U.S. Department
of Transportation

**Pipeline and Hazardous
Materials Safety
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

June 9, 2020

Joe Cruse
Quality / Lab Manager
CC Metals and Alloys, LLC
1542 North Main Street
PO Box 217
Calvert City, KY 42029

Reference No. 20-0024

Dear Mr. Cruse:

This letter is in response to your March 9, 2020, email requesting clarification of the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) applicable to the classification of "UN1408, Ferrosilicon, with 30 percent or more but less than 90 percent silicon." You state that your company has transported this material as a non-hazardous material based on third-party testing that confirmed that the material does not meet the definition of a Division 4.3 (dangerous when wet) material. However, you state that the U.S. Coast Guard will not accept the third-party testing information you have previously provided them and you seek confirmation that the product you transport does not meet the criteria of a Division 4.3 (dangerous when wet) material.

Under 49 CFR 173.22, it is the shipper's responsibility to properly classify a hazardous material and such determinations are not required to be verified by this Office. Furthermore, PHMSA does not certify a shipper's determination of whether a material is hazardous or not. However, based on the third-party test results you provided with your email, it is the opinion of this Office that the ferrosilicon manufactured by your company does not meet the criteria of a Division 4.3 (dangerous when wet) material. Note that exclusion from Divisions 4.3 alone does not necessarily indicate that the material is not subject to the HMR. To satisfy the request of the U.S. Coast Guard you may consider conducting additional tests to verify that the product does not meet any other hazard classification criteria, (e.g., Division 6.1).

I hope this information is helpful. Please contact us if we can be of further assistance.

Sincerely,

Dirk Der Kinderen
Chief, Standards Development Branch
Standards and Rulemaking Division

Cruse
20-0004

Dodd, Alice (PHMSA)

From: INFOCNTR (PHMSA)
Sent: Monday, March 9, 2020 3:40 PM
To: Hazmat Interps
Subject: FW: Request For Formal Letter of Interpretation On Hazmat Classification
Attachments: US DOT HAZ MAT Exemption Testing Results.pdf; Cruse Letter.docx

Hello Alice and Ikeya,

Below is a request for letter of interpretation with attached PDF test data.

Thanks,

Jonathon, HMIC

From: Joe Cruse [mailto:jcruse@ccmetals.com]
Sent: Monday, March 9, 2020 1:01 PM
To: INFOCNTR (PHMSA) <INFOCNTR.INFOCNTR@dot.gov>
Cc: Daniela Rost <d.rost@ftamericas.com>; David Tuten <dtuten@ccmetals.com>
Subject: Request For Formal Letter of Interpretation On Hazmat Classification

Good afternoon,

I was referred to this email address by Josh, at the USDOT Hazmat Hotline. We are requesting a formal letter of interpretation on the results of our testing of the Ferrosilicon products (Si >30% and <90% content) we produce and ship at CC Metals and Alloys, LLC in Calvert City, KY. This facility performed the testing, as prescribed for materials classification in 49 CFR Section 173, Appendix E, Division 4 (Sections 1-4), in the 1990's, when the facility was owned by VIAG, and was named SKW Metals and Alloys, Inc.

To give some background to our situation, the company produces Ferrosilicon at its single-site production facility in Calvert City, KY, located on the banks of the Tennessee River. We ship our product to both domestic and foreign locations via truck, railcar, barge, and sea container. In the mid-1990's, our company (as SKW Metals and Alloys, Inc.), along with all of our other North American and European competitors, undertook a testing regimen of our Ferrosilicon per 49 CFR Section 173, Appendix E, Division 4 (Sections 1-4). We performed all testing in-house, and also had a third party laboratory perform the same testing, on our entire line of Ferrosilicon products. In all cases, our testing results (in-house lab and third party lab) all demonstrated that none of our Ferrosilicon products met the criteria for classification as "Hazardous When Wet" materials, per the criteria contained within 49 CFR, Section 173, Appendix E, Division 4. Our competitors testing showed the same conclusions. At that point, we determined that our entire product line of Ferrosilicon was not subject to HMR, as did our competitors. Today, this facility, as CC Metals and Alloys, LLC, still produces those same Ferrosilicon products, under the same production methods and environment; there has been no change to the composition or other aspects of the products we produce and ship here.

A short time ago, our company was approached by the US Coast Guard's Marine Safety Unit, based out of Paducah, KY, to inquire as to why we ship our Ferrosilicon products from our river dock facility without the hazmat classification. We've shared our testing results and our formal declaration of our product not meeting hazard class and that the products are not subject to HMR. They are not satisfied with this, and are looking for some kind of formal response from USDOT on our determination. In my phone conversation with the Hazmat Hotline, Josh suggested I contact you via email on this matter. We are looking for some way to meet the local US Coast Guard MSU's request. I know that it is on the Shipper to demonstrate that our products do not meet the criteria of Division 4.3 or other hazard classes, to show that

they are not subject to the HMR. We believe we have successfully done so. We are asking USDOT to review our testing results, and issue to us a formal letter of interpretation of our testing results that we can show to the US Coast Guard MSU, and satisfy their request. We appreciate your help in this matter, and if you have any additional questions on this matter, please do not hesitate to call or email me, per my contact information below.

Thank you,

Joe Cruse
Quality/Lab Mgr
CC Metals and Alloys, LLC
1542 North Main Street (PO Box 217)
Calvert City, KY 42029
270.395.2103 (Office)
270.703.8833 (cell)

CRS

CLIMAX RESEARCH SERVICES

39205 COUNTRY CLUB DRIVE • FARMINGTON HILLS, MI 48331 • (810) 489-0720 • FACSIMILE (810) 489-8997

CRS Project Number: S-6747

January 27, 1997

Mr. Timothy H. Hall
SKW Metals and Alloys, Inc.
P.O. Box 217
Calvert City, Kentucky 42029

Dangerous When Wet Materials (as set forth in 49 CFR Section 173, Appendix E, Division 4, Sections 1, 2, 3 and 4) Evaluation of 50% FeSi, Regular, Lab ID: 2124A, Bin Number: 300.

Dear Mr. Hall:

We have completed our gas evolution measurements and the flammability tests, per Code 49 CFR 173, Appendix E division 4, Sections 1, 2, 3 and 4, on the sample material that you submitted in late December 1996. The material we received from SKW was labeled as: 50% FeSi, Regular. The results were as follows:

(1) no gas was evolved and no spontaneous ignition occurred.

(2) no gas was evolved and no spontaneous ignition occurred.

(3) no gas was evolved and no spontaneous ignition occurred.

(4) while some gas did evolve, the average rate never exceeded 1 liter per kilogram per hour in the sample tested. The gas was not flammable nor did it spontaneously ignite in any of the tests.

On the basis of these test results, the ferrosilicon material listed above would not fit the definition in 49 CFR Section 173, Appendix E, Division 4, Sections 1, 2, 3 and 4 as "Dangerous When Wet".

Sincerely,

James R. Lakin / by DARCIE L. MONROE
Engineering Associ

James R. Lakin
Business Operations Manager

CLIMAX RESEARCH SERVICES

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January 27, 1997

Mr. Timothy H. Hall
SKW Metals and Alloys, Inc.
P.O. Box 217
Calvert City, Kentucky 42029

Re: Gas Evolution Measurements and Flammability Tests.
CRS Project Number: S-6747

Dear Mr. Hall:

We have completed the gas evolution measurements and the flammability tests, per Code 49 CFR 173, Appendix E division 4, Sections 1, 2, 3 and 4, on the sample material that you submitted in late December 1996. The identification of the material submitted and its chemistry specification are listed below.

50% FeSi, Regular	Al	Si	Cr	Mn	Ti	Ca	P
Specification, %:	<1.25	47-51	<0.2	<0.75	<0.1	<0.3	
Lab ID: 2124A							
Bin Number: 300							
Chemistry:	0.19	47.30	0.12	0.37	0.041	0.00	0.030

Section 1 (Procedure & Results)

A small piece of the aforementioned material, approximately 2 mm in diameter, was placed in a trough of distilled water at 20°C. *No gas evolution was observed, nor did the sample spontaneously ignite.*

Section 2 (Procedure & Results)

A small piece of the material was placed in the center of a filter paper, which was floating in distilled water at 20°C. *No gas evolution was observed, nor did the sample spontaneously ignite.*

Section 3 (Procedure & Results)

A small pile with an indentation in the center, approximately 2cm high by 3cm in diameter, was made of the material. A few drops of water were added to the hollow. *No gas evolution was observed, nor did any of the sample spontaneously ignite.*

Section 4 (Procedure & Results)

Representative samples were taken from the lot of material submitted, and using a hammer and chisel the pieces were crushed individually. The larger pieces and the fines were screened off from each sample. Only material of +20 mesh to -8 mesh was used in the gas evolution tests. Three reaction vessels were set-up and filled with a deionized water. The reaction vessels were 1000 ml beakers each containing a small flask with 25.0 grams of sample material. Above each small flask a 50 ml buret was positioned up-side-down, which was also filled with deionized water and placed over the end of the flask making a water seal. The level in the buret was monitored for the next 5 days. Gas evolution data, measured in milliliters, is attached.

Following the gas evolution tests, the burets were submerged, still up-side-down, up to the stopcocks in water. A small flame was placed near the tip of the

buret and the stopcock was opened to allow the gas inside the burets to be pushed out into the flame by the water pressure. Flammability observations are noted at the bottom of the gas evolution data. The gas was not analyzed to determine its composition.

If you have questions about the test or these results please contact me. Thank you for doing business with us.

Sincerely,

James R. Lakin / by DARLIE L. MONROE
Engineering Associate

James R. Lakin
Business Operations Manager

Gas Evolution Measurements
(Water Volume Displacement)

		50% FeSi			Avg Rate
		1	2	3	(l/kg/hr)
	Time (hours)	(ml)	(ml)	(ml)	
Day 1	0.00	0.0	0.0	0.0	
	1.00	0.0	0.0	0.0	0.000
	2.00	0.0	0.0	0.0	0.000
	3.00	0.0	0.0	0.0	0.000
	4.00	0.0	0.0	0.0	0.000
	5.00	0.0	0.0	0.0	0.000
	6.00	0.1	0.1	0.0	0.003
	7.00	0.1	0.1	0.0	0.001
	8.00	0.1	0.1	0.0	0.000
	17.50	0.1	1.1	0.2	0.002
Day 2	26.00	0.2	2.0	1.0	0.003
	41.50	1.2	15.8	4.2	0.015
Day 3	50.00	2.3	23.3	7.4	0.019
	65.50	3.4	32.3	13.4	0.014
Day 4	89.50	9.3	44.8	23.5	0.016
Day 5	98.00	11.2	47.2	26.3	0.011
Flammable (F)					
Ignitible (I) *					
Not Flammable (NF)		X	X	X	

* Ignitible = the gas will ignite but will not sustain a continuous flame.

Ferrosilicon, 50%, Regular Grade

Specification Chemistry, %:

Al	Si	Cr	Mn	Ti	Ca	P
<1.25	47-51	<0.20	<0.75	<0.10	<0.30	

Sample I.D. Number: 2124B
Bin Number: 300
Observed Chemistry of Tested Sample, %:

Al	Si	Cr	Mn	Ti	Ca	P
0.19	47.30	0.12	0.37	0.041	0.00	0.030

Test 1:
A small quantity (approximately 2 mm diameter) of the above material was placed in a trough of distilled water at 20° C and observed to see whether any gas evolved and if it spontaneously ignited. Test 1 was performed in triplicate on the above material.

Result:
Neither evolution of gas nor spontaneous ignition was observed any of the three times Test 1 was performed.

Test 2:
A small quantity (approximately 2 mm diameter) of the above material was floated on a piece of filter paper in distilled water at 20° C and observed to see whether any gas evolved and if it spontaneously ignited. Test 2 was performed in triplicate on the above material.

Result:
Neither evolution of gas or spontaneous ignition was observed in any of the three times Test 2 was performed.

Test 3:
The test material was formed into three piles approximately 2 cm high by 3 cm wide. An indentation was formed in the top of each pile and a few drops of water were added to each hollow. Each pile was observed to see whether any gas evolved and if it spontaneously ignited. Test 3 was performed in triplicate on the above material.

Result:
Neither evolution of gas nor spontaneous ignition was observed any of the three times Test 3 was performed.

Test 4:
Enough water at 20° C to cover the sample, 10ml to 20ml, was added to a dropping funnel. The spout of the dropping funnel was inserted into one hole of a #14, two-hole stopper; a tube for conveying any gas produced into the collection cylinder, a gas buret, was inserted into the other hole of the stopper; the far end of the tube was inserted into the end of the collection cylinder.

The gas buret is glass, 50 ml capacity, marked in individual ml units with each ml subdivided into 0.1 ml increments. The gas buret was filled with water, inverted and stood in a water trough. The gas tube in the previous paragraph was inserted into the bottom end of the gas buret and any gas produced was measured by observing the displacement of the water in the top of the buret.

