478 / 480	481 / 484
CO	38.6 / 41.4	38.4 / 46.7	38.1 / 41.4	38.1 / 41.8	38.0 / 42.0	37.9 / 41.5	37.8 / 42.5	37.5 / 39.5	37.7 / 40.1	37.3 / 41.3
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/

0.02	0.25
0.012	0.15

	11	12	13	14	15	16	17	18	19	20
CO_2	463 / 466	465 / 598	/	/	/	/	/	/	/	/
CO	39.1 / 45.6	38.9 / 47.2	/	/	/	/	/	/	/	/
CO_2	490 / 494	493 / 496	483 / 491	486 / 494	494 / 498	499 / 504	500 / 504	500 / 535	498 / 501	498 / 501
CO	37.2 / 40.9	37.2 / 41.0	36.9 / 41.1	37.1 / 41.3	36.8 / 40.2	36.8 / 40.5	36.8 / 39.3	36.8 / 42.7	36.8 / 41.0	36.8 / 41.5
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/

Material:	Calcinit + Sugar (52.9 %)
Date:	12-5-13

Temp (°C):	22.8
RH (%):	19.5

Operator:	J. Phillips
Test Type:	Approaching needle

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
.05	.625	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Run Ref. Image →		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
0.1	1.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Run Ref. Image →		23	24	25	26	27	28	29	38	39	40	41	42	43	44	45	46	47	48	49	50
0.25	3.125	0	0	0	0	0	0	X													
Run Ref. Image →		30	31	32	33	34	35	36													
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

Blank Image
1
22
37

Material:	CalCinit + Sug.
Date:	5-15-2014

Temp (°C):	21.9
RH (%):	13.9

Operator:	Jason Phillips
Test Type:	Approaching needle

Tit (0 of 20) at 1.25 J

Notes: 30.3% sugar, gas analizer used for go/no-go.
Calcinit ground, not dried.
Phase 2 batch (500g)

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)		Run #, Pre-shot/Post-shot									
			1	2	3	4	5	6	7	8	9	10
.05	.625	CO_2	602/609	608/625	622/625	630/635	632/634	633/636	639/643	629/633	643/650	648/654
		CO	39.0/42.7	38.2/42.7	38.2/41.7	38/40.9	37.9/39.8	37.8/40.9	37.7/40.5	37.8/40.5	37.3/41.7	37.1/41.3
0.1	1.25	CO_2	670/678	670/671	670/674	672/674	669/674	674/679	668/675	661/666	661/669	661/668
		CO	36.3/41.4	36.2/37.6	36.2/41.1	36.2/39.7	36.2/39.7	36.1/41.4	36/39.5	35.5/40.1	35.7/41.4	35.9/42.4
0.25	3.125	CO_2	665/681	667/695	672/689	672/707	671/707	670/694	657/718	/	/	/
		CO	36/50.7	36.1/55.8	36.1/52.1	36/59.9	35.9/56.5	35.9/49.9	35.7/60.0	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/

			11	12	13	14	15	16	17	18	19	20
.05	.625	CO_2	683/658	654/658	655/663	672/678	656/661	659/663	658/663	661/668	661/666	665/669
		CO	37.1/41.6	37/41.2	36.9/42.8	36.2/41.3	36.7/41.8	36.8/39.5	36.5/40.2	36.4/40.6	36.4/40.2	36.4/39.1
0.1	1.25	CO_2	661/668	658/665	664/675	665/669	666/676	666/671	667/671	662/669	664/668	665/671
		CO	35.9/40.6	35.7/39.3	35.4/41.8	35.6/40.7	35.6/40.3	35.5/39.3	35.6/39.6	35.5/40.9	35.7/40.8	35.3/40.4
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/

Material:	Calcinit & Sugar 30.3%
Date:	5-15-2014

Temp (°C):	21.9
RH (%):	13.9

Operator:	Jason Phillips
Test Type:	Approaching needle

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Blank Image
0.5	6.25	X																				1
Run Ref. Image →		2																				
0.25	3.125	X																				4
Run Ref. Image →		3																				
0.1	1.25	X																				5
Run Ref. Image →		6																				
0.05	0.625	O	O	O	O	O	O	O	O	O	O	O	O	O	X							7
Run Ref. Image →		8	9	10	11	12	13	14	15	16	17	18	19	20	21							
0.03	0.25	O	O	O	O	O	O	O	O	O	O	O	O	O	X							22
Run Ref. Image →		23	24	25	26	27	28	29	30	31	32	33	34	35	36							
0.012	0.15	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	37
Run Ref. Image →		38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	
Run Ref. Image →																						
Run Ref. Image →																						
Run Ref. Image →																						

Material:	Calcinit + Sugar (22.2 %)
Date:	12-2-13

Temp (°C):	21.7
RH (%):	21.1

Operator:	J. Phillips
Test Type:	Approaching needle

Notes:
- Calcinit ground
- heavy pyrotechnic effect during Go's (Flame)
- No audible reports detected

TIL (0 of 20) at 0.15 J

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)		Run #, Pre-shot/Post-shot									
			1	2	3	4	5	6	7	8	9	10
0.5	6.25	CO_2	469 / 544									
		CO	37.5 / 112.2									
0.25	3.125	CO_2	474 / >									
		CO	41.4 / >									
0.1	1.25	CO_2	481 / 560									
		CO	41.9 / 58.3									
0.05	0.625	CO_2	484 / 499	484 / 507	481 / 496	484 / 495	489 / 504	488 / 520	487 / 498	491 / 499	492 / 524	493 / 508
		CO	41.3 / 55.1	41.2 / 57.9	40.5 / 54.8	40.3 / 51.3	40.2 / 54.4	39.8 / 57.4	39.3 / 49.3	39.2 / 52.2	39.1 / 56.7	38.9 / 52.6
0.02	0.25	CO_2	423 / 430	433 / 436	443 / 444	445 / 453	454 / 459	460 / 464	466 / 471	469 / 478	478 / 481	466 / 472
		CO	36.4 / 42.8	36.3 / 41.9	36.2 / 42.0	36.3 / 42.9	36.3 / 41.9	36.2 / 40.7	36.2 / 43.4	36.4 / 42.5	36.3 / 43.1	35.7 / 44.5

Cap. (µF)	Energy (J)		11	12	13	14	15	16	17	18	19	20
0.05	0.625	CO_2	495 / 507	495 / 499	499 / 504	499 / >						
		CO	38.8 / 52.7	38.5 / 50.4	38.5 / 49.9	38.5 / >						
0.02	0.25	CO_2	471 / 477	476 / 481	480 / 487	482 / 556						
		CO	38.8 / 42.7	38.8 / 42.6	38.8 / 42.0	35.7 / 50.3						
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
0.012	0.15	' CO_2	487 / 491	492 / 498	494 / 498	497 / 500	499 / 501	500 / 503	503 / 506	505 / 509	505 / 512	506 / 507
		CO	35.7 / 40.7	35.6 / 40.0	35.6 / 39.1	35.6 / 40.2	35.7 / 39.2	35.7 / 38.6	35.7 / 39.7	35.6 / 38.9	35.6 / 40.3	35.7 / 39.6
0.012	0.15	" CO_2	509 / 512	494 / 498	499 / 501	502 / 507	501 / 503	504 / 505	506 / 510	508 / 510	509 / 512	511 / 516
		CO	35.5 / 39.8	35.6 / 38.5	35.6 / 39.4	35.6 / 39.9	35.5 / 39.6	35.5 / 39.5	35.5 / 39.9	35.5 / 40.7	35.4 / 40.7	35.6 / 39.6

Material:	Calcinit + Sugar (30.3 %)	Temp (°C):	21.7	Operator:	J. Phillips
Date:	12-2-13	RH (%):	21.1	Test Type:	Approaching needle

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.25	3.125	0	0																		
Run Ref. Image →		2	3																		
.5	6.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Run Ref. Image →		4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
.75	9.375	0	X																		
Run Ref. Image →		25	26																		
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

Blank Image
1
24
27

JEL (0-20) (0.25J)

Material:	Calcinit & sugar
Date:	5-19-14

Temp (°F):	19.38
RH (%):	14.9

Operator:	Jason Phillips
Test Type:	Approaching needle

Notes: 20.2% Sugar Phase 2

- Calcinit grand; not dried
- Phase II batch (500g)

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)
0.25	3.125
.5	6.25
.75	9.375

	Run #, Pre-shot/Post-shot									
	1	2	3	4	5	6	7	8	9	10
CO_2	585/597	588/601	/	/	/	/	/	/	/	/
CO	41.7/47.9	41.7/46.9	/	/	/	/	/	/	/	/
CO_2	~~605~~/	603/632	606/626	609/640	598/620	606/624	601/636	609/639	609/639	612/651
CO	~~41.7~~/	41.5/58.2	41.4/57.8	41.9/54.1	40.6/54.1	40.5/54.9	40.2/55.8	40.2/59.5	40.4/54.5	39.6/58.2
CO_2	615/653	609/654	/	/	/	/	/	/	/	/
CO	39.8/63.1	38.4/59.1	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/

.5	6.25

	11	12	13	14	15	16	17	18	19	20
CO_2	615/640	619/640	621/641	622/645	633/654	638/661	633/656	634/652	634/665	638/663
CO	39.2/54.7	39.2/49.4	39.4/51.8	39.1/49.7	39.2/51.7	38.6/53.1	38.7/51.2	38.4/53.7	38.5/59.1	38.4/53.3
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/

Material:	Calcinit Sugar 20.2% Phase 2
Date:	5-19-2014

Temp (°C):	19.3
RH (%):	14.9

Operator:	Jason Phillips
Test Type:	Approaching needle

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.05	0.625	X																			
Run Ref. Image →		2																			
0.02	0.25	O	X																		
Run Ref. Image →		4	5																		
0.012	0.15	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Run Ref. Image →		7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

Blank Image
1
3
6

Material:	Calcinit + Sugar (202%)
Date:	12-4-13

Temp (°C):	22.9
RH (%):	18.4

Operator:	J. Phillips
Test Type:	Approaching needle

Notes:
- Gas analyzer used for Go-No Go
- Calcinit ground
- powdered sugar

TIL (0 of 20) at 0.15 J

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)
0.05	0.625
0.02	0.25
0.012	0.15