25 g of the above listed material was added to each of three 100 ml conical flasks with #14 neck size. The stoppers mentioned above were inserted into the neck of the conical flasks. The stopcocks were opened and 10 ml to 20 ml of the 20° C distilled water, enough to completely cover the sample, was allowed to flow into the flasks. A timer was started and readings of any gas evolved were taken every hour for five days. From this data the average rate of gas production per hour was calculated for the five days.

Result:
The Gas Collection data for Ferrosilicon, 50%, Regular Grade is detailed on the following page:

Gas Test on Regular Grade 50% FeSi

January 24, 1996

Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr
1	0.0	0.0	0.0	0.000	31	0.4	0.1	0.3	0.000	61	0.7	0.4	0.7	0.000	91	0.7	0.8	0.7	0.000
2	0.0	0.0	0.0	0.000	32	0.4	0.1	0.3	0.000	62	0.7	0.4	0.7	0.000	92	0.7	0.8	0.7	0.000
3	0.0	0.0	0.0	0.000	33	0.4	0.1	0.3	0.000	63	0.7	0.4	0.7	0.000	93	0.7	0.8	0.7	0.000
4	0.0	0.0	0.0	0.000	34	0.4	0.1	0.3	0.000	64	0.7	0.6	0.7	0.003	94	0.7	0.8	0.7	0.000
5	0.0	0.0	0.0	0.000	35	0.4	0.1	0.3	0.000	65	0.7	0.6	0.7	0.000	95	0.7	0.8	0.7	0.000
6	0.0	0.0	0.0	0.000	36	0.4	0.1	0.3	0.000	66	0.7	0.6	0.7	0.000	96	0.7	0.8	0.7	0.000
7	0.0	0.0	0.0	0.000	37	0.4	0.1	0.3	0.000	67	0.7	0.6	0.7	0.000	97	0.7	0.8	0.7	0.000
8	0.0	0.0	0.0	0.000	38	0.4	0.1	0.3	0.000	68	0.7	0.6	0.7	0.000	98	0.7	0.8	0.7	0.000
9	0.0	0.0	0.0	0.000	39	0.4	0.1	0.3	0.000	69	0.7	0.6	0.7	0.000	99	0.7	0.8	0.7	0.000
10	0.0	0.0	0.0	0.000	40	0.4	0.1	0.3	0.000	70	0.7	0.6	0.7	0.000	100	0.7	0.8	0.7	0.000
11	0.0	0.0	0.0	0.000	41	0.4	0.1	0.3	0.000	71	0.7	0.6	0.7	0.000	101	0.7	0.8	0.7	0.000
12	0.0	0.0	0.0	0.000	42	0.5	0.2	0.4	0.004	72	0.7	0.6	0.7	0.000	102	0.7	0.8	0.7	0.000
13	0.0	0.0	0.0	0.000	43	0.5	0.2	0.4	0.000	73	0.7	0.6	0.7	0.000	103	0.7	0.8	0.7	0.000
14	0.0	0.0	0.0	0.000	44	0.5	0.2	0.4	0.000	74	0.7	0.6	0.7	0.000	104	0.7	0.8	0.7	0.000
15	0.0	0.0	0.0	0.000	45	0.5	0.2	0.4	0.000	75	0.7	0.6	0.7	0.000	105	0.7	0.8	0.7	0.000
16	0.0	0.0	0.0	0.000	46	0.5	0.2	0.5	0.001	76	0.7	0.6	0.7	0.000	106	0.7	0.8	0.7	0.000
17	0.0	0.0	0.0	0.000	47	0.5	0.2	0.5	0.000	77	0.7	0.6	0.7	0.000	107	0.7	0.8	0.7	0.000
18	0.0	0.0	0.0	0.000	48	0.5	0.2	0.5	0.000	78	0.7	0.6	0.7	0.000	108	0.7	0.8	0.7	0.000
19	0.0	0.0	0.0	0.000	49	0.6	0.3	0.5	0.003	79	0.7	0.6	0.7	0.000	109	0.7	0.8	0.7	0.000
20	0.0	0.0	0.0	0.000	50	0.6	0.3	0.5	0.000	80	0.7	0.6	0.7	0.000	110	0.7	0.8	0.7	0.000
21	0.0	0.0	0.0	0.000	51	0.6	0.3	0.5	0.000	81	0.7	0.6	0.7	0.000	111	0.7	0.8	0.7	0.000
22	0.0	0.0	0.0	0.000	52	0.6	0.3	0.5	0.000	82	0.7	0.6	0.7	0.000	112	0.7	0.8	0.7	0.000
23	0.0	0.0	0.0	0.000	53	0.6	0.3	0.5	0.000	83	0.7	0.6	0.7	0.000	113	0.7	0.8	0.7	0.000
24	0.0	0.0	0.0	0.000	54	0.6	0.3	0.5	0.000	84	0.7	0.6	0.7	0.000	114	0.7	0.8	0.7	0.000
25	0.0	0.0	0.0	0.000	55	0.6	0.3	0.5	0.000	85	0.7	0.6	0.7	0.000	115	0.7	0.8	0.7	0.000
26	0.2	0.0	0.0	0.003	56	0.6	0.3	0.5	0.000	86	0.7	0.8	0.7	0.003	116	0.7	0.8	0.7	0.000
27	0.2	0.0	0.0	0.000	57	0.6	0.3	0.5	0.000	87	0.7	0.8	0.7	0.000	117	0.7	0.8	0.7	0.000
28	0.3	0.0	0.2	0.004	58	0.6	0.3	0.5	0.000	88	0.7	0.8	0.7	0.000	118	0.7	0.8	0.7	0.000
29	0.4	0.1	0.3	0.004	59	0.7	0.4	0.7	0.005	89	0.7	0.8	0.7	0.000	119	0.7	0.8	0.7	0.000
30	0.4	0.1	0.3	0.000	60	0.7	0.4	0.7	0.000	90	0.7	0.8	0.7	0.000	120	0.7	0.8	0.7	0.000

1. All samples 25 gram.
2. Average rate of gas production in L/Kg/Hr=Avg produced(ml)x40/1000ml/L

CRS

CLIMAX RESEARCH SERVICES

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CRS Project Number: S-6747

January 27, 1997

Mr. Timothy H. Hall
SKW Metals and Alloys, Inc.
P.O. Box 217
Calvert City, Kentucky 42029

Dangerous When Wet Materials (as set forth in 49 CFR Section 173, Appendix E, Division 4, Sections 1, 2, 3 and 4) Evaluation of 75% FeSi, Regular, Lab ID: 2125A, Bin Number: 14 Fce.

Dear Mr. Hall:

We have completed our gas evolution measurements and the flammability tests, per Code 49 CFR 173, Appendix E division 4, Sections 1, 2, 3 and 4, on the sample material that you submitted in late December 1996. The material we received from SKW was labeled as: 75% FeSi, Regular. The results were as follows:

(1) no gas was evolved and no spontaneous ignition occurred.

(2) no gas was evolved and no spontaneous ignition occurred.

(3) no gas was evolved and no spontaneous ignition occurred.

(4) while some gas did evolve, the average rate never exceeded 1 liter per kilogram per hour in the sample tested. The gas was flammable and ignitible (gas ignited but would not sustain a continuous flame). It did not spontaneously ignite in any of the tests.

On the basis of these test results, the ferrosilicon material listed above would not fit the definition in 49 CFR Section 173, Appendix E, Division 4, Sections 1, 2, 3 and 4 as "Dangerous When Wet".

Sincerely,

James R. Lakin / by DARLIE L. MONROE
Engineering Associate

James R. Lakin
Business Operations Manager

CLIMAX RESEARCH SERVICES

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January 27, 1997

Mr. Timothy H. Hall
SKW Metals and Alloys, Inc.
P.O. Box 217
Calvert City, Kentucky 42029

Re: Gas Evolution Measurements and Flammability Tests.
CRS Project Number: S-6747

Dear Mr. Hall:

We have completed the gas evolution measurements and the flammability tests, per Code 49 CFR 173, Appendix E division 4, Sections 1, 2, 3 and 4, on the sample material that you submitted in late December 1996. The identification of the material submitted and its chemistry specification are listed below.

75% FeSi, Regular	Al	Si	Cr	Mn	Ti	Ca	P
Specification, %:	<1.50	74-79	<0.3	<0.4	<0.2	<0.6	
Lab ID: 2125A							
Bin Number: 14 Fce							
Chemistry:	0.054	76.30	0.06	0.19	0.052	0.41	0.013

Section 1 (Procedure & Results)

A small piece of the aforementioned material, approximately 2 mm in diameter, was placed in a trough of distilled water at 20°C. *No gas evolution was observed, nor did the sample spontaneously ignite.*

Section 2 (Procedure & Results)

A small piece of the material was placed in the center of a filter paper, which was floating in distilled water at 20°C. *No gas evolution was observed, nor did the sample spontaneously ignite.*

Section 3 (Procedure & Results)

A small pile with an indentation in the center, approximately 2cm high by 3cm in diameter, was made of the material. A few drops of water were added to the hollow. *No gas evolution was observed, nor did any of the sample spontaneously ignite.*

Section 4 (Procedure & Results)

Representative samples were taken from the lot of material submitted, and using a hammer and chisel the pieces were crushed individually. The larger pieces and the fines were screened off from each sample. Only material of +20 mesh to -8 mesh was used in the gas evolution tests. Three reaction vessels were set-up and filled with a deionized water. The reaction vessels were 1000 ml beakers each containing a small flask with 25.0 grams of sample material. Above each small flask a 50 ml buret was positioned up-side-down, which was also filled with deionized water and placed over the end of the flask making a water seal. The level in the buret was monitored for the next 5 days. Gas evolution data, measured in milliliters, is attached.

Following the gas evolution tests, the burets were submerged, still up-side-down, up to the stopcocks in water. A small flame was placed near the tip of the

buret and the stopcock was opened to allow the gas inside the burets to be pushed out into the flame by the water pressure. Flammability observations are noted at the bottom of the gas evolution data. The gas was not analyzed to determine its composition.

If you have questions about the test or these results please contact me. Thank you for doing business with us.

Sincerely,

James R. Lakin / by Dazelle I. Monroe
Engineering Associate

James R. Lakin
Business Operations Manager

Gas Evolution Measurements
(Water Volume Displacement)

		75% FeSi			Avg Rate
		1	2	3	(l/kg/hr)
	Time (hours)	(ml)	(ml)	(ml)	
Day 1	0.00	0.0	0.0	0.0	
	1.00	0.2	0.2	0.3	0.009
	2.00	0.4	0.5	0.5	0.009
	3.00	0.8	0.6	0.8	0.011
	4.00	1.0	1.0	1.6	0.019
	5.00	1.3	0.8	1.1	-0.005
	6.00	1.4	0.9	1.5	0.008
	7.00	1.2	1.3	1.8	0.007
	8.00	2.1	1.3	2.0	0.011
	17.50	4.4	3.6	6.1	0.012
Day 2	26.00	6.5	5.3	8.0	0.009
	41.50	9.1	11.1	16.2	0.014
Day 3	50.00	11.4	15.8	26.1	0.027
	65.50	15.4	22.7	34.6	0.017
Day 4	89.50	18.0	34.0	46.6	0.014
Day 5	98.00	20.1	36.1	48.7	0.010
Flammable (F)		X	X		
Ignitible (I)*				X	
Not Flammable (NF)					

* Ignitible = the gas will ignite but will not sustain a continuous flame.

Ferrosilicon, 75%, Regular Grade

Specification Chemistry, %:

Al	Si	Cr	Mn	Ti	Ca	P
<1.5	74-79	<0.30	<0.40	<0.20	<0.60	

Sample I.D. Number: 2125A
Bin Number: 14 Fce
Observed Chemistry of Tested Sample, %:

Al	Si	Cr	Mn	Ti	Ca	P
0.05	76.30	0.06	0.19	0.052	0.41	0.013

Test 1:
A small quantity (approximately 2 mm diameter) of the above material was placed in a trough of distilled water at 20° C and observed to see whether any gas evolved and if it spontaneously ignited. Test 1 was performed in triplicate on the above material.

Result:
Neither evolution of gas nor spontaneous ignition was observed any of the three times Test 1 was performed.

Test 2:
A small quantity (approximately 2 mm diameter) of the above material was floated on a piece of filter paper in distilled water at 20° C and observed to see whether any gas evolved and if it spontaneously ignited. Test 2 was performed in triplicate on the above material.

Result:
Neither evolution of gas or spontaneous ignition was observed in any of the three times Test 2 was performed.

Test 3:
The test material was formed into three piles approximately 2 cm high by 3 cm wide. An indentation was formed in the top of each pile and a few drops of water were added to each hollow. Each pile was observed to see whether any gas evolved and if it spontaneously ignited. Test 3 was performed in triplicate on the above material.

Result:
Neither evolution of gas nor spontaneous ignition was observed any of the three times Test 3 was performed.