	Run #, Pre-shot/Post-shot									
	1	2	3	4	5	6	7	8	9	10
CO_2	448 /635									
CO	42.1 /65.8									
CO_2	444 /449	445 /491								
CO	42.2/47.2	42.0 /52.4								
CO_2	448 /451	437 /440	447 /450	449 /452	458/463	464 /466	461 / 462	456 /459	445 /450	444 /449
CO	41.7/45.9	40.7 /44.7	40.8 /44.2	40.6 /44.1	40.2 /43.6	40.0 /44.0	40.0 /43.3	39.7 / 44.5	39.0 /43.2	38.7 /42.7
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/

0.012	0.15

	11	12	13	14	15	16	17	18	19	20
CO_2	447 /454	449 /453	450 /452	438 /442	440 /446	451 /454	453 /455	450 /451	447 /449	446 /449
CO	38.7 /42.9	38.5 /42.3	38.5 /41.6	37.9 /41.8	37.8 /41.8	37.7/41.2	37.7 /41.8	37.7 /41.5	37.6 /40.3	37.5 /41.0
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/

Material:	Calcinit + Sugar (20.2 %)
Date:	12-4-13

Temp (°C):	22.9
RH (%):	18.4

Operator:	J. Phillips
Test Type:	Approaching needle

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
.75	9.375	0	X																		
Run Ref. Image →		2	3																		
.5	6.25	0	0	0	X																
Run Ref. Image →		5	6	7	8																
.25	3.125	0	0	0	0	0	0	0	X												
Run Ref. Image →		10	11	12	13	14	15	16	17												
.1	1.25	0	0	0	0	X															
Run Ref. Image →		19	20	21	22	23	~~24~~	~~25~~													
.05	.625	0	0	0	X																
Run Ref. Image →		25	26	27	28																
.02	.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Run Ref. Image →		30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

TIC
(0-20)
.25J

Blank Image
1
4
9
18
24
29

Material:	Calcinit to Sugar	**Temp (°F):**	19.8°C	**Operator:**	Jason Phillips
Date:	5-20-2014	**RH (%):**	13.3	**Test Type:**	Approaching needle

Notes: 52.9% Sugar, Phase 2 Batch (500g)

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)		Run #, Pre-shot/Post-shot									
			1	2	3	4	5	6	7	8	9	10
.75	9.375	CO_2	474/502	489/558	/	/	/	/	/	/	/	/
		CO	40.9/78.2	41.8/96.7	/	/	/	/	/	/	/	/
.5	6.25	CO_2	509/540	576/548	529/568	538/594	/	/	/	/	/	/
		CO	41.6/74.7	41.3/63.9	41.4/72.5	41.2/78.3	/	/	/	/	/	/
.25	3.125	CO_2	549/566	538/569	561/571	570/581	576/586	581/597	587/622	591/[illegible]	/	/
		CO	40.3/58.6	40.3/51.8	39.8/50.5	39.6/54.2	39.4/57.9	39.4/58.8	39.2/73.2	39.1/[illegible]	/	/
.1	1.25	CO_2	601/609	606/616	610/618	615/619	617/[illegible]	/	/	/	/	/
		CO	38.6/45.6	38.6/46.8	38.4/44.4	38.3/42.7	38.2/111.6	/	/	/	/	/
.05	.625	CO_2	629/635	636/641	636/640	640/>	/	/	/	/	/	/
		CO	38.0/42.4	37.8/42.8	37.8/41.9	37.7/79.9	/	/	/	/	/	/

			1	2	3	4	5	6	7	8	9	10
			11	12	13	14	15	16	17	18	19	20
.02	.25	CO_2	644/647	649/651	651/654	658/659	658/658	657/659	648/650	648/651	651/653	651/653
		CO	37.6/40.9	37.5/39.9	37.4/40.3	37.3/38.9	37.2/38.9	37.1/40.7	36.8/38.7	37.0/41.1	37.0/40.5	38.8/39.2
.02	.25	CO_2	651/653	651/655	652/654	650/653	649/652	650/654	648/659	649/651	650/651	651/652
		CO	36.9/41.3	36.9/40.2	36.8/40.2	36.7/39.6	36.7/40.1	36.6/38.4	36.7/40.5	36.7/40.4	36.7/39.5	37.0/39.9
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	(0-20) .25 D		/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/

Material:	Calcinit & sugar 52.9%
Date:	5-20-2014

Temp (°C):	19.8
RH (%):	13.3

Operator:	Jason Phillips
Test Type:	Approaching needle

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.006	0.075	X																			
Run Ref. Image →		2																			
0.002	0.025	⊗	⊗	⊗	⊗	X	Flash & Smoke														
Run Ref. Image →		4	5	6	7	8															
0.001	0.0125	⊗	⊗	⊗	O	⊗	⊗	O	O	⊗	O	⊗	⊗	O	O	⊗	⊗	O	O	⊗	O
Run Ref. Image →		10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

Blank Image
1
3
9

Material:	Calcinit + AL (49.7%)
Date:	18-Apr-2014

Temp (°C):	20.8
RH (%):	23.8

Operator:	Jason Phillips
Test Type:	Approaching ~~needle~~

Notes:
- Valinet H-2 AL
- Calcinit ground (not dried)

TIL (0 of 20) at 0.0125 J

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.02	0.25	X		~large	flash	+ smoke															
Run Ref. Image →		2																			
0.012	0.15	X		~large flash	+	smoke															
Run Ref. Image →		4																			
0.006	0.075	X		- flash + smoke																	
Run Ref. Image →		6																			
0.002	0.025	X		- flash + smoke																	
Run Ref. Image →		8																			
0.001	0.0125	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Run Ref. Image →		10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

Blank Image
1
3
5
7
9

Material:	Calcinit + Al (3548)
Date:	5-13-14

Temp (°F):	22.2
RH (%):	20.6

Operator:	J. Phillips
Test Type:	Approaching needle

TIL (0 of 20) at 0.0125 J

Notes:

- Valimet H-2 aluminum
- Phase II SOO_3 batch
- Camera used for Go-No Go

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.5	6.25	X		+ smoke																	
Run Ref. Image →		2																			
0.05	0.625	X		+ smoke																	
Run Ref. Image →		4																			
0.002	0.025	X	⊗	X	+ smoke																
Run Ref. Image →		6	14	12																	
.0002	0.0025	⊗																			
Run Ref. Image →		8																			
.0005	0.00625	⊗																			
Run Ref. Image →		10																			
.001	.0125	O	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	O
Run Ref. Image →		12	13	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
.0006	.075	X		+ smoke																	
Run Ref. Image →		16																			
Run Ref. Image →																					
Run Ref. Image →																					

Blank Image
1
3
5
7
9
11
15

Material:	Calcinit + Al H-2, 35.4%
Date:	4-15-14

Temp (°C):	18.3
RH (%):	19.3

Operator:	J Phillips
Test Type:	Approaching needle

TIL (0.F20) at 0.0125 J

Notes:
- Calcinit ground as received from fertilizer bag

O: Nothing

⊗: Small Aluminum flyers seen; no flash, smoke, or propagation

X: Definite reaction; Flash, smoke

- post shot images at 0.5, 0.002, 0.00032, 0.0005

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.006	0.075	X		- flash + smoke																	
Run Ref. Image →		2																			
0.002	0.025	O	O	X		- flash + smoke															
Run Ref. Image →		4	5	6																	
0.001	0.0125	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Run Ref. Image →		~~8~~ 7	~~9~~ 8	~~10~~ 9	~~11~~ 10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

Blank Image
1
3
27

Material:	Calcinit + Al (26.5%)
Date:	5-14-14

Temp (°C):	22.5
RH (%):	19.5°

Operator:	J. Phillips
Test Type:	Approaching needle

TIL (0 of 20) at 0.0125 J

Notes:

- Camera used for Go-No Go
- Calcinit ground, not dried
- Vallinat H-2 Al

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.002	0.025	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗
Run Ref. Image →		3	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0.006	0.075	X		- Flash + smoke																	
Run Ref. Image →		5																			
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

Blank Image
2
4

Material:	Calcinit + Al (26.5 °C)
Date:	4-17-14

Temp (°C):	20.1
RH (%):	24.8

Operator:	J. Phillips
Test Type:	Approaching needle

TIL (0 of 20) at 0.025 J

Notes:
- Valimet H-2 Al

⊗ : Al Plyers seen ONLY → No Go

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
.006	.075	X	Flash and Smoke																		
Run Ref. Image →		2	3	4	5	6	7	8	9	10											
.002	.025	X	Flash and Smoke																		
Run Ref. Image →		4																			
.001	.0125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Run Ref. Image →		6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Run Ref. Image →																					
				~~.001~~																	
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

TIC .0125 J

(0-20)

Blank Image
1
3
5

Material:	calcinit + H_2 Aluminum
Date:	5-16-2014

Temp (°F):	17.1
RH (%):	18

Operator:	Jason Phillips
Test Type:	Approaching needle

Notes:
Calcinit + H_2 Aluminum 49.7% Aluminum Phase 2 Batch

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.75	9.375	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Run Ref. Image →		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

Blank Image
2

Material:	Calcinit + Sawdust (44.2%)
Date:	4-24-14

Temp (°C):	24.0
RH (%):	12.9

Operator:	J. Phillips
Test Type:	Approaching needle

TK (0.020)
> 9.375 J

Notes:
- Calcinit ground (not dried)
- Sawdust not dried

- Slight odor of burnt wood on all shots

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)		Run #, Pre-shot/Post-shot									
			1	2	3	4	5	6	7	8	9	10
0.75	9.375	CO_2	640/639	649/648	659/660	666/665	677/~~690~~ 710	677/678	682/680	691/692	694/693	695/712
		CO	41.3/42.1	41.7/43.0	41.8/42.8	41.6/42.1	41.3/45.4	40.5/41.5	40.3/41.3	39.9/41.0	39.7/40.5	39.4/42.3
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/

			11	12	13	14	15	16	17	18	19	20
0.75	9.375	CO_2	697/695	700/698	702/702	666/667	651/661	658/659	661/661	660/660	665/667	666/669
		CO	39.1/40.2	38.8/39.5	38.6/39.8	36.5/37.7	37.6/39.0	37.6/38.6	37.6/38.6	37.4/38.2	37.3/39.0	37.4/39.5
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/

Material:	Calcinit + Sawdust (44.2 %)
Date:	4-24-14

Temp (°C):	24.0
RH (%):	12.9

Operator:	J. Phillips
Test Type:	Approaching needle

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
.75	9.375	X																			
Run Ref. Image →		2																			
.5	6.25	O	O	O	X																
Run Ref. Image →		4	5	6	7																
.25	3.125	O	O	O	X																
Run Ref. Image →		9	10	11	12																
.1	1.25	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Run Ref. Image →		14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