Test 4:
Enough water at 20° C to cover the sample, 10 ml to 20 ml, was added to a dropping funnel. The spout of the dropping funnel was inserted into one hole of a #14, two-hole stopper; a tube for conveying any gas produced into the collection cylinder, a gas buret, was inserted into the other hole of the stopper; the far end of the tube was inserted into the end of the collection cylinder.

The gas buret is glass, 50 ml capacity, marked in individual ml units with each ml subdivided into 0.1 ml increments. The gas buret was filled with water, inverted and stood in a water trough. The gas tube in the previous paragraph was inserted into the bottom end of the gas buret and any gas produced was measured by observing the displacement of the water in the top of the buret.

25 g of the above listed material was added to each of three 100 ml conical flasks with #14 neck size. The stoppers mentioned above were inserted into the neck of the conical flasks. The stopcocks were opened and 10 ml to 20 ml of the 20° C distilled water, enough to completely cover the sample, was allowed to flow into the flasks. A timer was started and readings of any gas evolved were taken every hour for five days. From this data the average rate of gas production per hour was calculated for the five days.

Result:
The Gas Collection data for Ferrosilicon, 75
%, Regular Grade is detailed on the following page:

Gas Test on Regular Grade 75% FeSi

January 24, 1996

Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr
1	0.0	0.0	0.0	0.000	31	0.7	0.6	1.0	0.009	61	1.9	0.1	2.2	0.000	91	1.9	0.1	2.2	0.000
2	0.0	0.0	0.0	0.000	32	0.7	0.1	1.1	-0.005	62	1.9	0.1	2.2	0.000	92	1.9	0.1	2.2	0.000
3	0.0	0.0	0.0	0.000	33	1.0	0.1	1.2	0.005	63	1.9	0.1	2.2	0.000	93	1.9	0.1	2.2	0.000
4	0.0	0.0	0.0	0.000	34	1.1	0.1	1.3	0.003	64	1.9	0.1	2.2	0.000	94	1.9	0.1	2.2	0.000
5	0.0	0.0	0.0	0.000	35	1.2	0.1	1.5	0.004	65	1.9	0.1	2.2	0.000	95	1.9	0.1	2.2	0.000
6	0.0	0.0	0.0	0.000	36	1.4	0.1	1.7	0.005	66	1.9	0.1	2.2	0.000	96	1.9	0.1	2.2	0.000
7	0.0	0.0	0.0	0.000	37	1.6	0.1	1.8	0.004	67	1.9	0.1	2.2	0.000	97	1.9	0.1	2.2	0.000
8	0.0	0.0	0.0	0.000	38	1.7	0.1	1.9	0.003	68	1.9	0.1	2.2	0.000	98	1.9	0.1	2.2	0.000
9	0.0	0.0	0.0	0.000	39	1.7	0.1	2.0	0.001	69	1.9	0.1	2.2	0.000	99	1.9	0.1	2.2	0.000
10	0.0	0.0	0.0	0.000	40	1.9	0.1	2.1	0.004	70	1.9	0.1	2.2	0.000	100	1.9	0.1	2.2	0.000
11	0.0	0.0	0.0	0.000	41	1.9	0.1	2.2	0.001	71	1.9	0.1	2.2	0.000	101	1.9	0.1	2.2	0.000
12	0.0	0.0	0.0	0.000	42	1.9	0.1	2.2	0.000	72	1.9	0.1	2.2	0.000	102	1.9	0.1	2.2	0.000
13	0.0	0.0	0.0	0.000	43	1.9	0.1	2.2	0.000	73	1.9	0.1	2.2	0.000	103	1.9	0.1	2.2	0.000
14	0.0	0.0	0.0	0.000	44	1.9	0.1	2.2	0.000	74	1.9	0.1	2.2	0.000	104	1.9	0.1	2.2	0.000
15	0.0	0.0	0.0	0.000	45	1.9	0.1	2.2	0.000	75	1.9	0.1	2.2	0.000	105	1.9	0.1	2.2	0.000
16	0.0	0.0	0.0	0.000	46	1.9	0.1	2.2	0.000	76	1.9	0.1	2.2	0.000	106	1.9	0.1	2.2	0.000
17	0.0	0.0	0.0	0.000	47	1.9	0.1	2.2	0.000	77	1.9	0.1	2.2	0.000	107	1.9	0.1	2.2	0.000
18	0.0	0.0	0.0	0.000	48	1.9	0.1	2.2	0.000	78	1.9	0.1	2.2	0.000	108	1.9	0.1	2.2	0.000
19	0.0	0.0	0.0	0.000	49	1.9	0.1	2.2	0.000	79	1.9	0.1	2.2	0.000	109	1.9	0.1	2.2	0.000
20	0.0	0.0	0.0	0.000	50	1.9	0.1	2.2	0.000	80	1.9	0.1	2.2	0.000	110	1.9	0.1	2.2	0.000
21	0.0	0.0	0.0	0.000	51	1.9	0.1	2.2	0.000	81	1.9	0.1	2.2	0.000	111	1.9	0.1	2.2	0.000
22	0.0	0.0	0.0	0.000	52	1.9	0.1	2.2	0.000	82	1.9	0.1	2.2	0.000	112	1.9	0.1	2.2	0.000
23	0.0	0.0	0.0	0.000	53	1.9	0.1	2.2	0.000	83	1.9	0.1	2.2	0.000	113	1.9	0.1	2.2	0.000
24	0.0	0.0	0.0	0.000	54	1.9	0.1	2.2	0.000	84	1.9	0.1	2.2	0.000	114	1.9	0.1	2.2	0.000
25	0.0	0.0	0.0	0.000	55	1.9	0.1	2.2	0.000	85	1.9	0.1	2.2	0.000	115	1.9	0.1	2.2	0.000
26	0.0	0.0	0.3	0.004	56	1.9	0.1	2.2	0.000	86	1.9	0.1	2.2	0.000	116	1.9	0.1	2.2	0.000
27	0.0	0.0	0.4	0.001	57	1.9	0.1	2.2	0.000	87	1.9	0.1	2.2	0.000	117	1.9	0.1	2.2	0.000
28	0.2	0.0	0.5	0.004	58	1.9	0.1	2.2	0.000	88	1.9	0.1	2.2	0.000	118	1.9	0.1	2.2	0.000
29	0.5	0.1	0.7	0.008	59	1.9	0.1	2.2	0.000	89	1.9	0.1	2.2	0.000	119	1.9	0.1	2.2	0.000
30	0.6	0.1	0.9	0.004	60	1.9	0.1	2.2	0.000	90	1.9	0.1	2.2	0.000	120	1.9	0.1	2.2	0.000

1. All samples 25 gram.
2. Average rate of gas production in L/Kg/Hr=Avg produced(ml)x40/1000ml/L

DOT75REG.XLS

CLIMAX RESEARCH SERVICES

39205 COUNTRY CLUB DRIVE • FARMINGTON HILLS, MI 48331 • (810) 489-0720 • FACSIMILE (810) 489-8997

CRS Project Number: S-6747

January 27, 1997

Mr. Timothy H. Hall
SKW Metals and Alloys, Inc.
P.O. Box 217
Calvert City, Kentucky 42029

Dangerous When Wet Materials (as set forth in 49 CFR Section 173, Appendix E, Division 4, Sections 1, 2, 3 and 4) Evaluation of CSF 10, Lab ID: 2130A, Bin Number: 312.

Dear Mr. Hall:

We have completed our gas evolution measurements and the flammability tests, per Code 49 CFR 173, Appendix E division 4, Sections 1, 2, 3 and 4, on the sample material that you submitted in late December 1996. The material we received from SKW was labeled as: CSF 10. The results were as follows:

(1) no gas was evolved and no spontaneous ignition occurred.

(2) no gas was evolved and no spontaneous ignition occurred.

(3) no gas was evolved and no spontaneous ignition occurred.

(4) while some gas did evolve, the average rate never exceeded 1 liter per kilogram per hour in the sample tested. The gas was not flammable but was ignitible (gas ignited but would not sustain a continuous flame). It did not spontaneously ignite in any of the tests.

On the basis of these test results, the ferrosilicon material listed above would not fit the definition in 49 CFR Section 173, Appendix E, Division 4, Sections 1, 2, 3 and 4 as "Dangerous When Wet".

Sincerely,

James R. Lakin /by Darrie L. Monroe
Engineering Associate

James R. Lakin
Business Operations Manager

CRS

CLIMAX RESEARCH SERVICES

39205 COUNTRY CLUB DRIVE • FARMINGTON HILLS, MI 48331 • (810) 489-0720 • FACSIMILE (810) 489-8997

January 27, 1997

Mr. Timothy H. Hall
SKW Metals and Alloys, Inc.
P.O. Box 217
Calvert City, Kentucky 42029

Re: Gas Evolution Measurements and Flammability Tests.
CRS Project Number: S-6747

Dear Mr. Hall:

We have completed the gas evolution measurements and the flammability tests, per Code 49 CFR 173, Appendix E division 4, Sections 1, 2, 3 and 4, on the sample material that you submitted in late December 1996. The identification of the material submitted and its chemistry specification are listed below.

CSF 10	Al	Si	Ce	TRE
Specification, %:	<1.5	50-55	9-11	10.5-15
Lab ID: 2130A				
Bin Number: 312				
Chemistry:	0.47	37.90	9.65	10.76

Section 1 (Procedure & Results)

A small piece of the aforementioned material, approximately 2 mm in diameter, was placed in a trough of distilled water at 20°C. *No gas evolution was observed, nor did the sample spontaneously ignite.*

Section 2 (Procedure & Results)

A small piece of the material was placed in the center of a filter paper, which was floating in distilled water at 20°C. *No gas evolution was observed, nor did the sample spontaneously ignite.*

Section 3 (Procedure & Results)

A small pile with an indentation in the center, approximately 2cm high by 3cm in diameter, was made of the material. A few drops of water were added to the hollow. *No gas evolution was observed, nor did any of the sample spontaneously ignite.*

Section 4 (Procedure & Results)

Representative samples were taken from the lot of material submitted, and using a hammer and chisel the pieces were crushed individually. The larger pieces and the fines were screened off from each sample. Only material of +20 mesh to -8 mesh was used in the gas evolution tests. Three reaction vessels were set-up and filled with a deionized water. The reaction vessels were 1000 ml beakers each containing a small flask with 25.0 grams of sample material. Above each small flask a 50 ml buret was positioned up-side-down, which was also filled with deionized water and placed over the end of the flask making a water seal. The level in the buret was monitored for the next 5 days. Gas evolution data, measured in milliliters, is attached.

Following the gas evolution tests, the burets were submerged, still up-side-down, up to the stopcocks in water. A small flame was placed near the tip of the

buret and the stopcock was opened to allow the gas inside the burets to be pushed out into the flame by the water pressure. Flammability observations are noted at the bottom of the gas evolution data. The gas was not analyzed to determine its composition.

If you have questions about the test or these results please contact me. Thank you for doing business with us.

Sincerely,

James R. Lakin /by Darcie L. Menzee
Engineering Associate

James R. Lakin
Business Operations Manager

Gas Evolution Measurements
(Water Volume Displacement)

		CSF 10			Avg Rate
		1	2	3	(l/kg/hr)
	Time (hours)	(ml)	(ml)	(ml)	
Day 1	0.00	0.0	0.0	0.0	
	1.00	0.1	0.1	0.1	0.004
	2.00	0.1	0.1	0.3	0.003
	3.00	0.2	0.2	1.1	0.013
	4.00	0.2	0.2	1.2	0.001
	5.00	0.2	0.3	3.1	0.027
	6.00	0.2	0.4	5.8	0.037
	7.00	0.3	0.9	7.3	0.033
	8.00	0.3	0.9	7.5	0.015
Day 2	22.25	0.8	1.2	22.2	0.015
Day 3	46.25	4.0	34.8	46.3	0.034
	54.75	5.4	39.2	48.2	0.012
Day 4	70.25	8.1	44.3	50.0	0.008
Day 5	98.75	13.8	49.8	50.0	0.005

Flammable (F)			
Ignitible (I)*		X	
Not Flammable (NF)	X		X

* Ignitible = the gas will ignite but will not sustain a continuous flame.

CSF-10

Specification Chemistry, %:

Al	Si	Ce	TRE
<1.50	35-40	9-11	10.5-15

Sample I.D. Number: 2130B
Bin Number: 312
Observed Chemistry of Tested Sample, %:

Al	Si	Ce	TRE
0.19	37.90	9.65	10.76

Test 1:
A small quantity (approximately 2 mm diameter) of the above material was placed in a trough of distilled water at 20° C and observed to see whether any gas evolved and if it spontaneously ignited. Test 1 was performed in triplicate on the above material.

Result:
Neither evolution of gas nor spontaneous ignition was observed any of the three times Test 1 was performed.

Test 2:
A small quantity (approximately 2 mm diameter) of the above material was floated on a piece of filter paper in distilled water at 20° C and observed to see whether any gas evolved and if it spontaneously ignited. Test 2 was performed in triplicate on the above material.