Blank Image
1
3
8
13

Material:	Calcinit & Sandust 25%
Date:	5-21-14

Temp (°F):	18.2°C
RH (%):	14.9

Operator:	Jason Phillips
Test Type:	Approaching needle

Notes:
- Phase 2 (500g) Batch
- Calcinit ground, not dried
- ~~Canon~~ Gas analyzer used for Go-No Go

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)
.75	9.375
.5	6.25
.25	3.125
.1	1.25

	Run #, Pre-shot/Post-shot									
	1	2	3	4	5	6	7	8	9	10
CO_2	508/554	/	/	/	/	/	/	/	/	/
CO	41.1/91.4	/	/	/	/	/	/	/	/	/
CO_2	525/541	536/557	544/558	557/627	/	/	/	/	/	/
CO	41.7/67.2	41.3/70.4	41.1/73.2	40.8/86.5	/	/	/	/	/	/
CO_2	557/580	576/589	581/603	586/630	/	/	/	/	/	/
CO	40.2/61.2	40.2/59.2	40.1/61.8	40.4/69.4	/	/	/	/	/	/
CO_2	596/601	602/605	606/610	611/614	612/617	615/621	618/626	623/628	628/632	630/635
CO	39.6/47.2	39.3/42.5	39.4/44.7	38.9/43.1	39.1/43.8	39.0/42.9	38.8/45.3	38.6/43.2	38.6/43.3	38.5/43.2
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/

.1	1.25

	11	12	13	14	15	16	17	18	19	20
CO_2	638/640	648/652	639/643	641/643	641/645	645/647	646/651	353/360	367/378	384/394
CO	38.3/43.3	38.3/43.9	38.2/43.0	38.2/43.2	38.0/43.6	38.1/42.7	38.1/42.3	35.6/44.8	35.7/44.5	35.7/43.0
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/

TIL 1.25 J
(0-20)

Material:	Calcinit & Sawdust 25.8%
Date:	5-21-2014

Temp (°C):	18.2
RH (%):	14.9

Operator:	Jason Phillips
Test Type:	Approaching needle

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.5	6.25	O																			
Run Ref. Image →		2																			
.75	9.375	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Run Ref. Image →		4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →						Orange color on every run															
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

Blank Image
1
3

Material:	Calcinit & woodmeal
Date:	4-21-14

Temp (°C):	17.0
RH (%):	35.7

Operator:	Jason Phillips
Test Type:	Approaching needle

Notes: Gas analyzer used for go/no-go.
- Woodmeal tested as received. (not dried)
- Calcinit ground. (not dried)

TIL 79.375 J

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)		Run #, Pre-shot/Post-shot									
			1	2	3	4	5	6	7	8	9	10
0.5	6.25	CO_2	587/587	/	/	/	/	/	/	/	/	/
		CO	37.3/37.3	/	/	/	/	/	/	/	/	/
0.75	9.375	CO_2	610/612	617/619	612/612	622/622	628/629	633/634	634/635	636/637	638/639	639/640
		CO	37.0/37.1	37.0/37.8	37.0/37.2	36.7/36.9	36.7/37.0	36.6/36.9	36.8/37.4	36.7/36.9	36.6/37.0	36.5/37.1
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/

- Orange color seen in ALL shots

			11	12	13	14	15	16	17	18	19	20
0.75	9.375	CO_2	639/637	628/626	625/623	627/627	629/629	629/630	630/630	633/634	639/640	643/642
		CO	36.3/36.7	36.2/36.7	36.1/36.4	36.2/36.3	36.0/36.5	35.9/36.8	35.8/36.3	35.6/36.4	35.5/36.5	35.3/35.5
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/

Material:	Calcinit + Sawdust (25.3 %)
Date:	4-21-14

Temp (°C):	17.0
RH (%):	36.2

Operator:	Jason Phillips
Test Type:	Approaching needle

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.75	9.375	X																			
Run Ref. Image →		2																			
0.5	6.25	O	X																		
Run Ref. Image →		4	5																		
.25	3.125	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Run Ref. Image →		7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

Blank Image
1
3
6

Material:	Calcinit+SD 17.3%
Date:	5-22-2014

Temp (°F):	19.5
RH (%):	29.1

Operator:	Jason Phillips
Test Type:	Approaching needle

Notes:
- Gas analyzer used for Go-No Go
- Calcinit ground; not dried

Phase II batch (500g)

TIL
3.125 J

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)		Run #, Pre-shot/Post-shot									
			1	2	3	4	5	6	7	8	9	10
0.75	9.375	CO_2	495 / 552	/	/	/	/	/	/	/	/	/
		CO	40.5 / 80.3	/	/	/	/	/	/	/	/	/
0.5	6.25	CO_2	525 / 551	543 / 594	/	/	/	/	/	/	/	/
		CO	40.5 / 62.0	39.4 / 75.8	/	/	/	/	/	/	/	/
0.25	3.125	CO_2	556 / 574	572 / 589	580 / 603	585 / 605	591 / 604	593 / 609	585 / 609	579 / 593	583 / 602	592 / 605
		CO	39.5 / 51.6	39.1 / 50.8	39.0 / 57.6	39.1 / 57.7	38.7 / 51.1	39.7 / 53.8	38.5 / 56.8	38.2 / 51.4	38.1 / 52.0	38.0 / 50.3
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/

			11	12	13	14	15	16	17	18	19	20
0.25	3.125	CO_2	597 / 614	602 / 620	606 / 630	611 / 640	618 / 635	622 / 650	625 / 635	626 / 647	630 / 642	636 / 650
		CO	38.0 / 54.5	37.9 / 50.6	37.8 / 56.2	37.7 / 55.7	37.4 / 56.6	37.2 / 57.6	37.4 / 47.1	37.5 / 58.3	37.5 / 51.0	37.3 / 55.1
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/

Material:	Calcinit + Sawdust (17.3%)
Date:	5-22-14

Temp (°C):	19.5
RH (%):	29.1

Operator:	J. Phillips
Test Type:	Approaching needle

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.75	9.375	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Run Ref. Image →		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

Blank Image
1

TIL (0.020)
9.375 J

Material:	Calcinit + Sawdust (17.3%)	**Temp (°C):**	20.6	**Operator:**	Jason Phillips
Date:	4-22-14	**RH (%):**	32.4	**Test Type:**	Approaching needle

Notes:
- Woodmeal tested as recieved. (not dried)
- Calcinit ground (not dried)

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)
0.75	9.375

	Run #, Pre-shot/Post-shot									
	1	2	3	4	5	6	7	8	9	10
CO_2	492/492	514/513	530/529	544/544	543/553	558/559	561/560	555/554	562/563	569/568
CO	40.3/40.5	40.3/41.0	40.2/40.7	39.5/40.2	39.2/39.1	38.8/39.3	39.0/39.5	38.4/38.9	38.4/39.4	38.0/38.6
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/

0.75	9.375

	11	12	13	14	15	16	17	18	19	20
CO_2	574/572	582/582	596/594	609/609	618/618	623/623	630/631	635/633	635/635	633/634
CO	37.7/38.3	37.5/38.2	37.2/37.2	37.1/37.5	36.9/37.8	36.8/37.4	36.8/37.3	36.6/36.7	36.6/37.0	36.7/36.9
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/

Material:	Calcinit + Sawdust (17.3%)
Date:	4-22-14

Temp (°C):	20.6
RH (%):	32.4

Operator:	J. Phillips
Test Type:	Approaching needle

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
.75	9.375	X																			
Run Ref. Image →		2	3																		
.5	6.25	X																			
Run Ref. Image →		4	1																		
.25	3.125	0	0	0	0	0	0	X													
Run Ref. Image →		6	7	8	9	10	11	12													
.1	1.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	
Run Ref. Image →		14	15	16	17	18	19	20	21	22	[illegible]	24	25	26	27	28	29	30	31	32	
.05	.625	0	0	0	0	0	0	0	0	0	023	0	0	0	0	0	0	0	0	0	0
Run Ref. Image →		34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

TTL
0.20
.625 J

Blank Image
1
3
5
13
33

Material:	Calcinit & Sawdust	Temp (°F):	70.4°C	Operator:	Jason Phillips
Date:	5-23-2014	RH (%):	47.9	Test Type:	Approaching needle

Notes:
Sawdust 44.2% Phase 2 Batch (500g)

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)		Run #, Pre-shot/Post-shot									
			1	2	3	4	5	6	7	8	9	10
.75	9.375	CO_2	790/868	/	/	/	/	/	/	/	/	/
		CO	38.1/116.1	/	/	/	/	/	/	/	/	/
.5	6.25	CO_2	776/829	/	/	/	/	/	/	/	/	/
		CO	40.4/77.7	/	/	/	/	/	/	/	/	/
.25	3.125	CO_2	765/779	747/763	616/634	618/631	610/625	610/619	612/671	/	/	/
		CO	41.0/64.8	40.7/61.9	36.6/57.1	36.9/56.4	37.0/61.8	36.7/62.0	36.8/77.2	/	/	/
.1	1.25	CO_2	601/608	590/597	589/625	585/588	578/583	565/583	565/574	563/572	562/569	559/568
		CO	36.4/45.9	36.6/45.3	36.5/51.4	36.7/44.5	36.4/46.3	36.5/47.8	37.1/45.8	36.5/48.1	36.5/45.3	36.5/44.4
.05	.625	CO_2	589/591	590/597	592/595	590/601	591/595	595/595	589/594	589/602	590/597	593/596
		CO	36.5/41.2	36.0/43.1	36.4/41.5	36.2/42.9	36.3/42.5	36.3/40.2	36.4/43.8	36.2/42.7	36.1/41.5	36.2/41.9

			11	12	13	14	15	16	17	18	19	20
.1	1.25	CO_2	565/572	569/576	571/578	571/574	574/583	580/583	584/592	588/600	588/959	/
		CO	36.5/44.8	36.3/44.4	36.5/44.3	36.3/41.1	36.2/46	36.4/42.0	36.3/45.7	36.5/44.8	36.3/90.1	/
.05	.625	CO_2	587/600	595/614	596/635	597/604	596/600	600/603	604/608	608/612	612/617	615/622
		CO	36.7/43.2	36.4/47.5	36.3/49.4	36.5/44.3	36.1/42.6	36.1/43.1	36.3/43.1	36.0/41.8	36.1/47.3	36.2/40.4
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/