Result:
Neither evolution of gas or spontaneous ignition was observed in any of the three times Test 2 was performed.

Test 3:
The test material was formed into three piles approximately 2 cm high by 3 cm wide. An indentation was formed in the top of each pile and a few drops of water were added to each hollow. Each pile was observed to see whether any gas evolved and if it spontaneously ignited. Test 3 was performed in triplicate on the above material.

Result:
Neither evolution of gas nor spontaneous ignition was observed any of the three times Test 3 was performed.

Test 4:
Enough water at 20° C to cover the sample, 10ml to 20ml, was added to a dropping funnel. The spout of the dropping funnel was inserted into one hole of a #14, two-hole stopper; a tube for conveying any gas produced into the collection cylinder, a gas buret, was inserted into the other hole of the stopper; the far end of the tube was inserted into the end of the collection cylinder.

The gas buret is glass, 50 ml capacity, marked in individual ml units with each ml subdivided into 0.1 ml increments. The gas buret was filled with water, inverted and stood in a water trough. The gas tube in the previous paragraph was inserted into the bottom end of the gas buret and any gas produced was measured by observing the displacement of the water in the top of the buret.

25 g of the above listed material was added to each of three 100 ml conical flasks with #14 neck size. The stoppers mentioned above were inserted into the neck of the conical flasks. The stopcocks were opened and 10ml to 20ml of the 20° C distilled water, enough to completely cover the sample, was allowed to flow into the flasks. A timer was started and readings of any gas evolved were taken every hour for five days. From this data the average rate of gas production per hour was calculated for the five days.

Result:
The Gas Collection data for CSF-10 is detailed on the following page:

Gas Test on CSF-10

January 24, 1996

Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr
1	0.0	0.0	1.0	0.013	31	0.0	0.0	1.0	0.000	61	0.0	0.0	4.0	0.000	91	0.0	0.0	4.0	0.000
2	0.0	0.0	1.0	0.000	32	0.0	0.0	1.0	0.000	62	0.0	0.0	4.0	0.000	92	0.0	0.0	4.0	0.000
3	0.0	0.0	1.0	0.000	33	0.0	0.0	1.0	0.000	63	0.0	0.0	4.0	0.000	93	0.0	0.0	4.0	0.000
4	0.0	0.0	1.0	0.000	34	0.0	0.0	1.0	0.000	64	0.0	0.0	4.0	0.000	94	0.0	0.0	4.0	0.000
5	0.0	0.0	1.0	0.000	35	0.0	0.0	1.0	0.000	65	0.0	0.0	4.0	0.000	95	0.0	0.0	4.0	0.000
6	0.0	0.0	1.0	0.000	36	0.0	0.0	2.0	0.013	66	0.0	0.0	4.0	0.000	96	0.0	0.0	4.0	0.000
7	0.0	0.0	1.0	0.000	37	0.0	0.0	2.0	0.000	67	0.0	0.0	4.0	0.000	97	0.0	0.0	4.0	0.000
8	0.0	0.0	1.0	0.000	38	0.0	0.0	2.0	0.000	68	0.0	0.0	4.0	0.000	98	0.0	0.0	4.0	0.000
9	0.0	0.0	1.0	0.000	39	0.0	0.0	2.0	0.000	69	0.0	0.0	4.0	0.000	99	0.0	0.0	4.0	0.000
10	0.0	0.0	1.0	0.000	40	0.0	0.0	2.0	0.000	70	0.0	0.0	4.0	0.000	100	0.0	0.0	4.0	0.000
11	0.0	0.0	1.0	0.000	41	0.0	0.0	3.0	0.013	71	0.0	0.0	4.0	0.000	101	0.0	0.0	4.0	0.000
12	0.0	0.0	1.0	0.000	42	0.0	0.0	3.0	0.000	72	0.0	0.0	4.0	0.000	102	0.0	0.0	4.0	0.000
13	0.0	0.0	1.0	0.000	43	0.0	0.0	3.0	0.000	73	0.0	0.0	4.0	0.000	103	0.0	0.0	4.0	0.000
14	0.0	0.0	1.0	0.000	44	0.0	0.0	3.0	0.000	74	0.0	0.0	4.0	0.000	104	0.0	0.0	4.0	0.000
15	0.0	0.0	1.0	0.000	45	0.0	0.0	3.0	0.000	75	0.0	0.0	4.0	0.000	105	0.0	0.0	4.0	0.000
16	0.0	0.0	1.0	0.000	46	0.0	0.0	3.0	0.000	76	0.0	0.0	4.0	0.000	106	0.0	0.0	4.0	0.000
17	0.0	0.0	1.0	0.000	47	0.0	0.0	3.0	0.000	77	0.0	0.0	4.0	0.000	107	0.0	0.0	4.0	0.000
18	0.0	0.0	1.0	0.000	48	0.0	0.0	3.0	0.000	78	0.0	0.0	4.0	0.000	108	0.0	0.0	4.0	0.000
19	0.0	0.0	1.0	0.000	49	0.0	0.0	3.0	0.000	79	0.0	0.0	4.0	0.000	109	0.0	0.0	4.0	0.000
20	0.0	0.0	1.0	0.000	50	0.0	0.0	3.0	0.000	80	0.0	0.0	4.0	0.000	110	0.0	0.0	4.0	0.000
21	0.0	0.0	1.0	0.000	51	0.0	0.0	4.0	0.013	81	0.0	0.0	4.0	0.000	111	0.0	0.0	4.0	0.000
22	0.0	0.0	1.0	0.000	52	0.0	0.0	4.0	0.000	82	0.0	0.0	4.0	0.000	112	0.0	0.0	4.0	0.000
23	0.0	0.0	1.0	0.000	53	0.0	0.0	4.0	0.000	83	0.0	0.0	4.0	0.000	113	0.0	0.0	4.0	0.000
24	0.0	0.0	1.0	0.000	54	0.0	0.0	4.0	0.000	84	0.0	0.0	4.0	0.000	114	0.0	0.0	4.0	0.000
25	0.0	0.0	1.0	0.000	55	0.0	0.0	4.0	0.000	85	0.0	0.0	4.0	0.000	115	0.0	0.0	4.0	0.000
26	0.0	0.0	1.0	0.000	56	0.0	0.0	4.0	0.000	86	0.0	0.0	4.0	0.000	116	0.0	0.0	4.0	0.000
27	0.0	0.0	1.0	0.000	57	0.0	0.0	4.0	0.000	87	0.0	0.0	4.0	0.000	117	0.0	0.0	4.0	0.000
28	0.0	0.0	1.0	0.000	58	0.0	0.0	4.0	0.000	88	0.0	0.0	4.0	0.000	118	0.0	0.0	4.0	0.000
29	0.0	0.0	1.0	0.000	59	0.0	0.0	4.0	0.000	89	0.0	0.0	4.0	0.000	119	0.0	0.0	4.0	0.000
30	0.0	0.0	1.0	0.000	60	0.0	0.0	4.0	0.000	90	0.0	0.0	4.0	0.000	120	0.0	0.0	4.0	0.000

1. All samples 25 gram.
2. Average rate of gas production in L/Kg/Hr=Avg produced(ml)x40/1000ml/L

DOTCSF10.XLS

CLIMAX RESEARCH SERVICES

39205 COUNTRY CLUB DRIVE • FARMINGTON HILLS, MI 48331 • (810) 489-0720 • FACSIMILE (810) 489-8997

CRS Project Number: S-6747

February 5, 1997

Mr. Timothy H. Hall
SKW Metals and Alloys, Inc.
P.O. Box 217
Calvert City, Kentucky 42029

Dangerous When Wet Materials (as set forth in 49 CFR Section 173, Appendix E, Division 4, Sections 1, 2, 3 and 4) Evaluation of FeSi Dross, Lab ID: 2124A, Bin Number: 300.

Dear Mr. Hall:

We have completed our gas evolution measurements and the flammability tests, per Code 49 CFR 173, Appendix E division 4, Sections 1, 2, 3 and 4, on the sample material that you submitted in late December 1996. The material we received from SKW was labeled as: FeSi Dross. The results were as follows:

(1) no gas was evolved and no spontaneous ignition occurred.

(2) no gas was evolved and no spontaneous ignition occurred.

(3) no gas was evolved and no spontaneous ignition occurred.

(4) while some gas did evolve, the average rate never exceeded 1 liter per kilogram per hour in the sample tested. The gas was not flammable, but was ignitible (gas ignited but would not sustain a continuous flame). It did not spontaneously ignite in any of the tests.

On the basis of these test results, the ferrosilicon material listed above would not fit the definition in 49 CFR Section 173, Appendix E, Division 4, Sections 1, 2, 3 and 4 as "Dangerous When Wet".

Sincerely,

James R. Lakin / by [illegible] Engineering Associate

James R. Lakin
Business Operations Manager

CLIMAX RESEARCH SERVICES

39205 COUNTRY CLUB DRIVE • FARMINGTON HILLS, MI 48331 • (810) 489-0720 • FACSIMILE (810) 489-8997

February 5, 1997

Mr. Timothy H. Hall
SKW Metals and Alloys, Inc.
P.O. Box 217
Calvert City, Kentucky 42029

Re: Gas Evolution Measurements and Flammability Tests.
CRS Project Number: S-6747

Dear Mr. Hall:

We have completed the gas evolution measurements and the flammability tests, per Code 49 CFR 173, Appendix E division 4, Sections 1, 2, 3 and 4, on the sample material that you submitted in late December 1996. The identification of the material submitted and its chemistry specification are listed below.

FeSi Dross	Si
Specification, %:	35-45
Lab ID: 2124A	
Bin Number: 300	
Chemistry:	40.6

Section 1 (Procedure & Results)

A small piece of the aforementioned material, approximately 2 mm in diameter, was placed in a trough of distilled water at 20°C. *No gas evolution was observed, nor did the sample spontaneously ignite.*

Section 2 (Procedure & Results)

A small piece of the material was placed in the center of a filter paper, which was floating in distilled water at 20°C. *No gas evolution was observed, nor did the sample spontaneously ignite.*

Section 3 (Procedure & Results)

A small pile with an indentation in the center, approximately 2cm high by 3cm in diameter, was made of the material. A few drops of water were added to the hollow. *No gas evolution was observed, nor did any of the sample spontaneously ignite.*

Section 4 (Procedure & Results)

Representative samples were taken from the lot of material submitted, and using a hammer and chisel the pieces were crushed individually. The larger pieces and the fines were screened off from each sample. Only material of +20 mesh to -8 mesh was used in the gas evolution tests. Three reaction vessels were set-up and filled with a deionized water. The reaction vessels were 1000 ml beakers each containing a small flask with 25.0 grams of sample material. Above each small flask a 50 ml buret was positioned up-side-down, which was also filled with deionized water and placed over the end of the flask making a water seal. The level in the buret was monitored for the next 5 days. Gas evolution data, measured in milliliters, is attached.

Following the gas evolution tests, the burets were submerged, still up-side-down, up to the stopcocks in water. A small flame was placed near the tip of the

buret and the stopcock was opened to allow the gas inside the burets to be pushed out into the flame by the water pressure. Flammability observations are noted at the bottom of the gas evolution data. The gas was not analyzed to determine its composition.

If you have questions about the test or these results please contact me. Thank you for doing business with us.

Sincerely,

James R. Lakin / by Darcie L. Monroe

James R. Lakin
Business Operations Manager

Engineering Associate

Gas Evolution Measurements
(Water Volume Displacement)

		FeSi Dross			Avg Rate
		1	2	3	(l/kg/hr)
	Time (hours)	(ml)	(ml)	(ml)	
Day 1	0.00	0.0	0.0	0.0	
	1.00	0.1	0.2	0.2	0.007
	2.00	0.1	0.2	0.2	0.000
	3.00	0.1	0.3	0.3	0.003
	4.00	0.2	0.5	0.2	0.003
	5.00	0.2	0.6	0.3	0.003
	6.00	0.3	0.8	0.4	0.005
Day 2	21.00	0.3	5.7	1.1	0.005
	29.50	0.4	11.7	2.0	0.011
Day 3	45.00	0.4	26.6	3.7	0.014
	53.50	0.4	31.8	4.7	0.010
Day 4	69.00	0.9	38.7	7.5	0.009
	77.50	1.6	42.6	9.7	0.011
Day 5	93.00	3.0	46.8	13.6	0.008
	101.50	3.5	48.3	15.2	0.006
Flammable (F)					
Ignitible (I)*			X	X	
Not Flammable (NF)		X			

* Ignitible = the gas will ignite but will not sustain a continuous flame.

Silicon Dross

Specification Chemistry, %:

Si
35-45

Sample I.D. Number: 2172B
Stockpile Number: 1-D
Observed Chemistry of Tested Sample, %:

Si
40.60

Test 1:
A small quantity (approximately 2 mm diameter) of the above material was placed in a trough of distilled water at 20° C and observed to see whether any gas evolved and if it spontaneously ignited. Test 1 was performed in triplicate on the above material.