0-20 .625

Material:	Calcinit & Sawdust 44.2%	Temp (°C):	47.9	Operator:	Jason Phillips
Date:	5/23/2014	RH (%):	70.4	Test Type:	Approaching needle

Appendix A: Impact Sensitivity Test Data

Impact Sensitivity Test Results

Tools: Type-12A
Striker: 2.5kg
Impactor: 2.5kg
Sandpaper: 180A Garnet

Date: 12-3-13
Operator: J. Phillips
Temp.: 20.4°C
RH: 22.1%

Material: Calcinit + Sugar (30.3%)
Sample size: 35 ± 2 mg
Notes:
- Calcinit ground
- powdered sugar

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				
12				$H_{50} > 115$ cm
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
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32				
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35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: TYPE 12
Striker: 2.5 Kg
Impactor: 2.5 Kg
Sandpaper: 180A Garnet

Date: 5-19-2014
Operator: Jason Phillips
Temp.: 21.8°C
RH: 13.9%

Material: Calcinit + Sugar 20.2%
Sample size: 35 mg ± 2
Notes: Phase 2 Batch, ground not dried (500g)

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
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29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

> 115 CM

Impact Sensitivity Test Results

Tools: Type 12 A
Striker: 2.5kg
Impactor: 2.5kg
Sandpaper: 180A Garnet

Date: 12-4-13
Operator: J. Phillips
Temp.: 21.3 °C
RH: 21.7 %

Material: Calcinit + Sugar (20.2%)
Sample size: 35 ± 2mg
Notes:
- Calcinit ground
- powdered sugar

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				
12				
13				
14				$H_{50} > 115$ cm
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: Type-12	**Date:** 4-20-14	**Material:** Calcinit + Sugar (52.9 %)
Striker: 2.5 kg	**RH (%):** 12.8	**Sample size:** 35 ± 2 mg
Impactor: 2.5 kg	**Temp (°C):** 22.9	**Notes:**
Sandpaper: 180 A Garnet	**Operator:** J. Phillips	~Calcinit ground; not dried

Run #	Ht. (cm)	Go	No Go	Comments
1	115		0	
2	115		0	
3	115		0	
4	115		0	
5	115		0	
6	115		0	
7	115		0	
8	115		0	
9	115		0	
10	115		0	$H_{50} > 115$ cm
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: Type-12
Striker: 2.5kg
Impactor: 2.5kg
Sandpaper: 180A Garnet

Date: 4-14-14
Operator: J. Phillips
Temp.: 24.6°
RH: 15.2%

Material: Calcinit + sugar ~52.9%
Sample size: 35 ± 2mg
Notes:

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				
12				
13				
14				
15				
16				
17				H_{50} > 115 cm
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: 12A
Striker: 2.5 Kg
Impactor: 2.5 Kg
Sandpaper: 180 A garnet

Date: 5-15-2014
Operator: Jason Phillips
Temp.: 23.3
RH: 12.9%

Material: Calcinit & sugar 30.5%
Sample size: 35 ± 2 Kg
Notes:
- Calcinit ground; not dried
- Phase II batch (500g)

Run #	Ht. (cm)	Go	No Go	Comments
1	115		X	
2	115		X	
3	115		X	$H_{50} > 115$ cm
4	115		X	
5	115		X	
6	115		X	
7	115		X	
8	115		X	
9	115		X	
10	115		X	
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: Type-12A
Striker: 2.5kg
Impactor: 2.5kg
Sandpaper: 180A Garnet

Date: 5-14-14
Operator: J. Phillips
Temp.: 21.6°C
RH: 24.9%

Material: Calcinit + Al (26.5%)
Sample size: 35±2mg
Notes:
- Valimet H-2 Al
- Calcinit ground; not dried

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				$H_{50} > 115$ cm
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: Type-12
Striker: 2.5kg
Impactor: 2.5kg
Sandpaper: 180A Garnet

Date: 4-17-14
Operator: J. Phillips
Temp.: 23.4°C
RH: 20.7%

Material: Calcinit + Al (26.5%) Valinet H-2
Sample size: 35 ± 2mg
Notes:

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				
12				$H_{50} > 115$ cm
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: 12-Type
Striker: 2.5 Kg
Impactor: 2.5 Kg
Sandpaper: 180 A Garnet

Date: 5-16-2014
Operator: Jason Phillips
Temp.: 20.8°C
RH: 20.5%

Material: Calcinit + Al (H-2) - 49.7%
Sample size: 35 ± 2 mg
Notes: Ground not dried Calcinit Phase 2 Batch

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115	X		Spark
6	114		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				
12				
13				H50 > 115cm
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: Type-12
Striker: 2.5 kg
Impactor: 2.5 kg
Sandpaper: 180A Garnet

Date: 4-18-14
Operator: J. Phillips
Temp.: 20.9°C
RH: 27.1%

Material: Calcinit + Al (49.7%)
Sample size: 35±2 mg
Notes:
- Calcinit ground (not dried)
- Valimet H-2 Al

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				
12				
13				$H_{50} > 115$ cm
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: Type 12A
Striker: 2.5 kg
Impactor: 2.5 kg
Sandpaper: 180 A Garnet

Date: 5-13-14
Operator: J. Phillips
Temp.: 21.9°C
RH: 21.7%

Material: Calcinit + Al (35.4%)
Sample size: 35 ± 2 mg
Notes:
- Calcinit grand (not dried)
- Valinod H-2 Al
- Phase II batch (500 g)

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				$H_{50} > 115$ cm
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: Type-12
Striker: 2.5 kg
Impactor: 2.5 kg
Sandpaper: 180A Garnet

Date: 4-15-14
Operator: J. Phillips
Temp.: 22.2 °C
RH: 17.3%

Material: Calcinit + Al (H_2) - 35.4%
Sample size: 35 ± 2 mg
Notes:

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				
12				
13				
14				$H_{50} > 115$ cm
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: Type 12
Striker: 2.5kg
Impactor: 2.5kg
Sandpaper: 180A Garnet

Date: 4-21-14
Operator: J. Phillips
Temp.: 21.1 °C
RH: 37.7%

Material: Calcinit + Sawdust (25.8%)
Sample size: 35 ± 2 mg
Notes:
- Calcinit ground (not dried)
- wood meal not dried

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				$H_{50} > 115$ cm
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: Type-12	**Date:** 5-22-2014	**Material:** Calcinit + Sawdust (17.3 %)
Striker: 2.5kg	**RH (%):** 25.7	**Sample size:** 35 +/- 2 mg
Impactor: 2.5kg	**Temp (°C):** 24.1	**Notes:**
Sandpaper:	**Operator:**	- Calcinit ground; not dried
180A Garnet	Jason Phillips	- Phase II batch (500g)

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				$H_{50} > 115$ cm
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: ~~Z~~ Type-12
Striker: 2.5 kg
Impactor: 2.5 kg
Sandpaper: 180A Garnet

Date: 4-22-14
Operator: J. Phillips
Temp.: 21.1°C
RH: 31.4%

Material: Calcinit + Sawdust (17.3%)
Sample size: 35±2 mg
Notes:
- Sawdust not dried
- Calcinit ground (not dried)

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				
12				$H_{50} > 115$ cm
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: Type 12	**Date:** 5-23-2014	**Material:** Calcinit & Sawdust
Striker: 2.5	**RH (%):**	**Sample size:** 35 ±2
Impactor: 2.5	**Temp (°C):**	**Notes:** 44.2% Sawdust, Phase 2 (500g)
Sandpaper: 180A Garnet	**Operator:** Jason Phillips	

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

>115cm

Impact Sensitivity Test Results

Tools: Type 12
Striker: 2.5 kg
Impactor: 2.5 kg
Sandpaper: 180A Garnet

Date: 4-24-14
Operator: J. Phillips
Temp.: 21.9°C
RH: 17.8%

Material: Calcinit + Sawdust (44.2 %)
Sample size: 25 ± 2 mg
Notes:
- Calcinit ground (not dried)
- Sawdust not dried

Run #	Ht. (cm)	Go	No Go	Comments
1	115	X	O	
2	115		O	
3	115	X		spark, sandpaper torn (jetting)
4	114		O	
5	115	X		sandpaper torn (jetting)
6	114		O	
7	115	X		spark + " "
8	114		O	
9	115		O	
10	115		O	
11				
12				
13				$H_{50} > 115$ cm
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Impact Sensitivity Test Results

Tools: Type-12	**Date:** 5-21-14	**Material:** Calcinit + Sawdust (25.8%)
Striker: 2.5kg	**RH (%):** 19.5	**Sample size:** 35 ± 2mg
Impactor: 2.5kg	**Temp (°C):** 21.1	**Notes:**
Sandpaper: 180A Garnet	**Operator:** J. Phillips	- Calcinit ground, not dried - Phase II batch (500g)

Run #	Ht. (cm)	Go	No Go	Comments
1	115		O	
2	115		O	
3	115		O	
4	115		O	
5	115		O	
6	115		O	
7	115		O	
8	115		O	
9	115		O	
10	115		O	
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

$H_{50} > 115$ cm

Appendix B: Friction Sensitivity Test Data

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	TIL (0 of 20)
																					>360N

Material:	Calcinit + Sugar (20.2%)
Date:	12-4-13

Operator:	J. Phillips

Temp:	21.7°C
RH:	21.1%

Go	X
No Go	O

Notes:
- Calcinit ground, powdered sugar
- brown streaks only - no smoke, reports, etc.

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	O	O	O	O	X																Flash; orange
32.4	O	O	O	O	O	X															Flash; orange
28.8	O	O	O	O	O	O	O	O	X												Flash; orange
25.2	O	O	O	O	O	O	X														white orange Flashes
24.0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	

(0-20)
24.0 Kg

Material:	Calcinit & Sugar 52.9%
Date:	5-20-2014

Operator:	Jason Phillips

Temp:	24.1 °C
RH:	11.8%

Go	X
No Go	O

Notes: Phase 2 Batch (500g) Lights off, Ground, not dried

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X		orange flash
32.4	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
																					TIL (0 of 20)
																					32.4 kg

Material:	Calcinit + Sugar 52.9 %
Date:	4-14-14

Operator:	J. Phillips

Temp:	21.6°C
RH:	16.3%

Go	X
No Go	O

Notes:

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	O	X																			white/orange Flashes
32.4	X																				white/orange Flashes
28.8	O	O	O	O	O	O	O	O	O	O	O	O	X								white/orange Flash
25.2	O	O	O	O	O	O	O	X													white/orange Flash
24.0	O	O	O	O	O	O	O	O	O	O	O	X									white/orange Flash
21.6	O	X																			white/orange Flash
19.2	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	

TIL
(0-20)
19.2 Kg

Material:	Calcinit + Sugar 30.3%
Date:	5-15-2014

Operator:	Jason Phillips

Temp:	23.3
RH:	12.9%

Go	X
No Go	O

Notes: 30.3% sugar, ~~gas~~ Calcinit ground not dried, Phase 2 Batch 500g

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
24.0	O	O																			
36.0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
																					TIL (0 of 20) at >360 N

Material:	Calcinit + Sugar (30.3%)
Date:	12-3-13

Operator:	J. Phillips

Temp:	22.4°C
RH:	18.4 %

Go	X
No Go	O

Notes:
- Calcinit ground
- Powdered sugar
- No reports, smoke, etc
- Slight brown streaking on pins/plate

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
24.0	0	0	0																		
25.2	0	0	0																		
28.8	0																				
32.4	0																				
36.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

TIL

>36.0Kg

Material:	Calcinit 6 sugar 20.2%
Date:	5-19-2014

Operator:	Jason Phillips

Temp:	21.7°C
RH:	11.7%

Go	X
No Go	O

Notes: Phase 2, Calcinit undried, Ground.
Batch (500g) lights OFF

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
21.6	X																				White Orange Flash
19.2	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	TIL

Material:	Calcinit + H_2 Aluminum 49.7%
Date:	5-16-2014

Operator:	Jason Phillips

Temp:	20°C
RH:	20.5%

Go	X
No Go	O

Notes: Phase 2, Lights OFF

TIC 0-20
19.2 Kg

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	X																				Orange Flash
28.8	X	O	O																		" "
25.2	O	O	O	X																	" "
24.0	X																				" "
21.6	O	X																			" "
19.2	X																				" "
18.0	O	X																			" "
16.8	X																				" "
16.0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	

Material:	Calcinit + Al (49.7%)
Date:	4-18-14

Operator:	J. Phillips

Temp:	23.6 °C
RH:	20.7 %

Go	X
No Go	O

Notes:
- Valimet H-2 Al
- Calcinit ground (not dried)
- Lights OFF

TILO-20
@ 16 kg

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	O	O	X																		O orange/white flashes
32.4	X																				" "
24.0	X																				" "
21.6	O	O	O	O	O	O	O	O	O	O	X										" "
19.2	X																				" "
18.0	O	O	O	O	O	O	O	X													" "
16.8	O	O	X																		" "
16.0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	TIL (0 of 20) at 16.0 kg

Material:	Calcinit + Al (35.4%)
Date:	5-13-14

Operator:	J. Phillips

Temp:	20.0°C
RH:	25.9%

Go	X
No Go	O

Notes: -Valinet #-2 aluminum
-Calcinit ground, not dried
-Lights OFF
- Phase II batch (500g)

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	X																				white/orange flasher
32.4	O	X																			orange flasher
28.8	X																				" "
24.0	X																				" "
21.6	O	O	O	X																	" "
19.2	O	O	O	O	O	O	O	O	O	O	X										" "
18.0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	TIL

Material:	Calcinit + Al (1-5) 35.4 %
Date:	4-15-14

Operator:	J. Phillips

Temp:	21.8 °C
RH:	18.4 %

Go	X
No Go	O

Notes:
- Calcinit tested as received from fertilizer bag, ground
- Lights OFF

TIL 0-20
@ 18.0 kg

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
18.0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O		
19.2	O	O	O	O	O	O	X														orange/white flash
21.6	X																				white flashes
																					TIL (0 of 20) at 180 N

Material:	Calcinit + Al (26.5%)
Date:	5-14-14

Operator:	J. Phillips

Temp:	23.6 °C
RH:	21.8 %

Go	X
No Go	O

Notes: - Calcinit ground; not dried
- Valimet H-2 Al
- Lights OFF

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	X																				Orange flashes
32.4	X																				" "
28.8	O	O	O	O	O	O	O	O	O	O	X										orange flash
25.2	O	O	O	O	O	X															Orange flash
24.0	O	O	O	O	O	O	X														Orange flash
21.6	O	X																			Orange flash
19.2	X																				Orange flash
18.0	O	O	O	O	X																Orange flash
16.8	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X			" "
16.0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	

TIL
0-20 @
16.0 Kg

Material:	Calcinite + AL 26.5%
Date:	17-Apr-2014

Operator:	Jason Phillips

Temp:	21.2
RH:	26.0%

Go	X
No Go	O

Notes: Valinet H-2
– lights OFF

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	O	O	O	O	O	O	O	O	O	X											Orange Flash
32.4	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	

Material:	Calcinit + Sawdust (25.8%)
Date:	4-21-14

Operator:	J. Phillips

Temp:	241.°C
RH:	27.9 %

Go	X
No Go	O

Notes:
Woodmeal tested as received (not dried
- lights off, Calcinit ground. (not dried

TIL
0-20 @ 32.4 kg

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
32.4	O	O	O	O	O	X															Orang w/white flash
36.0	O	O	O	X																	Orange Flash
28.8	X																				Orange w/white flash
25.2	O	O	O	O	O	O	O	O	O	O	O	X									White flash
24.0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	

Material:	Calcinit + Sawdust (17.3%)
Date:	5-22-2014

Operator:	Jason Phillips

Temp:	22.5
RH:	25.0

Go	X
No Go	O

Notes:
- Calcinit ~~+ Sawdust~~ ground; not dried
- Lights OFF

TIL
24.0kg

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	O	O	O	O	O	O	O	O	O	O	O	O	O	X							Orange flash
32.4	O	O	X																		" "
28.8	X																				" "
25.2	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
																					TIL (0 of 20)
																					25.2 kg

Material:	Calcinit + woodmeal (17.3 %)
Date:	4-22-14

Operator:	Jason Phillips

Temp:	25.1
RH:	24.1

Go	X
No Go	O

Notes:
- Woodmeal tested as received (not dried)
- Calcinit ground (not dried)

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	X																				orange & white Flash
32.4	O	O	O	O	O	O	O	X													" "
28.8	O	O	O	O	O	O	O	O	O	X											" "
25.2	O	O	O	O	O	O	O	O	O	O	O	O	X								" "
24.0	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	

TIL
(0-2)
24.0 Kg

Material:	Calcinit to Sawdust ~~40.2%~~ 44.2%
Date:	5-23-2014

Operator:	Jason Phillips

Temp:	20.9°C
RH:	45.9%

Go	X
No Go	O

Notes: - Calcinit ground Not dried, Phase II batch (500g) Lights off

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36.0	X																				Orange flash
32.4	X																				" "
28.8	X																				" "
25.2	O	O	O	O	O	O	O	O	O	O	X										" "
24.0	O	X																			" "
21.6	O	O	O	O	O	O	O	O	O	O	O	X									" "
19.2	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	

Material:	Calcinit + Sawdust (44.2%)
Date:	4-24-14

Operator:	Jason Phillips

Temp:	22.7
RH:	14.0

Go	X
No Go	O

Notes:
- Calcinit ground (not dried)
- Sawdus not dried

TIL
1-20 @ 19.2 Kg

BAM Friction Test Results

Load (Kg)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Comments
36	O	X																			Orange Flash
32.4	X																				Orange Flash
28.8	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	

TIL
0-20
28.8 Kg

Material:	Calcinit 6 Sawdust 25.8%
Date:	5-21-2014

Operator:	Jason Phillips

Temp:	20.4°C
RH:	17.2%

Go	X
No Go	O

Notes: - lights off - Ground not dried. - Phase2 Batch (500g)
(Calcinit)

Appendix C: ESD Sensitivity Test Data

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Blank Image
0.05	0.625	X																				1
Run Ref. Image →		2																				
0.02	0.25	O	O	O	O	O	O	O	O	O	O	O	X									3
Run Ref. Image →		4	5	6	7	8	9	10	11	12	13	14	15									
0.012	0.15	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	16
Run Ref. Image →		17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
Run Ref. Image →																						
Run Ref. Image →																						
Run Ref. Image →																						
Run Ref. Image →																						
Run Ref. Image →																						
Run Ref. Image →																						

Material:	Calcinit + Sugar (52.9%)
Date:	12-5-13

Temp (°C):	22.8
RH (%):	19.5

Operator:	J. Phillips
Test Type:	Approaching ~~needle~~

Notes:

- ground Calcinit + powdered sugar
- Gas analyzer used for Go-No Go

TIL (0.020) at 0.15 J

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)
0.05	0.625
0.02	0.25
0.012	0.15

	Run #, Pre-shot/Post-shot									
	1	2	3	4	5	6	7	8	9	10
CO_2	426 / >	/	/	/	/	/	/	/	/	/
CO	41.6 / 95.9	/	/	/	/	/	/	/	/	/
CO_2	442 / 448	451 / 455	447 / 450	450 / 455	455 / 461	461 / 464	463 / 472	474 / 481	467 / 471	465 / 473
CO	42.0 / 46.2	41.6 / 47.4	41.2 / 45.5	41.1 / 46.4	40.9 / 45.6	40.6 / 45.2	40.3 / 46.8	40.0 / 46.7	39.3 / 45.7	39.2 / 48.0
CO_2	465 / 468	469 / 508	476 / 479	479 / 484	480 / 484	478 / 480	476 / 480	479 / 485	478 / 480	481 / 484
CO	38.6 / 41.4	38.4 / 46.7	38.1 / 41.4	38.1 / 41.8	38.0 / 42.0	37.9 / 41.5	37.8 / 42.5	37.5 / 39.5	37.7 / 40.1	37.3 / 41.3
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/

0.02	0.25
0.012	0.15

	11	12	13	14	15	16	17	18	19	20
CO_2	463 / 466	465 / 598	/	/	/	/	/	/	/	/
CO	39.1 / 45.6	38.9 / 47.2	/	/	/	/	/	/	/	/
CO_2	490 / 494	493 / 496	483 / 491	486 / 494	494 / 498	499 / 504	500 / 504	500 / 535	498 / 501	498 / 501
CO	37.2 / 40.9	37.2 / 41.0	36.9 / 41.1	37.1 / 41.3	36.8 / 40.2	36.8 / 40.5	36.8 / 39.3	36.8 / 42.7	36.8 / 41.0	36.8 / 41.5
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/