Result:
Neither evolution of gas nor spontaneous ignition was observed any of the three times Test 1 was performed.

Test 2:
A small quantity (approximately 2 mm diameter) of the above material was floated on a piece of filter paper in distilled water at 20° C and observed to see whether any gas evolved and if it spontaneously ignited. Test 2 was performed in triplicate on the above material.

Result:
Neither evolution of gas or spontaneous ignition was observed in any of the three times Test 2 was performed.

Test 3:
The test material was formed into three piles approximately 2 cm high by 3 cm wide. An indentation was formed in the top of each pile and a few drops of water were added to each hollow. Each pile was observed to see whether any gas evolved and if it spontaneously ignited. Test 3 was performed in triplicate on the above material.

Result:
Neither evolution of gas nor spontaneous ignition was observed any of the three times Test 3 was performed.

Test 4:
Enough water at 20° C to cover the sample, 10ml to 20ml, was added to a dropping funnel. The spout of the dropping funnel was inserted into one hole of a #14, two-hole stopper; a tube for conveying any gas produced into the collection cylinder, a gas buret, was inserted into the other hole of the stopper; the far end of the tube was inserted into the end of the collection cylinder.

The gas buret is glass, 50 ml capacity, marked in individual ml units with each ml subdivided into 0.1 ml increments. The gas buret was filled with water, inverted and stood in a water trough. The gas tube in the previous paragraph was inserted into the bottom end of the gas buret and any gas produced was measured by observing the displacement of the water in the top of the buret.

25 g of the above listed material was added to each of three 100 ml conical flasks with #14 neck size. The stoppers mentioned above were inserted into the neck of the conical flasks. The stopcocks were opened and 10 ml to 20 ml of the 20° C distilled water, enough to completely cover the sample, was allowed to flow into the flasks. A timer was started and readings of any gas evolved were taken every hour for five days. From this data the average rate of gas production per hour was calculated for the five days.

Result:
The Gas Collection data for Silicon Dross is detailed on the following page:

Gas Test on Si Dross

January 24, 1996

Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr
1	0.0	0.0	0.0	0.000	31	0.0	0.0	0.3	0.000	61	1.7	0.0	2.3	0.000	91	2.1	0.0	2.4	0.000
2	0.0	0.0	0.0	0.000	32	0.0	0.0	0.3	0.000	62	1.8	0.0	2.3	0.001	92	2.1	0.0	2.4	0.000
3	0.0	0.0	0.0	0.000	33	0.0	0.0	0.3	0.000	63	1.9	0.0	2.3	0.001	93	2.1	0.0	2.4	0.000
4	0.0	0.0	0.0	0.000	34	0.0	0.0	0.3	0.000	64	2.0	0.0	2.3	0.001	94	2.1	0.0	2.4	0.000
5	0.0	0.0	0.0	0.000	35	0.0	0.0	0.4	0.001	65	2.0	0.0	2.3	0.000	95	2.1	0.0	2.4	0.000
6	0.0	0.0	0.0	0.000	36	0.0	0.0	0.4	0.000	66	2.0	0.0	2.3	0.000	96	2.1	0.0	2.4	0.000
7	0.0	0.0	0.0	0.000	37	0.0	0.0	0.4	0.000	67	2.0	0.0	2.3	0.000	97	2.1	0.0	2.4	0.000
8	0.0	0.0	0.0	0.000	38	0.0	0.0	0.4	0.000	68	2.0	0.0	2.3	0.000	98	2.1	0.0	2.4	0.000
9	0.0	0.0	0.0	0.000	39	0.0	0.0	0.4	0.000	69	2.0	0.0	2.3	0.000	99	2.1	0.0	2.4	0.000
10	0.0	0.0	0.0	0.000	40	0.0	0.0	0.4	0.000	70	2.0	0.0	2.3	0.000	100	2.1	0.0	2.4	0.000
11	0.0	0.0	0.0	0.000	41	0.0	0.0	0.4	0.000	71	2.0	0.0	2.3	0.000	101	2.1	0.0	2.4	0.000
12	0.0	0.0	0.0	0.000	42	0.0	0.0	0.4	0.000	72	2.1	0.0	2.4	0.003	102	2.1	0.0	2.4	0.000
13	0.0	0.0	0.0	0.000	43	0.0	0.0	0.4	0.000	73	2.1	0.0	2.4	0.000	103	2.1	0.0	2.4	0.000
14	0.0	0.0	0.0	0.000	44	0.0	0.0	0.4	0.000	74	2.1	0.0	2.4	0.000	104	2.1	0.0	2.4	0.000
15	0.0	0.0	0.0	0.000	45	0.0	0.0	0.5	0.001	75	2.1	0.0	2.4	0.000	105	2.1	0.0	2.4	0.000
16	0.0	0.0	0.0	0.000	46	0.0	0.0	0.5	0.000	76	2.1	0.0	2.4	0.000	106	2.1	0.0	2.4	0.000
17	0.0	0.0	0.0	0.000	47	0.0	0.0	0.5	0.000	77	2.1	0.0	2.4	0.000	107	2.1	0.0	2.4	0.000
18	0.0	0.0	0.0	0.000	48	0.0	0.0	0.5	0.000	78	2.1	0.0	2.4	0.000	108	2.1	0.0	2.4	0.000
19	0.0	0.0	0.0	0.000	49	0.0	0.0	0.7	0.003	79	2.1	0.0	2.4	0.000	109	2.1	0.0	2.4	0.000
20	0.0	0.0	0.0	0.000	50	0.0	0.0	0.7	0.000	80	2.1	0.0	2.4	0.000	110	2.1	0.0	2.4	0.000
21	0.0	0.0	0.3	0.004	51	0.0	0.0	0.7	0.000	81	2.1	0.0	2.4	0.000	111	2.1	0.0	2.4	0.000
22	0.0	0.0	0.3	0.000	52	1.5	0.0	1.5	0.031	82	2.1	0.0	2.4	0.000	112	2.1	0.0	2.4	0.000
23	0.0	0.0	0.3	0.000	53	1.5	0.0	2.2	0.009	83	2.1	0.0	2.4	0.000	113	2.1	0.0	2.4	0.000
24	0.0	0.0	0.3	0.000	54	1.6	0.0	2.3	0.003	84	2.1	0.0	2.4	0.000	114	2.1	0.0	2.4	0.000
25	0.0	0.0	0.3	0.000	55	1.6	0.0	2.3	0.000	85	2.1	0.0	2.4	0.000	115	2.1	0.0	2.4	0.000
26	0.0	0.0	0.3	0.000	56	1.6	0.0	2.3	0.000	86	2.1	0.0	2.4	0.000	116	2.1	0.0	2.4	0.000
27	0.0	0.0	0.3	0.000	57	1.6	0.0	2.3	0.000	87	2.1	0.0	2.4	0.000	117	2.1	0.0	2.4	0.000
28	0.0	0.0	0.3	0.000	58	1.7	0.0	2.3	0.001	88	2.1	0.0	2.4	0.000	118	2.1	0.0	2.4	0.000
29	0.0	0.0	0.3	0.000	59	1.7	0.0	2.3	0.000	89	2.1	0.0	2.4	0.000	119	2.1	0.0	2.4	0.000
30	0.0	0.0	0.3	0.000	60	1.7	0.0	2.3	0.000	90	2.1	0.0	2.4	0.000	120	2.1	0.0	2.4	0.000

1. All samples 25 gram.
2.Average rate of gas production in L/Kg/Hr=Avg produced(ml)x40/1000ml/L

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CRS Project Number: S-6747

February 5, 1997

Mr. Timothy H. Hall
SKW Metals and Alloys, Inc.
P.O. Box 217
Calvert City, Kentucky 42029

Dangerous When Wet Materials (as set forth in 49 CFR Section 173, Appendix E, Division 4, Sections 1, 2, 3 and 4) Evaluation of Graphidox, Lab ID: 2129A, Bin Number: 406.

Dear Mr. Hall:

We have completed our gas evolution measurements and the flammability tests, per Code 49 CFR 173, Appendix E division 4, Sections 1, 2, 3 and 4, on the sample material that you submitted in late December 1996. The material we received from SKW was labeled as: Graphidox. The results were as follows:

(1) no gas was evolved and no spontaneous ignition occurred.

(2) no gas was evolved and no spontaneous ignition occurred.

(3) no gas was evolved and no spontaneous ignition occurred.

(4) while some gas did evolve, the average rate never exceeded 1 liter per kilogram per hour in the sample tested. The gas was not flammable, but was ignitible (gas ignited but would not sustain a continuous flame). It did not spontaneously ignite in any of the tests.

On the basis of these test results, the ferrosilicon material listed above would not fit the definition in 49 CFR Section 173, Appendix E, Division 4, Sections 1, 2, 3 and 4 as "Dangerous When Wet".

Sincerely,

James R. Lakin / by Darcie L. Monroe
Engineering Associate

James R. Lakin
Business Operations Manager

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February 5, 1997

Mr. Timothy H. Hall
SKW Metals and Alloys, Inc.
P.O. Box 217
Calvert City, Kentucky 42029

Re: Gas Evolution Measurements and Flammability Tests.
CRS Project Number: S-6747

Dear Mr. Hall:

We have completed the gas evolution measurements and the flammability tests, per Code 49 CFR 173, Appendix E division 4, Sections 1, 2, 3 and 4, on the sample material that you submitted in late December 1996. The identification of the material submitted and its chemistry specification are listed below.

Graphidox	Al	Si	Ti	Ca
Specification, %:	<1.50	50-55	9-11	5.0-7.0
Lab ID: 2129A				
Bin Number: 406				
Chemistry:	1.01	51.13	9.24	5.52

Section 1 (Procedure & Results)

A small piece of the aforementioned material, approximately 2 mm in diameter, was placed in a trough of distilled water at 20°C. *No gas evolution was observed, nor did the sample spontaneously ignite.*

Section 2 (Procedure & Results)

A small piece of the material was placed in the center of a filter paper, which was floating in distilled water at 20°C. *No gas evolution was observed, nor did the sample spontaneously ignite.*

Section 3 (Procedure & Results)

A small pile with an indentation in the center, approximately 2cm high by 3cm in diameter, was made of the material. A few drops of water were added to the hollow. *No gas evolution was observed, nor did any of the sample spontaneously ignite.*

Section 4 (Procedure & Results)

Representative samples were taken from the lot of material submitted, and using a hammer and chisel the pieces were crushed individually. The larger pieces and the fines were screened off from each sample. Only material of +20 mesh to -8 mesh was used in the gas evolution tests. Three reaction vessels were set-up and filled with a deionized water. The reaction vessels were 1000 ml beakers each containing a small flask with 25.0 grams of sample material. Above each small flask a 50 ml buret was positioned up-side-down, which was also filled with deionized water and placed over the end of the flask making a water seal. The level in the buret was monitored for the next 5 days. Gas evolution data, measured in milliliters, is attached.

Following the gas evolution tests, the burets were submerged, still up-side-

down, up to the stopcocks in water. A small flame was placed near the tip of the buret and the stopcock was opened to allow the gas inside the burets to be pushed out into the flame by the water pressure. Flammability observations are noted at the bottom of the gas evolution data. The gas was not analyzed to determine its composition.

If you have questions about the test or these results please contact me. Thank you for doing business with us.

Sincerely,

James R. Lakin /by Barbie L. Monroe Engineering Associate

James R. Lakin
Business Operations Manager

Gas Evolution Measurements
(Water Volume Displacement)

		Graphidox			
		1	2	3	Avg Rate
	Time	(ml)	(ml)	(ml)	(l/kg/hr)
	(hours)				
Day 1	0.00	0.0	0.0	0.0	
	1.00	0.2	0.2	0.2	0.008
	2.00	0.5	0.2	0.4	0.007
	3.00	0.9	0.2	0.4	0.005
	4.00	1.6	0.4	0.5	0.013
	5.00	2.1	0.4	0.5	0.007
	6.00	2.4	0.4	0.5	0.004
Day 2	21.00	17.4	0.6	0.6	0.014
	29.50	23.2	2.0	0.8	0.012
Day 3	45.00	31.8	6.9	0.9	0.012
	53.50	34.8	9.8	0.9	0.009
Day 4	69.00	38.6	13.2	1.2	0.006
	77.50	41.9	17.0	1.7	0.012
Day 5	93.00	45.8	23.4	2.0	0.009
	101.50	46.5	25.6	2.2	0.005

Flammable (F)			
Ignitible (I)*	X	X	
Not Flammable (NF)			X

* Ignitible = the gas will ignite but will not sustain a continuous flame.

Graphidox

Specification Chemistry, %:

Al	Si	Ti	Ca
<1.50	50-55	9-11	5.0-7.0

Sample I.D. Number: 2129B
Bin Number: 406
Observed Chemistry of Tested Sample, %:

Al	Si	Ti	Ca
1.01	51.13	9.24	5.52

Test 1:
A small quantity (approximately 2 mm diameter) of the above material was placed in a trough of distilled water at 20° C and observed to see whether any gas evolved and if it spontaneously ignited. Test 1 was performed in triplicate on the above material.

Result:
Neither evolution of gas nor spontaneous ignition was observed any of the three times Test 1 was performed.

Test 2:
A small quantity (approximately 2 mm diameter) of the above material was floated on a piece of filter paper in distilled water at 20° C and observed to see whether any gas evolved and if it spontaneously ignited. Test 2 was performed in triplicate on the above material.

Result:
Neither evolution of gas or spontaneous ignition was observed in any of the three times Test 2 was performed.

Test 3:
The test material was formed into three piles approximately 2 cm high by 3 cm wide. An indentation was formed in the top of each pile and a few drops of water were added to each hollow. Each pile was observed to see whether any gas evolved and if it spontaneously ignited. Test 3 was performed in triplicate on the above material.

Result:
Neither evolution of gas nor spontaneous ignition was observed any of the three times Test 3 was performed.

Test 4:
Enough water at 20° C to cover the sample, 10 ml to 20 ml, was added to a dropping funnel. The spout of the dropping funnel was inserted into one hole of a #14, two-hole stopper; a tube for conveying any gas produced into the collection cylinder, a gas buret, was inserted into the other hole of the stopper; the far end of the tube was inserted into the end of the collection cylinder.

The gas buret is glass, 50 ml capacity, marked in individual ml units with each ml subdivided into 0.1 ml increments. The gas buret was filled with water, inverted and stood in a water trough. The gas tube in the previous paragraph was inserted into the bottom end of the gas buret and any gas produced was measured by observing the displacement of the water in the top of the buret.

25 g of the above listed material was added to each of three 100 ml conical flasks with #14 neck size. The stoppers mentioned above were inserted into the neck of the conical flasks. The stopcocks were opened and 10 ml to 20 ml of the 20° C distilled water, enough to completely cover the sample, was allowed to flow into the flasks. A timer was started and readings of any gas evolved were taken every hour for five days. From this data the average rate of gas production per hour was calculated for the five days.

Result:
The Gas Collection data for Graphidox is detailed on the following page:

Gas Test on Graphidox

January 24, 1996

Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr
1	0.0	0.0	0.0	0.000	31	0.0	0.0	0.0	0.000	61	2.6	0.0	0.0	0.000	91	2.7	0.0	0.0	0.000
2	0.0	0.0	0.0	0.000	32	0.0	0.0	0.0	0.000	62	2.6	0.0	0.0	0.000	92	2.7	0.0	0.0	0.000
3	0.0	0.0	0.0	0.000	33	0.0	0.0	0.0	0.000	63	2.6	0.0	0.0	0.000	93	2.7	0.0	0.0	0.000
4	0.0	0.0	0.0	0.000	34	0.0	0.0	0.0	0.000	64	2.6	0.0	0.0	0.000	94	2.7	0.0	0.0	0.000
5	0.0	0.0	0.0	0.000	35	0.0	0.0	0.0	0.000	65	2.6	0.0	0.0	0.000	95	2.7	0.0	0.0	0.000
6	0.0	0.0	0.0	0.000	36	0.0	0.0	0.0	0.000	66	2.6	0.0	0.0	0.000	96	2.7	0.0	0.0	0.000
7	0.0	0.0	0.0	0.000	37	0.0	0.0	0.0	0.000	67	2.6	0.0	0.0	0.000	97	2.7	0.0	0.0	0.000
8	0.0	0.0	0.0	0.000	38	0.0	0.0	0.0	0.000	68	2.7	0.0	0.0	0.001	98	2.7	0.0	0.0	0.000
9	0.0	0.0	0.0	0.000	39	0.0	0.0	0.0	0.000	69	2.7	0.0	0.0	0.000	99	2.7	0.0	0.0	0.000
10	0.0	0.0	0.0	0.000	40	0.0	0.0	0.0	0.000	70	2.7	0.0	0.0	0.000	100	2.7	0.0	0.0	0.000
11	0.0	0.0	0.0	0.000	41	0.0	0.0	0.0	0.000	71	2.7	0.0	0.0	0.000	101	2.7	0.0	0.0	0.000
12	0.0	0.0	0.0	0.000	42	0.0	0.0	0.0	0.000	72	2.7	0.0	0.0	0.000	102	2.7	0.0	0.0	0.000
13	0.0	0.0	0.0	0.000	43	0.0	0.0	0.0	0.000	73	2.7	0.0	0.0	0.000	103	2.7	0.0	0.0	0.000
14	0.0	0.0	0.0	0.000	44	0.0	0.0	0.0	0.000	74	2.7	0.0	0.0	0.000	104	2.7	0.0	0.0	0.000
15	0.0	0.0	0.0	0.000	45	0.0	0.0	0.0	0.000	75	2.7	0.0	0.0	0.000	105	2.8	0.0	0.0	0.001
16	0.0	0.0	0.0	0.000	46	1.4	0.0	0.0	0.019	76	2.7	0.0	0.0	0.000	106	2.8	0.0	0.0	0.000
17	0.0	0.0	0.0	0.000	47	1.7	0.0	0.0	0.004	77	2.7	0.0	0.0	0.000	107	2.8	0.0	0.0	0.000
18	0.0	0.0	0.0	0.000	48	1.7	0.0	0.0	0.000	78	2.7	0.0	0.0	0.000	108	2.8	0.0	0.0	0.000
19	0.0	0.0	0.0	0.000	49	2.1	0.0	0.0	0.005	79	2.7	0.0	0.0	0.000	109	2.8	0.0	0.0	0.000
20	0.0	0.0	0.0	0.000	50	2.2	0.0	0.0	0.001	80	2.7	0.0	0.0	0.000	110	2.8	0.0	0.0	0.000
21	0.0	0.0	0.0	0.000	51	2.5	0.0	0.0	0.004	81	2.7	0.0	0.0	0.000	111	2.8	0.0	0.0	0.000
22	0.0	0.0	0.0	0.000	52	2.5	0.0	0.0	0.000	82	2.7	0.0	0.0	0.000	112	2.8	0.0	0.0	0.000
23	0.0	0.0	0.0	0.000	53	2.5	0.0	0.0	0.000	83	2.7	0.0	0.0	0.000	113	2.8	0.0	0.0	0.000
24	0.0	0.0	0.0	0.000	54	2.6	0.0	0.0	0.001	84	2.7	0.0	0.0	0.000	114	2.8	0.0	0.0	0.000
25	0.0	0.0	0.0	0.000	55	2.6	0.0	0.0	0.000	85	2.7	0.0	0.0	0.000	115	2.8	0.0	0.0	0.000
26	0.0	0.0	0.0	0.000	56	2.6	0.0	0.0	0.000	86	2.7	0.0	0.0	0.000	116	2.8	0.0	0.0	0.000
27	0.0	0.0	0.0	0.000	57	2.6	0.0	0.0	0.000	87	2.7	0.0	0.0	0.000	117	2.8	0.0	0.0	0.000
28	0.0	0.0	0.0	0.000	58	2.6	0.0	0.0	0.000	88	2.7	0.0	0.0	0.000	118	2.8	0.0	0.0	0.000
29	0.0	0.0	0.0	0.000	59	2.6	0.0	0.0	0.000	89	2.7	0.0	0.0	0.000	119	2.8	0.0	0.0	0.000
30	0.0	0.0	0.0	0.000	60	2.6	0.0	0.0	0.000	90	2.7	0.0	0.0	0.000	120	2.8	0.0	0.0	0.000

1. All samples 25 gram.
2.Average rate of gas production in L/Kg/Hr=Avg produced(ml)x40/1000ml/L

CRS

CLIMAX RESEARCH SERVICES

39205 COUNTRY CLUB DRIVE • FARMINGTON HILLS, MI 48331 • (810) 489-0720 • FACSIMILE (810) 489-8997

CRS Project Number: S-6747

January 27, 1997

Mr. Timothy H. Hall
SKW Metals and Alloys, Inc.
P.O. Box 217
Calvert City, Kentucky 42029

Dangerous When Wet Materials (as set forth in 49 CFR Section 173, Appendix E, Division 4, Sections 1, 2, 3 and 4) Evaluation of Low Ca Graphidox, Lab ID: 2128A, Bin Number: 405.

Dear Mr. Hall:

We have completed our gas evolution measurements and the flammability tests, per Code 49 CFR 173, Appendix E division 4, Sections 1, 2, 3 and 4, on the sample material that you submitted in late December 1996. The material we received from SKW was labeled as: Low Ca Graphidox. The results were as follows:

(1) no gas was evolved and no spontaneous ignition occurred.

(2) no gas was evolved and no spontaneous ignition occurred.

(3) no gas was evolved and no spontaneous ignition occurred.

(4) while some gas did evolve, the average rate never exceeded 1 liter per kilogram per hour in the sample tested. The gas was flammable and ignitible (gas ignited but would not sustain a continuous flame). It did not spontaneously ignite in any of the tests.

On the basis of these test results, the ferrosilicon material listed above would not fit the definition in 49 CFR Section 173, Appendix E, Division 4, Sections 1, 2, 3 and 4 as "Dangerous When Wet".

Sincerely,

James R. Lakin / by Darcie L. Monroe
Engineering Assoc.

James R. Lakin
Business Operations Manager

CLIMAX RESEARCH SERVICES

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January 27, 1997

Mr. Timothy H. Hall
SKW Metals and Alloys, Inc.
P.O. Box 217
Calvert City, Kentucky 42029

Re: Gas Evolution Measurements and Flammability Tests.
CRS Project Number: S-6747

Dear Mr. Hall:

We have completed the gas evolution measurements and the flammability tests, per Code 49 CFR 173, Appendix E division 4, Sections 1, 2, 3 and 4, on the sample material that you submitted in late December 1996. The identification of the material submitted and its chemistry specification are listed below.

Low Ca Graphidox	Al	Si	Ti	Ca
Specification, %:	<1.5	50-55	9-11	0.5-1.5
Lab ID: 2128A				
Bin Number: 405				
Chemistry:	0.24	50.38	10.92	0.50

Section 1 (Procedure & Results)

A small piece of the aforementioned material, approximately 2 mm in diameter, was placed in a trough of distilled water at 20°C. *No gas evolution was observed, nor did the sample spontaneously ignite.*

Section 2 (Procedure & Results)

A small piece of the material was placed in the center of a filter paper, which was floating in distilled water at 20°C. *No gas evolution was observed, nor did the sample spontaneously ignite.*

Section 3 (Procedure & Results)

A small pile with an indentation in the center, approximately 2cm high by 3cm in diameter, was made of the material. A few drops of water were added to the hollow. *No gas evolution was observed, nor did any of the sample spontaneously ignite.*

Section 4 (Procedure & Results)

Representative samples were taken from the lot of material submitted, and using a hammer and chisel the pieces were crushed individually. The larger pieces and the fines were screened off from each sample. Only material of +20 mesh to -8 mesh was used in the gas evolution tests. Three reaction vessels were set-up and filled with a deionized water. The reaction vessels were 1000 ml beakers each containing a small flask with 25.0 grams of sample material. Above each small flask a 50 ml buret was positioned up-side-down, which was also filled with deionized water and placed over the end of the flask making a water seal. The level in the buret was monitored for the next 5 days. Gas evolution data, measured in milliliters, is attached.

Following the gas evolution tests, the burets were submerged, still up-side-down, up to the stopcocks in water. A small flame was placed near the tip of the

buret and the stopcock was opened to allow the gas inside the burets to be pushed out into the flame by the water pressure. Flammability observations are noted at the bottom of the gas evolution data. The gas was not analyzed to determine its composition.

If you have questions about the test or these results please contact me. Thank you for doing business with us.

Sincerely,

James R. Lakin / by DARCIE L. MONREE
Engineering Associate

James R. Lakin
Business Operations Manager

Gas Evolution Measurements
(Water Volume Displacement)

		Low Ca Graphidox			Avg Rate
		1	2	3	(l/kg/hr)
	Time (hours)	(ml)	(ml)	(ml)	
Day 1	0.00	0.0	0.0	0.0	
	1.00	0.2	0.1	0.1	0.005
	2.00	0.3	0.2	0.2	0.004
	3.00	0.6	0.7	0.7	0.017
	4.00	1.0	0.8	0.7	0.007
	5.00	1.2	1.0	0.9	0.008
	6.00	1.5	1.2	1.2	0.011
	7.00	1.8	1.7	1.6	0.013
	8.00	1.9	1.8	1.6	0.009
Day 2	22.25	4.4	4.6	3.6	0.007
Day 3	46.25	5.2	9.9	5.1	0.004
	54.75	5.4	12.4	5.5	0.005
Day 4	70.25	5.6	16.0	6.0	0.004
Day 5	98.75	7.4	22.4	7.6	0.005

Flammable (F)		X	
Ignitible (I)*	X		X
Not Flammable (NF)			

* Ignitible = the gas will ignite but will not sustain a continuous flame.