Material:	Calcinit + Sugar (52.9 %)
Date:	12-5-13

Temp (°C):	22.8
RH (%):	19.5

Operator:	J. Phillips
Test Type:	Approaching needle

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
.05	.625	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Run Ref. Image →		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
0.1	1.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Run Ref. Image →		23	24	25	26	27	28	29	38	39	40	41	42	43	44	45	46	47	48	49	50
0.25	3.125	0	0	0	0	0	0	X													
Run Ref. Image →		30	31	32	33	34	35	36													
Run Ref. Image →																					
Run Ref. Image →																					
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Run Ref. Image →																					
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Material:	CalCinit + Sug.
Date:	5-15-2014

Temp (°C):	21.9
RH (%):	13.9

Operator:	Jason Phillips
Test Type:	Approaching needle

Tit (0 of 20) at 1.25 J

Notes: 30.3% sugar, gas analizer used for go/no-go.
Calcinit ground, not dried.
Phase 2 batch (500g)

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)		Run #, Pre-shot/Post-shot									
			1	2	3	4	5	6	7	8	9	10
.05	.625	CO_2	602/609	608/625	622/625	630/635	632/634	633/636	639/643	629/633	643/650	648/654
		CO	39.0/42.7	38.2/42.7	38.2/41.7	38/40.9	37.9/39.8	37.8/40.9	37.7/40.5	37.8/40.5	37.3/41.7	37.1/41.3
0.1	1.25	CO_2	670/678	670/671	670/674	672/674	669/674	674/679	668/675	661/666	661/669	661/668
		CO	36.3/41.4	36.2/37.6	36.2/41.1	36.2/39.7	36.2/39.7	36.1/41.4	36/39.5	35.5/40.1	35.7/41.4	35.9/42.4
0.25	3.125	CO_2	665/681	667/695	672/689	672/707	671/707	670/694	657/718	/	/	/
		CO	36/50.7	36.1/55.8	36.1/52.1	36/59.9	35.9/56.5	35.9/49.9	35.7/60.0	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/

			11	12	13	14	15	16	17	18	19	20
.05	.625	CO_2	683/658	654/658	655/663	672/678	656/661	659/663	658/663	661/668	661/666	665/669
		CO	37.1/41.6	37/41.2	36.9/42.8	36.2/41.3	36.7/41.8	36.8/39.5	36.5/40.2	36.4/40.6	36.4/40.2	36.4/39.1
0.1	1.25	CO_2	661/668	658/665	664/675	665/669	666/676	666/671	667/671	662/669	664/668	665/671
		CO	35.9/40.6	35.7/39.3	35.4/41.8	35.6/40.7	35.6/40.3	35.5/39.3	35.6/39.6	35.5/40.9	35.7/40.8	35.3/40.4
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/

Material:	Calcinit & Sugar 30.3%
Date:	5-15-2014

Temp (°C):	21.9
RH (%):	13.9

Operator:	Jason Phillips
Test Type:	Approaching needle

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Blank Image
0.5	6.25	X																				1
Run Ref. Image →		2																				
0.25	3.125	X																				4
Run Ref. Image →		3																				
0.1	1.25	X																				5
Run Ref. Image →		6																				
0.05	0.625	O	O	O	O	O	O	O	O	O	O	O	O	O	X							7
Run Ref. Image →		8	9	10	11	12	13	14	15	16	17	18	19	20	21							
0.03	0.25	O	O	O	O	O	O	O	O	O	O	O	O	O	X							22
Run Ref. Image →		23	24	25	26	27	28	29	30	31	32	33	34	35	36							
0.012	0.15	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	37
Run Ref. Image →		38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	
Run Ref. Image →																						
Run Ref. Image →																						
Run Ref. Image →																						

Material:	Calcinit + Sugar (22.2 %)
Date:	12-2-13

Temp (°C):	21.7
RH (%):	21.1

Operator:	J. Phillips
Test Type:	Approaching needle

Notes:
- Calcinit ground
- heavy pyrotechnic effect during Go's (Flame)
- No audible reports detected

TIL (0 of 20) at 0.15 J

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)		Run #, Pre-shot/Post-shot									
			1	2	3	4	5	6	7	8	9	10
0.5	6.25	CO_2	469 / 544									
		CO	37.5 / 112.2									
0.25	3.125	CO_2	474 / >									
		CO	41.4 / >									
0.1	1.25	CO_2	481 / 560									
		CO	41.9 / 58.3									
0.05	0.625	CO_2	484 / 499	484 / 507	481 / 496	484 / 495	489 / 504	488 / 520	487 / 498	491 / 499	492 / 524	493 / 508
		CO	41.3 / 55.1	41.2 / 57.9	40.5 / 54.8	40.3 / 51.3	40.2 / 54.4	39.8 / 57.4	39.3 / 49.3	39.2 / 52.2	39.1 / 56.7	38.9 / 52.6
0.02	0.25	CO_2	423 / 430	433 / 436	443 / 444	445 / 453	454 / 459	460 / 464	466 / 471	469 / 478	478 / 481	466 / 472
		CO	36.4 / 42.8	36.3 / 41.9	36.2 / 42.0	36.3 / 42.9	36.3 / 41.9	36.2 / 40.7	36.2 / 43.4	36.4 / 42.5	36.3 / 43.1	35.7 / 44.5

Cap. (µF)	Energy (J)		11	12	13	14	15	16	17	18	19	20
0.05	0.625	CO_2	495 / 507	495 / 499	499 / 504	499 / >						
		CO	38.8 / 52.7	38.5 / 50.4	38.5 / 49.9	38.5 / >						
0.02	0.25	CO_2	471 / 477	476 / 481	480 / 487	482 / 556						
		CO	38.8 / 42.7	38.8 / 42.6	38.8 / 42.0	35.7 / 50.3						
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
0.012	0.15	' CO_2	487 / 491	492 / 498	494 / 498	497 / 500	499 / 501	500 / 503	503 / 506	505 / 509	505 / 512	506 / 507
		CO	35.7 / 40.7	35.6 / 40.0	35.6 / 39.1	35.6 / 40.2	35.7 / 39.2	35.7 / 38.6	35.7 / 39.7	35.6 / 38.9	35.6 / 40.3	35.7 / 39.6
0.012	0.15	" CO_2	509 / 512	494 / 498	499 / 501	502 / 507	501 / 503	504 / 505	506 / 510	508 / 510	509 / 512	511 / 516
		CO	35.5 / 39.8	35.6 / 38.5	35.6 / 39.4	35.6 / 39.9	35.5 / 39.6	35.5 / 39.5	35.5 / 39.9	35.5 / 40.7	35.4 / 40.7	35.6 / 39.6

Material:	Calcinit + Sugar (30.3 %)	Temp (°C):	21.7	Operator:	J. Phillips
Date:	12-2-13	RH (%):	21.1	Test Type:	Approaching needle

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.25	3.125	0	0																		
Run Ref. Image →		2	3																		
.5	6.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Run Ref. Image →		4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
.75	9.375	0	X																		
Run Ref. Image →		25	26																		
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
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Run Ref. Image →																					

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JEL (0-20) (0.25J)

Material:	Calcinit & sugar
Date:	5-19-14

Temp (°F):	19.38
RH (%):	14.9

Operator:	Jason Phillips
Test Type:	Approaching needle

Notes: 20.2% Sugar Phase 2

- Calcinit grand; not dried
- Phase II batch (500g)

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)
0.25	3.125
.5	6.25
.75	9.375

	Run #, Pre-shot/Post-shot									
	1	2	3	4	5	6	7	8	9	10
CO_2	585/597	588/601	/	/	/	/	/	/	/	/
CO	41.7/47.9	41.7/46.9	/	/	/	/	/	/	/	/
CO_2	~~605~~/	603/632	606/626	609/640	598/620	606/624	601/636	609/639	609/639	612/651
CO	~~41.7~~/	41.5/58.2	41.4/57.8	41.9/54.1	40.6/54.1	40.5/54.9	40.2/55.8	40.2/59.5	40.4/54.5	39.6/58.2
CO_2	615/653	609/654	/	/	/	/	/	/	/	/
CO	39.8/63.1	38.4/59.1	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/

.5	6.25

	11	12	13	14	15	16	17	18	19	20
CO_2	615/640	619/640	621/641	622/645	633/654	638/661	633/656	634/652	634/665	638/663
CO	39.2/54.7	39.2/49.4	39.4/51.8	39.1/49.7	39.2/51.7	38.6/53.1	38.7/51.2	38.4/53.7	38.5/59.1	38.4/53.3
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/

Material:	Calcinit Sugar 20.2% Phase 2
Date:	5-19-2014

Temp (°C):	19.3
RH (%):	14.9

Operator:	Jason Phillips
Test Type:	Approaching needle

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.05	0.625	X																			
Run Ref. Image →		2																			
0.02	0.25	O	X																		
Run Ref. Image →		4	5																		
0.012	0.15	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Run Ref. Image →		7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Run Ref. Image →																					
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Material:	Calcinit + Sugar (202%)
Date:	12-4-13

Temp (°C):	22.9
RH (%):	18.4

Operator:	J. Phillips
Test Type:	Approaching needle

Notes:
- Gas analyzer used for Go-No Go
- Calcinit ground
- powdered sugar

TIL (0 of 20) at 0.15 J

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)
0.05	0.625
0.02	0.25
0.012	0.15

	Run #, Pre-shot/Post-shot									
	1	2	3	4	5	6	7	8	9	10
CO_2	448 /635									
CO	42.1 /65.8									
CO_2	444 /449	445 /491								
CO	42.2/47.2	42.0 /52.4								
CO_2	448 /451	437 /440	447 /450	449 /452	458/463	464 /466	461 / 462	456 /459	445 /450	444 /449
CO	41.7/45.9	40.7 /44.7	40.8 /44.2	40.6 /44.1	40.2 /43.6	40.0 /44.0	40.0 /43.3	39.7 / 44.5	39.0 /43.2	38.7 /42.7
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/

0.012	0.15

	11	12	13	14	15	16	17	18	19	20
CO_2	447 /454	449 /453	450 /452	438 /442	440 /446	451 /454	453 /455	450 /451	447 /449	446 /449
CO	38.7 /42.9	38.5 /42.3	38.5 /41.6	37.9 /41.8	37.8 /41.8	37.7/41.2	37.7 /41.8	37.7 /41.5	37.6 /40.3	37.5 /41.0
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/