Low-Calcium Graphidox

Specification Chemistry, %:

Al	Si	Ti	Ca
<1.50	50-55	9-11	0.5-1.5

Sample I.D. Number: 2128B
Bin Number: 405
Observed Chemistry of Tested Sample, %:

Al	Si	Ti	Ca
0.24	50.38	10.92	0.50

Test 1:
A small quantity (approximately 2 mm diameter) of the above material was placed in a trough of distilled water at 20° C and observed to see whether any gas evolved and if it spontaneously ignited. Test 1 was performed in triplicate on the above material.

Result:
Neither evolution of gas nor spontaneous ignition was observed any of the three times Test 1 was performed.

Test 2:
A small quantity (approximately 2 mm diameter) of the above material was floated on a piece of filter paper in distilled water at 20° C and observed to see whether any gas evolved and if it spontaneously ignited. Test 2 was performed in triplicate on the above material.

Result:
Neither evolution of gas or spontaneous ignition was observed in any of the three times Test 2 was performed.

Test 3:
The test material was formed into three piles approximately 2 cm high by 3 cm wide. An indentation was formed in the top of each pile and a few drops of water were added to each hollow. Each pile was observed to see whether any gas evolved and if it spontaneously ignited. Test 3 was performed in triplicate on the above material.

Result:
Neither evolution of gas nor spontaneous ignition was observed any of the three times Test 3 was performed.

Test 4:

Enough water at 20° C to cover the sample, 10ml to 20ml, was added to a dropping funnel. The spout of the dropping funnel was inserted into one hole of a #14, two-hole stopper; a tube for conveying any gas produced into the collection cylinder, a gas buret, was inserted into the other hole of the stopper; the far end of the tube was inserted into the end of the collection cylinder.

The gas buret is glass, 50 ml capacity, marked in individual ml units with each ml subdivided into 0.1 ml increments. The gas buret was filled with water, inverted and stood in a water trough. The gas tube in the previous paragraph was inserted into the bottom end of the gas buret and any gas produced was measured by observing the displacement of the water in the top of the buret.

25 g of the above listed material was added to each of three 100 ml conical flasks with #14 neck size. The stoppers mentioned above were inserted into the neck of the conical flasks. The stopcocks were opened and 10ml to 20ml of the 20° C distilled water, enough to completely cover the sample, was allowed to flow into the flasks. A timer was started and readings of any gas evolved were taken every hour for five days. From this data the average rate of gas production per hour was calculated for the five days.

Result:
The Gas Collection data for Low-Calcium Graphidox is detailed on the following page:

Gas Test on Low Calcium Graphidox

January 16, 1996

Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr
1	0.0	2.0	1.0	0.040	31	0.0	2.0	1.0	0.000	61	0.0	3.0	1.0	0.000	91	0.0	3.0	1.0	0.000
2	0.0	2.0	1.0	0.000	32	0.0	2.0	1.0	0.000	62	0.0	3.0	1.0	0.000	92	0.0	3.0	1.0	0.000
3	0.0	2.0	1.0	0.000	33	0.0	2.0	1.0	0.000	63	0.0	3.0	1.0	0.000	93	0.0	3.0	1.0	0.000
4	0.0	2.0	1.0	0.000	34	0.0	2.0	1.0	0.000	64	0.0	3.0	1.0	0.000	94	0.0	3.0	1.0	0.000
5	0.0	2.0	1.0	0.000	35	0.0	2.0	1.0	0.000	65	0.0	3.0	1.0	0.000	95	0.0	3.0	1.0	0.000
6	0.0	2.0	1.0	0.000	36	0.0	2.0	1.0	0.000	66	0.0	3.0	1.0	0.000	96	0.0	3.0	1.0	0.000
7	0.0	2.0	1.0	0.000	37	0.0	2.0	1.0	0.000	67	0.0	3.0	1.0	0.000	97	0.0	3.0	1.0	0.000
8	0.0	2.0	1.0	0.000	38	0.0	2.0	1.0	0.000	68	0.0	3.0	1.0	0.000	98	0.0	3.0	1.0	0.000
9	0.0	2.0	1.0	0.000	39	0.0	2.0	1.0	0.000	69	0.0	3.0	1.0	0.000	99	0.0	3.0	1.0	0.000
10	0.0	2.0	1.0	0.000	40	0.0	2.0	1.0	0.000	70	0.0	3.0	1.0	0.000	100	0.0	3.0	1.0	0.000
11	0.0	2.0	1.0	0.000	41	0.0	2.0	1.0	0.000	71	0.0	3.0	1.0	0.000	101	0.0	3.0	1.0	0.000
12	0.0	2.0	1.0	0.000	42	0.0	2.0	1.0	0.000	72	0.0	3.0	1.0	0.000	102	0.0	3.0	1.0	0.000
13	0.0	2.0	1.0	0.000	43	0.0	2.0	1.0	0.000	73	0.0	3.0	1.0	0.000	103	0.0	3.0	1.0	0.000
14	0.0	2.0	1.0	0.000	44	0.0	2.0	1.0	0.000	74	0.0	3.0	1.0	0.000	104	0.0	3.0	1.0	0.000
15	0.0	2.0	1.0	0.000	45	0.0	3.0	1.0	0.013	75	0.0	3.0	1.0	0.000	105	0.0	3.0	1.0	0.000
16	0.0	2.0	1.0	0.000	46	0.0	3.0	1.0	0.000	76	0.0	3.0	1.0	0.000	106	0.0	3.0	1.0	0.000
17	0.0	2.0	1.0	0.000	47	0.0	3.0	1.0	0.000	77	0.0	3.0	1.0	0.000	107	0.0	3.0	1.0	0.000
18	0.0	2.0	1.0	0.000	48	0.0	3.0	1.0	0.000	78	0.0	3.0	1.0	0.000	108	0.0	3.0	1.0	0.000
19	0.0	2.0	1.0	0.000	49	0.0	3.0	1.0	0.000	79	0.0	3.0	1.0	0.000	109	0.0	3.0	1.0	0.000
20	0.0	2.0	1.0	0.000	50	0.0	3.0	1.0	0.000	80	0.0	3.0	1.0	0.000	110	0.0	3.0	1.0	0.000
21	0.0	2.0	1.0	0.000	51	0.0	3.0	1.0	0.000	81	0.0	3.0	1.0	0.000	111	0.0	3.0	1.0	0.000
22	0.0	2.0	1.0	0.000	52	0.0	3.0	1.0	0.000	82	0.0	3.0	1.0	0.000	112	0.0	3.0	1.0	0.000
23	0.0	2.0	1.0	0.000	53	0.0	3.0	1.0	0.000	83	0.0	3.0	1.0	0.000	113	0.0	3.0	1.0	0.000
24	0.0	2.0	1.0	0.000	54	0.0	3.0	1.0	0.000	84	0.0	3.0	1.0	0.000	114	0.0	3.0	1.0	0.000
25	0.0	2.0	1.0	0.000	55	0.0	3.0	1.0	0.000	85	0.0	3.0	1.0	0.000	115	0.0	3.0	1.0	0.000
26	0.0	2.0	1.0	0.000	56	0.0	3.0	1.0	0.000	86	0.0	3.0	1.0	0.000	116	0.0	3.0	1.0	0.000
27	0.0	2.0	1.0	0.000	57	0.0	3.0	1.0	0.000	87	0.0	3.0	1.0	0.000	117	0.0	3.0	1.0	0.000
28	0.0	2.0	1.0	0.000	58	0.0	3.0	1.0	0.000	88	0.0	3.0	1.0	0.000	118	0.0	3.0	1.0	0.000
29	0.0	2.0	1.0	0.000	59	0.0	3.0	1.0	0.000	89	0.0	3.0	1.0	0.000	119	0.0	3.0	1.0	0.000
30	0.0	2.0	1.0	0.000	60	0.0	3.0	1.0	0.000	90	0.0	3.0	1.0	0.000	120	0.0	3.0	1.0	0.000

1. All samples 25 gram.
2. Average rate of gas production in L/Kg/Hr=Avg produced(ml)x40/1000ml/L

CLIMAX RESEARCH SERVICES

39205 COUNTRY CLUB DRIVE • FARMINGTON HILLS, MI 48331 • (810) 489-0720 • FACSIMILE (810) 489-8997

CRS Project Number: S-6747

February 5, 1997

Mr. Timothy H. Hall
SKW Metals and Alloys, Inc.
P.O. Box 217
Calvert City, Kentucky 42029

Dangerous When Wet Materials (as set forth in 49 CFR Section 173, Appendix E, Division 4, Sections 1, 2, 3 and 4) Evaluation of I63, Lab ID: 2131A, Bin Number: 316.

Dear Mr. Hall:

We have completed our gas evolution measurements and the flammability tests, per Code 49 CFR 173, Appendix E division 4, Sections 1, 2, 3 and 4, on the sample material that you submitted in late December 1996. The material we received from SKW was labeled as: I63. The results were as follows:

(1) no gas was evolved and no spontaneous ignition occurred.

(2) no gas was evolved and no spontaneous ignition occurred.

(3) no gas was evolved and no spontaneous ignition occurred.

(4) while some gas did evolve, the average rate never exceeded 1 liter per kilogram per hour in the sample tested. The gas was flammable, but it did not spontaneously ignite in any of the tests.

On the basis of these test results, the ferrosilicon material listed above would not fit the definition in 49 CFR Section 173, Appendix E, Division 4, Sections 1, 2, 3 and 4 as "Dangerous When Wet".

Sincerely,

James R. Lakin / by Darrel I. Monroe

James R. Lakin Engineering Associate
Business Operations Manager

CLIMAX RESEARCH SERVICES

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February 5, 1997

Mr. Timothy H. Hall
SKW Metals and Alloys, Inc.
P.O. Box 217
Calvert City, Kentucky 42029

Re: Gas Evolution Measurements and Flammability Tests.
CRS Project Number: S-6747

Dear Mr. Hall:

We have completed the gas evolution measurements and the flammability tests, per Code 49 CFR 173, Appendix E division 4, Sections 1, 2, 3 and 4, on the sample material that you submitted in late December 1996. The identification of the material submitted and its chemistry specification are listed below.

I63	Al	Si	Mn	Ca	Ba
Specification, %:	0.8-1.5	60-65	7-12	1.5-3.0	4.0-6.0
Lab ID: 2131A					
Bin Number: 316					
Chemistry:	1.23	64.87	7.14	1.90	4.09

Section 1 (Procedure & Results)

A small piece of the aforementioned material, approximately 2 mm in diameter, was placed in a trough of distilled water at 20°C. *No gas evolution was observed, nor did the sample spontaneously ignite.*

Section 2 (Procedure & Results)

A small piece of the material was placed in the center of a filter paper, which was floating in distilled water at 20°C. *No gas evolution was observed, nor did the sample spontaneously ignite.*

Section 3 (Procedure & Results)

A small pile with an indentation in the center, approximately 2cm high by 3cm in diameter, was made of the material. A few drops of water were added to the hollow. *No gas evolution was observed, nor did any of the sample spontaneously ignite.*

Section 4 (Procedure & Results)

Representative samples were taken from the lot of material submitted, and using a hammer and chisel the pieces were crushed individually. The larger pieces and the fines were screened off from each sample. Only material of +20 mesh to -8 mesh was used in the gas evolution tests. Three reaction vessels were set-up and filled with a deionized water. The reaction vessels were 1000 ml beakers each containing a small flask with 25.0 grams of sample material. Above each small flask a 50 ml buret was positioned up-side-down, which was also filled with deionized water and placed over the end of the flask making a water seal. The level in the buret was monitored for the next 5 days. Gas evolution data, measured in milliliters, is attached.

Following the gas evolution tests, the burets were submerged, still up-side-down, up to the stopcocks in water. A small flame was placed near the tip of the

buret and the stopcock was opened to allow the gas inside the burets to be pushed out into the flame by the water pressure. Flammability observations are noted at the bottom of the gas evolution data. The gas was not analyzed to determine its composition.

If you have questions about the test or these results please contact me. Thank you for doing business with us.

Sincerely,

James R. Lakin /by Darcie L. Monroe

James R. Lakin
Business Operations Manager

Engineering Associate

Gas Evolution Measurements
(Water Volume Displacement)

		I63			
		1	2	3	Avg Rate
	Time	(ml)	(ml)	(ml)	(l/kg/hr)
	(hours)				
Day 1	0.00	0.0	0.0	0.0	
	1.00	0.6	0.7	0.6	0.025
	2.00	2.2	2.0	1.7	0.053
	3.00	5.0	4.6	3.9	0.101
	4.00	5.6	5.2	4.4	0.023
	5.00	8.0	7.5	6.7	0.093
	8.25	11.8	10.6	10.3	0.043
Day 2	20.25	19.8	20.2	18.2	0.028
	28.75	25.0	26.6	23.6	0.027
Day 3	44.25	34.0	36.6	32.6	0.024
	52.25	36.9	39.8	35.8	0.016
Day 4	68.25	40.4	44.1	40.4	0.010
	76.50	41.8	46.2	42.5	0.009
Day 5	92.25	46.6	49.5	47.2	0.011
	100.75	49.4	50.0	50.0	0.010
Flammable (F)		X	X	X	
Ignitible (I)*					
Not Flammable (NF)					

* Ignitible = the gas will ignite but will not sustain a continuous flame.