Material:	Calcinit + Sugar (20.2 %)
Date:	12-4-13

Temp (°C):	22.9
RH (%):	18.4

Operator:	J. Phillips
Test Type:	Approaching needle

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
.75	9.375	0	X																		
Run Ref. Image →		2	3																		
.5	6.25	0	0	0	X																
Run Ref. Image →		5	6	7	8																
.25	3.125	0	0	0	0	0	0	0	X												
Run Ref. Image →		10	11	12	13	14	15	16	17												
.1	1.25	0	0	0	0	X															
Run Ref. Image →		19	20	21	22	23	~~24~~	~~25~~													
.05	.625	0	0	0	X																
Run Ref. Image →		25	26	27	28																
.02	.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Run Ref. Image →		30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

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.25J

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Material:	Calcinit to Sugar	**Temp (°F):**	19.8°C	**Operator:**	Jason Phillips
Date:	5-20-2014	**RH (%):**	13.3	**Test Type:**	Approaching needle

Notes: 52.9% Sugar, Phase 2 Batch (500g)

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)		Run #, Pre-shot/Post-shot									
			1	2	3	4	5	6	7	8	9	10
.75	9.375	CO_2	474/502	489/558	/	/	/	/	/	/	/	/
		CO	40.9/78.2	41.8/96.7	/	/	/	/	/	/	/	/
.5	6.25	CO_2	509/540	576/548	529/568	538/594	/	/	/	/	/	/
		CO	41.6/74.7	41.3/63.9	41.4/72.5	41.2/78.3	/	/	/	/	/	/
.25	3.125	CO_2	549/566	538/569	561/571	570/581	576/586	581/597	587/622	591/[illegible]	/	/
		CO	40.3/58.6	40.3/51.8	39.8/50.5	39.6/54.2	39.4/57.9	39.4/58.8	39.2/73.2	39.1/[illegible]	/	/
.1	1.25	CO_2	601/609	606/616	610/618	615/619	617/[illegible]	/	/	/	/	/
		CO	38.6/45.6	38.6/46.8	38.4/44.4	38.3/42.7	38.2/111.6	/	/	/	/	/
.05	.625	CO_2	629/635	636/641	636/640	640/>	/	/	/	/	/	/
		CO	38.0/42.4	37.8/42.8	37.8/41.9	37.7/79.9	/	/	/	/	/	/

			1	2	3	4	5	6	7	8	9	10
			11	12	13	14	15	16	17	18	19	20
.02	.25	CO_2	644/647	649/651	651/654	658/659	658/658	657/659	648/650	648/651	651/653	651/653
		CO	37.6/40.9	37.5/39.9	37.4/40.3	37.3/38.9	37.2/38.9	37.1/40.7	36.8/38.7	37.0/41.1	37.0/40.5	38.8/39.2
.02	.25	CO_2	651/653	651/655	652/654	650/653	649/652	650/654	648/659	649/651	650/651	651/652
		CO	36.9/41.3	36.9/40.2	36.8/40.2	36.7/39.6	36.7/40.1	36.6/38.4	36.7/40.5	36.7/40.4	36.7/39.5	37.0/39.9
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	(0-20) .25 D		/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/

Material:	Calcinit & sugar 52.9%
Date:	5-20-2014

Temp (°C):	19.8
RH (%):	13.3

Operator:	Jason Phillips
Test Type:	Approaching needle

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.006	0.075	X																			
Run Ref. Image →		2																			
0.002	0.025	⊗	⊗	⊗	⊗	X	Flash & Smoke														
Run Ref. Image →		4	5	6	7	8															
0.001	0.0125	⊗	⊗	⊗	O	⊗	⊗	O	O	⊗	O	⊗	⊗	O	O	⊗	⊗	O	O	⊗	O
Run Ref. Image →		10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Run Ref. Image →																					
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Material:	Calcinit + AL (49.7%)
Date:	18-Apr-2014

Temp (°C):	20.8
RH (%):	23.8

Operator:	Jason Phillips
Test Type:	Approaching ~~needle~~

Notes:
- Valinet H-2 AL
- Calcinit ground (not dried)

TIL (0 of 20) at 0.0125 J

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.02	0.25	X		~large	flash	+ smoke															
Run Ref. Image →		2																			
0.012	0.15	X		~large flash	+	smoke															
Run Ref. Image →		4																			
0.006	0.075	X		- flash + smoke																	
Run Ref. Image →		6																			
0.002	0.025	X		- flash + smoke																	
Run Ref. Image →		8																			
0.001	0.0125	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Run Ref. Image →		10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

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Material:	Calcinit + Al (3548)
Date:	5-13-14

Temp (°F):	22.2
RH (%):	20.6

Operator:	J. Phillips
Test Type:	Approaching needle

TIL (0 of 20) at 0.0125 J

Notes:

- Valimet H-2 aluminum
- Phase II SOO_3 batch
- Camera used for Go-No Go

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.5	6.25	X		+ smoke																	
Run Ref. Image →		2																			
0.05	0.625	X		+ smoke																	
Run Ref. Image →		4																			
0.002	0.025	X	⊗	X	+ smoke																
Run Ref. Image →		6	14	12																	
.0002	0.0025	⊗																			
Run Ref. Image →		8																			
.0005	0.00625	⊗																			
Run Ref. Image →		10																			
.001	.0125	O	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	O
Run Ref. Image →		12	13	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
.0006	.075	X		+ smoke																	
Run Ref. Image →		16																			
Run Ref. Image →																					
Run Ref. Image →																					

Blank Image
1
3
5
7
9
11
15

Material:	Calcinit + Al H-2, 35.4%
Date:	4-15-14

Temp (°C):	18.3
RH (%):	19.3

Operator:	J Phillips
Test Type:	Approaching needle

TIL (0.F20) at 0.0125 J

Notes:
- Calcinit ground as received from fertilizer bag

O: Nothing

⊗: Small Aluminum flyers seen; no flash, smoke, or propagation

X: Definite reaction; Flash, smoke

- post shot images at 0.5, 0.002, 0.00032, 0.0005

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.006	0.075	X		- flash + smoke																	
Run Ref. Image →		2																			
0.002	0.025	O	O	X		- flash + smoke															
Run Ref. Image →		4	5	6																	
0.001	0.0125	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Run Ref. Image →		~~8~~ 7	~~9~~ 8	~~10~~ 9	~~11~~ 10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

Blank Image
1
3
27

Material:	Calcinit + Al (26.5%)
Date:	5-14-14

Temp (°C):	22.5
RH (%):	19.5°

Operator:	J. Phillips
Test Type:	Approaching needle

TIL (0 of 20) at 0.0125 J

Notes:

- Camera used for Go-No Go
- Calcinit ground, not dried
- Vallinat H-2 Al

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.002	0.025	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗
Run Ref. Image →		3	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0.006	0.075	X		- Flash + smoke																	
Run Ref. Image →		5																			
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

Blank Image
2
4

Material:	Calcinit + Al (26.5 °C)
Date:	4-17-14

Temp (°C):	20.1
RH (%):	24.8

Operator:	J. Phillips
Test Type:	Approaching needle

TIL (0 of 20) at 0.025 J

Notes:
- Valimet H-2 Al

⊗ : Al Plyers seen ONLY → No Go

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
.006	.075	X	Flash and Smoke																		
Run Ref. Image →		2	3	4	5	6	7	8	9	10											
.002	.025	X	Flash and Smoke																		
Run Ref. Image →		4																			
.001	.0125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Run Ref. Image →		6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Run Ref. Image →																					
				~~.001~~																	
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

TIC .0125 J

(0-20)

Blank Image
1
3
5

Material:	calcinit + H_2 Aluminum
Date:	5-16-2014

Temp (°F):	17.1
RH (%):	18

Operator:	Jason Phillips
Test Type:	Approaching needle

Notes:
Calcinit + H_2 Aluminum 49.7% Aluminum Phase 2 Batch

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.75	9.375	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Run Ref. Image →		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

Blank Image
2

Material:	Calcinit + Sawdust (44.2%)
Date:	4-24-14

Temp (°C):	24.0
RH (%):	12.9

Operator:	J. Phillips
Test Type:	Approaching needle

TK (0.020)
> 9.375 J

Notes:
- Calcinit ground (not dried)
- Sawdust not dried

- Slight odor of burnt wood on all shots

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)		Run #, Pre-shot/Post-shot									
			1	2	3	4	5	6	7	8	9	10
0.75	9.375	CO_2	640/639	649/648	659/660	666/665	677/~~690~~ 710	677/678	682/680	691/692	694/693	695/712
		CO	41.3/42.1	41.7/43.0	41.8/42.8	41.6/42.1	41.3/45.4	40.5/41.5	40.3/41.3	39.9/41.0	39.7/40.5	39.4/42.3
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/

			11	12	13	14	15	16	17	18	19	20
0.75	9.375	CO_2	697/695	700/698	702/702	666/667	651/661	658/659	661/661	660/660	665/667	666/669
		CO	39.1/40.2	38.8/39.5	38.6/39.8	36.5/37.7	37.6/39.0	37.6/38.6	37.6/38.6	37.4/38.2	37.3/39.0	37.4/39.5
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/

Material:	Calcinit + Sawdust (44.2 %)
Date:	4-24-14

Temp (°C):	24.0
RH (%):	12.9

Operator:	J. Phillips
Test Type:	Approaching needle

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
.75	9.375	X																			
Run Ref. Image →		2																			
.5	6.25	O	O	O	X																
Run Ref. Image →		4	5	6	7																
.25	3.125	O	O	O	X																
Run Ref. Image →		9	10	11	12																
.1	1.25	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Run Ref. Image →		14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

Blank Image
1
3
8
13

Material:	Calcinit & Sandust 25%
Date:	5-21-14

Temp (°F):	18.2°C
RH (%):	14.9

Operator:	Jason Phillips
Test Type:	Approaching needle

Notes:
- Phase 2 (500g) Batch
- Calcinit ground, not dried
- ~~Canon~~ Gas analyzer used for Go-No Go

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)
.75	9.375
.5	6.25
.25	3.125
.1	1.25

	Run #, Pre-shot/Post-shot									
	1	2	3	4	5	6	7	8	9	10
CO_2	508/554	/	/	/	/	/	/	/	/	/
CO	41.1/91.4	/	/	/	/	/	/	/	/	/
CO_2	525/541	536/557	544/558	557/627	/	/	/	/	/	/
CO	41.7/67.2	41.3/70.4	41.1/73.2	40.8/86.5	/	/	/	/	/	/
CO_2	557/580	576/589	581/603	586/630	/	/	/	/	/	/
CO	40.2/61.2	40.2/59.2	40.1/61.8	40.4/69.4	/	/	/	/	/	/
CO_2	596/601	602/605	606/610	611/614	612/617	615/621	618/626	623/628	628/632	630/635
CO	39.6/47.2	39.3/42.5	39.4/44.7	38.9/43.1	39.1/43.8	39.0/42.9	38.8/45.3	38.6/43.2	38.6/43.3	38.5/43.2
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/

.1	1.25

	11	12	13	14	15	16	17	18	19	20
CO_2	638/640	648/652	639/643	641/643	641/645	645/647	646/651	353/360	367/378	384/394
CO	38.3/43.3	38.3/43.9	38.2/43.0	38.2/43.2	38.0/43.6	38.1/42.7	38.1/42.3	35.6/44.8	35.7/44.5	35.7/43.0
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/

TIL 1.25 J
(0-20)

Material:	Calcinit & Sawdust 25.8%
Date:	5-21-2014

Temp (°C):	18.2
RH (%):	14.9

Operator:	Jason Phillips
Test Type:	Approaching needle

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.5	6.25	O																			
Run Ref. Image →		2																			
.75	9.375	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Run Ref. Image →		4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →						Orange color on every run															
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

Blank Image
1
3

Material:	Calcinit & woodmeal
Date:	4-21-14

Temp (°C):	17.0
RH (%):	35.7

Operator:	Jason Phillips
Test Type:	Approaching needle

Notes: Gas analyzer used for go/no-go.
- Woodmeal tested as received. (not dried)
- Calcinit ground. (not dried)

TIL 79.375 J

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)		Run #, Pre-shot/Post-shot									
			1	2	3	4	5	6	7	8	9	10
0.5	6.25	CO_2	587/587	/	/	/	/	/	/	/	/	/
		CO	37.3/37.3	/	/	/	/	/	/	/	/	/
0.75	9.375	CO_2	610/612	617/619	612/612	622/622	628/629	633/634	634/635	636/637	638/639	639/640
		CO	37.0/37.1	37.0/37.8	37.0/37.2	36.7/36.9	36.7/37.0	36.6/36.9	36.8/37.4	36.7/36.9	36.6/37.0	36.5/37.1
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/

- Orange color seen in ALL shots

			11	12	13	14	15	16	17	18	19	20
0.75	9.375	CO_2	639/637	628/626	625/623	627/627	629/629	629/630	630/630	633/634	639/640	643/642
		CO	36.3/36.7	36.2/36.7	36.1/36.4	36.2/36.3	36.0/36.5	35.9/36.8	35.8/36.3	35.6/36.4	35.5/36.5	35.3/35.5
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/

Material:	Calcinit + Sawdust (25.3 %)
Date:	4-21-14

Temp (°C):	17.0
RH (%):	36.2

Operator:	Jason Phillips
Test Type:	Approaching needle

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.75	9.375	X																			
Run Ref. Image →		2																			
0.5	6.25	O	X																		
Run Ref. Image →		4	5																		
.25	3.125	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Run Ref. Image →		7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

Blank Image
1
3
6

Material:	Calcinit+SD 17.3%
Date:	5-22-2014

Temp (°F):	19.5
RH (%):	29.1

Operator:	Jason Phillips
Test Type:	Approaching needle

Notes:
- Gas analyzer used for Go-No Go
- Calcinit ground; not dried

Phase II batch (500g)

TIL
3.125 J

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)		Run #, Pre-shot/Post-shot									
			1	2	3	4	5	6	7	8	9	10
0.75	9.375	CO_2	495 / 552	/	/	/	/	/	/	/	/	/
		CO	40.5 / 80.3	/	/	/	/	/	/	/	/	/
0.5	6.25	CO_2	525 / 551	543 / 594	/	/	/	/	/	/	/	/
		CO	40.5 / 62.0	39.4 / 75.8	/	/	/	/	/	/	/	/
0.25	3.125	CO_2	556 / 574	572 / 589	580 / 603	585 / 605	591 / 604	593 / 609	585 / 609	579 / 593	583 / 602	592 / 605
		CO	39.5 / 51.6	39.1 / 50.8	39.0 / 57.6	39.1 / 57.7	38.7 / 51.1	39.7 / 53.8	38.5 / 56.8	38.2 / 51.4	38.1 / 52.0	38.0 / 50.3
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/

			11	12	13	14	15	16	17	18	19	20
0.25	3.125	CO_2	597 / 614	602 / 620	606 / 630	611 / 640	618 / 635	622 / 650	625 / 635	626 / 647	630 / 642	636 / 650
		CO	38.0 / 54.5	37.9 / 50.6	37.8 / 56.2	37.7 / 55.7	37.4 / 56.6	37.2 / 57.6	37.4 / 47.1	37.5 / 58.3	37.5 / 51.0	37.3 / 55.1
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/

Material:	Calcinit + Sawdust (17.3%)
Date:	5-22-14

Temp (°C):	19.5
RH (%):	29.1

Operator:	J. Phillips
Test Type:	Approaching needle

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.75	9.375	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Run Ref. Image →		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

Blank Image
1

TIL (0.020)
9.375 J

Material:	Calcinit + Sawdust (17.3%)	**Temp (°C):**	20.6	**Operator:**	Jason Phillips
Date:	4-22-14	**RH (%):**	32.4	**Test Type:**	Approaching needle

Notes:
- Woodmeal tested as recieved. (not dried)
- Calcinit ground (not dried)

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)
0.75	9.375

	Run #, Pre-shot/Post-shot									
	1	2	3	4	5	6	7	8	9	10
CO_2	492/492	514/513	530/529	544/544	543/553	558/559	561/560	555/554	562/563	569/568
CO	40.3/40.5	40.3/41.0	40.2/40.7	39.5/40.2	39.2/39.1	38.8/39.3	39.0/39.5	38.4/38.9	38.4/39.4	38.0/38.6
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/

0.75	9.375

	11	12	13	14	15	16	17	18	19	20
CO_2	574/572	582/582	596/594	609/609	618/618	623/623	630/631	635/633	635/635	633/634
CO	37.7/38.3	37.5/38.2	37.2/37.2	37.1/37.5	36.9/37.8	36.8/37.4	36.8/37.3	36.6/36.7	36.6/37.0	36.7/36.9
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/
CO_2	/	/	/	/	/	/	/	/	/	/
CO	/	/	/	/	/	/	/	/	/	/

Material:	Calcinit + Sawdust (17.3%)
Date:	4-22-14

Temp (°C):	20.6
RH (%):	32.4

Operator:	J. Phillips
Test Type:	Approaching needle

ABL ESD Test Results

Cap. (µF)	Energy (J)	Run # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
.75	9.375	X																			
Run Ref. Image →		2	3																		
.5	6.25	X																			
Run Ref. Image →		4	1																		
.25	3.125	0	0	0	0	0	0	X													
Run Ref. Image →		6	7	8	9	10	11	12													
.1	1.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	
Run Ref. Image →		14	15	16	17	18	19	20	21	22	[illegible]	24	25	26	27	28	29	30	31	32	
.05	.625	0	0	0	0	0	0	0	0	0	023	0	0	0	0	0	0	0	0	0	0
Run Ref. Image →		34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					
Run Ref. Image →																					

TTL
0.20
.625 J

Blank Image
1
3
5
13
33

Material:	Calcinit & Sawdust	Temp (°F):	70.4°C	Operator:	Jason Phillips
Date:	5-23-2014	RH (%):	47.9	Test Type:	Approaching needle

Notes:
Sawdust 44.2% Phase 2 Batch (500g)

ABL ESD Gas Analyzer Results (ppm)

Cap. (µF)	Energy (J)		Run #, Pre-shot/Post-shot									
			1	2	3	4	5	6	7	8	9	10
.75	9.375	CO_2	790/868	/	/	/	/	/	/	/	/	/
		CO	38.1/116.1	/	/	/	/	/	/	/	/	/
.5	6.25	CO_2	776/829	/	/	/	/	/	/	/	/	/
		CO	40.4/77.7	/	/	/	/	/	/	/	/	/
.25	3.125	CO_2	765/779	747/763	616/634	618/631	610/625	610/619	612/671	/	/	/
		CO	41.0/64.8	40.7/61.9	36.6/57.1	36.9/56.4	37.0/61.8	36.7/62.0	36.8/77.2	/	/	/
.1	1.25	CO_2	601/608	590/597	589/625	585/588	578/583	565/583	565/574	563/572	562/569	559/568
		CO	36.4/45.9	36.6/45.3	36.5/51.4	36.7/44.5	36.4/46.3	36.5/47.8	37.1/45.8	36.5/48.1	36.5/45.3	36.5/44.4
.05	.625	CO_2	589/591	590/597	592/595	590/601	591/595	595/595	589/594	589/602	590/597	593/596
		CO	36.5/41.2	36.0/43.1	36.4/41.5	36.2/42.9	36.3/42.5	36.3/40.2	36.4/43.8	36.2/42.7	36.1/41.5	36.2/41.9

			11	12	13	14	15	16	17	18	19	20
.1	1.25	CO_2	565/572	569/576	571/578	571/574	574/583	580/583	584/592	588/600	588/959	/
		CO	36.5/44.8	36.3/44.4	36.5/44.3	36.3/41.1	36.2/46	36.4/42.0	36.3/45.7	36.5/44.8	36.3/90.1	/
.05	.625	CO_2	587/600	595/614	596/635	597/604	596/600	600/603	604/608	608/612	612/617	615/622
		CO	36.7/43.2	36.4/47.5	36.3/49.4	36.5/44.3	36.1/42.6	36.1/43.1	36.3/43.1	36.0/41.8	36.1/47.3	36.2/40.4
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/
		CO_2	/	/	/	/	/	/	/	/	/	/
		CO	/	/	/	/	/	/	/	/	/	/

0-20 .625

Material:	Calcinit & Sawdust 44.2%	Temp (°C):	47.9	Operator:	Jason Phillips
Date:	5/23/2014	RH (%):	70.4	Test Type:	Approaching needle