Inoculoy 63

Specification Chemistry, %:

Al	Si	Mn	Ca	Ba
0.8-1.5	60-65	7-12	1.5-3.0	4.0-6.0

Sample I.D. Number: 2131B
Bin Number: 316
Observed Chemistry of Tested Sample, %:

Al	Si	Mn	Ca	Ba
1.23	64.87	7.14	1.90	4.09

Test 1:
A small quantity (approximately 2 mm diameter) of the above material was placed in a trough of distilled water at 20° C and observed to see whether any gas evolved and if it spontaneously ignited. Test 1 was performed in triplicate on the above material.

Result:
Neither evolution of gas nor spontaneous ignition was observed any of the three times Test 1 was performed.

Test 2:
A small quantity (approximately 2 mm diameter) of the above material was floated on a piece of filter paper in distilled water at 20° C and observed to see whether any gas evolved and if it spontaneously ignited. Test 2 was performed in triplicate on the above material.

Result:
Neither evolution of gas or spontaneous ignition was observed in any of the three times Test 2 was performed.

Test 3:
The test material was formed into three piles approximately 2 cm high by 3 cm wide. An indentation was formed in the top of each pile and a few drops of water were added to each hollow. Each pile was observed to see whether any gas evolved and if it spontaneously ignited. Test 3 was performed in triplicate on the above material.

Result:
Neither evolution of gas nor spontaneous ignition was observed any of the three times Test 3 was performed.

Test 4:
Enough water at 20° C to cover the sample, 10 ml to 20 ml, was added to a dropping funnel. The spout of the dropping funnel was inserted into one hole of a #14, two-hole stopper; a tube for conveying any gas produced into the collection cylinder, a gas buret, was inserted into the other hole of the stopper; the far end of the tube was inserted into the end of the collection cylinder.

The gas buret is glass, 50 ml capacity, marked in individual ml units with each ml subdivided into 0.1 ml increments. The gas buret was filled with water, inverted and stood in a water trough. The gas tube in the previous paragraph was inserted into the bottom end of the gas buret and any gas produced was measured by observing the displacement of the water in the top of the buret.

25 g of the above listed material was added to each of three 100 ml conical flasks with #14 neck size. The stoppers mentioned above were inserted into the neck of the conical flasks. The stopcocks were opened and 10 ml to 20 ml of the 20° C distilled water, enough to completely cover the sample, was allowed to flow into the flasks. A timer was started and readings of any gas evolved were taken every hour for five days. From this data the average rate of gas production per hour was calculated for the five days.

Result:
The Gas Collection data for Inoculoy 63 is detailed on the following page:

Gas Test on I-63

January 24, 1996

Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr
1	0.0	0.0	1.0	0.013	31	6.0	0.0	5.0	0.027	61	12.0	0.0	7.0	0.000	91	12.0	0.0	7.0	0.000
2	0.0	0.0	1.0	0.000	32	6.0	0.0	5.0	0.000	62	12.0	0.0	7.0	0.000	92	12.0	0.0	7.0	0.000
3	0.0	0.0	1.0	0.000	33	6.0	0.0	5.0	0.000	63	12.0	0.0	7.0	0.000	93	12.0	0.0	7.0	0.000
4	0.0	0.0	1.0	0.000	34	6.0	0.0	5.0	0.000	64	12.0	0.0	7.0	0.000	94	12.0	0.0	7.0	0.000
5	0.0	0.0	1.0	0.000	35	6.0	0.0	5.0	0.000	65	12.0	0.0	7.0	0.000	95	12.0	0.0	7.0	0.000
6	0.0	0.0	1.0	0.000	36	6.0	0.0	5.0	0.000	66	12.0	0.0	7.0	0.000	96	12.0	0.0	7.0	0.000
7	0.0	0.0	1.0	0.000	37	6.0	0.0	5.0	0.000	67	12.0	0.0	7.0	0.000	97	12.0	0.0	7.0	0.000
8	0.0	0.0	1.0	0.000	38	6.0	0.0	5.0	0.000	68	12.0	0.0	7.0	0.000	98	13.0	0.0	7.0	0.013
9	0.0	0.0	1.0	0.000	39	7.0	0.0	5.0	0.013	69	12.0	0.0	7.0	0.000	99	13.0	0.0	7.0	0.000
10	0.0	0.0	1.0	0.000	40	7.0	0.0	6.0	0.013	70	12.0	0.0	7.0	0.000	100	13.0	0.0	7.0	0.000
11	0.0	0.0	1.0	0.000	41	8.0	0.0	6.0	0.013	71	12.0	0.0	7.0	0.000	101	13.0	0.0	7.0	0.000
12	0.0	0.0	1.0	0.000	42	9.0	0.0	7.0	0.027	72	12.0	0.0	7.0	0.000	102	13.0	0.0	7.0	0.000
13	0.0	0.0	1.0	0.000	43	9.0	0.0	7.0	0.000	73	12.0	0.0	7.0	0.000	103	13.0	0.0	7.0	0.000
14	1.0	0.0	1.0	0.013	44	9.0	0.0	7.0	0.000	74	12.0	0.0	7.0	0.000	104	13.0	0.0	7.0	0.000
15	1.0	0.0	1.0	0.000	45	10.0	0.0	7.0	0.013	75	12.0	0.0	7.0	0.000	105	13.0	0.0	7.0	0.000
16	1.0	0.0	1.0	0.000	46	10.0	0.0	7.0	0.000	76	12.0	0.0	7.0	0.000	106	13.0	0.0	7.0	0.000
17	1.0	0.0	2.0	0.013	47	11.0	0.0	7.0	0.013	77	12.0	0.0	7.0	0.000	107	13.0	0.0	7.0	0.000
18	1.0	0.0	2.0	0.000	48	11.0	0.0	7.0	0.000	78	12.0	0.0	7.0	0.000	108	13.0	0.0	7.0	0.000
19	2.0	0.0	2.0	0.013	49	11.0	0.0	7.0	0.000	79	12.0	0.0	7.0	0.000	109	13.0	0.0	7.0	0.000
20	2.0	0.0	2.0	0.000	50	11.0	0.0	7.0	0.000	80	12.0	0.0	7.0	0.000	110	13.0	0.0	7.0	0.000
21	2.0	0.0	2.0	0.000	51	12.0	0.0	7.0	0.013	81	12.0	0.0	7.0	0.000	111	13.0	0.0	7.0	0.000
22	2.0	0.0	2.0	0.000	52	12.0	0.0	7.0	0.000	82	12.0	0.0	7.0	0.000	112	13.0	0.0	7.0	0.000
23	2.0	0.0	2.0	0.000	53	12.0	0.0	7.0	0.000	83	12.0	0.0	7.0	0.000	113	13.0	0.0	7.0	0.000
24	3.0	0.0	3.0	0.027	54	12.0	0.0	7.0	0.000	84	12.0	0.0	7.0	0.000	114	13.0	0.0	7.0	0.000
25	4.0	0.0	3.0	0.013	55	12.0	0.0	7.0	0.000	85	12.0	0.0	7.0	0.000	115	13.0	0.0	7.0	0.000
26	4.0	0.0	4.0	0.013	56	12.0	0.0	7.0	0.000	86	12.0	0.0	7.0	0.000	116	13.0	0.0	7.0	0.000
27	5.0	0.0	4.0	0.013	57	12.0	0.0	7.0	0.000	87	12.0	0.0	7.0	0.000	117	13.0	0.0	7.0	0.000
28	5.0	0.0	4.0	0.000	58	12.0	0.0	7.0	0.000	88	12.0	0.0	7.0	0.000	118	13.0	0.0	7.0	0.000
29	5.0	0.0	4.0	0.000	59	12.0	0.0	7.0	0.000	89	12.0	0.0	7.0	0.000	119	13.0	0.0	7.0	0.000
30	5.0	0.0	4.0	0.000	60	12.0	0.0	7.0	0.000	90	12.0	0.0	7.0	0.000	120	13.0	0.0	7.0	0.000

1. All samples 25 gram.
2. Average rate of gas production in L/Kg/Hr=Avg produced(ml)x40/1000ml/L

CLIMAX RESEARCH SERVICES

39205 COUNTRY CLUB DRIVE • FARMINGTON HILLS, MI 48331 • (810) 489-0720 • FACSIMILE (810) 489-8997

CRS Project Number: S-6747

January 27, 1997

Mr. Timothy H. Hall
SKW Metals and Alloys, Inc.
P.O. Box 217
Calvert City, Kentucky 42029

Dangerous When Wet Materials (as set forth in 49 CFR Section 173, Appendix E, Division 4, Sections 1, 2, 3 and 4) Evaluation of Noduloy 5C1, Lab ID: 2126A, Bin Number: 109.

Dear Mr. Hall:

We have completed our gas evolution measurements and the flammability tests, per Code 49 CFR 173, Appendix E division 4, Sections 1, 2, 3 and 4, on the sample material that you submitted in late December 1996. The material we received from SKW was labeled as: Noduloy 5C1. The results were as follows:

(1) no gas was evolved and no spontaneous ignition occurred.

(2) no gas was evolved and no spontaneous ignition occurred.

(3) no gas was evolved and no spontaneous ignition occurred.

(4) while some gas did evolve, the average rate never exceeded 1 liter per kilogram per hour in the sample tested. The gas was flammable and ignitible (gas ignited but would not sustain flame). It did not spontaneously ignite in any of the tests.

On the basis of these test results, the ferrosilicon material listed above would not fit the definition in 49 CFR Section 173, Appendix E, Division 4, Sections 1, 2, 3 and 4 as "Dangerous When Wet".

Sincerely,

James R. Lakin /by DARCIE L. MONROE
Engineering Associate

James R. Lakin
Business Operations Manager

CLIMAX RESEARCH SERVICES

39205 COUNTRY CLUB DRIVE • FARMINGTON HILLS, MI 48331 • (810) 489-0720 • FACSIMILE (810) 489-8997

January 27, 1997

Mr. Timothy H. Hall
SKW Metals and Alloys, Inc.
P.O. Box 217
Calvert City, Kentucky 42029

Re: Gas Evolution Measurements and Flammability Tests.
CRS Project Number: S-6747

Dear Mr. Hall:

We have completed the gas evolution measurements and the flammability tests, per Code 49 CFR 173, Appendix E division 4, Sections 1, 2, 3 and 4, on the sample material that you submitted in late December 1996. The identification of the material submitted and its chemistry specification are listed below.

Noduloy 5C1	Al	Si	Ce	Mg	TRE	Ca
Specification, %:	0.7-1.2	44-48	0.9-1.2	5.5-6.0		0.8-1.3
Lab ID: 2126A						
Bin Number: 109						
Chemistry:	0.72	44.87	0.91	5.93		1.20

Section 1 (Procedure & Results)

A small piece of the aforementioned material, approximately 2 mm in diameter, was placed in a trough of distilled water at 20°C. *No gas evolution was observed, nor did the sample spontaneously ignite.*

Section 2 (Procedure & Results)

A small piece of the material was placed in the center of a filter paper, which was floating in distilled water at 20°C. *No gas evolution was observed, nor did the sample spontaneously ignite.*

Section 3 (Procedure & Results)

A small pile with an indentation in the center, approximately 2cm high by 3cm in diameter, was made of the material. A few drops of water were added to the hollow. *No gas evolution was observed, nor did any of the sample spontaneously ignite.*

Section 4 (Procedure & Results)

Representative samples were taken from the lot of material submitted, and using a hammer and chisel the pieces were crushed individually. The larger pieces and the fines were screened off from each sample. Only material of +20 mesh to -8 mesh was used in the gas evolution tests. Three reaction vessels were set-up and filled with a deionized water. The reaction vessels were 1000 ml beakers each containing a small flask with 25.0 grams of sample material. Above each small flask a 50 ml buret was positioned up-side-down, which was also filled with deionized water and placed over the end of the flask making a water seal. The level in the buret was monitored for the next 5 days. Gas evolution data, measured in milliliters, is attached.

Following the gas evolution tests, the burets were submerged, still up-side-down, up to the stopcocks in water. A small flame was placed near the tip of the

buret and the stopcock was opened to allow the gas inside the burets to be pushed out into the flame by the water pressure. Flammability observations are noted at the bottom of the gas evolution data. The gas was not analyzed to determine its composition.

If you have questions about the test or these results please contact me. Thank you for doing business with us.

Sincerely,

James R Lakin /by DARLENE L MONROE

James R. Lakin
Business Operations Manager

Engineering Associate

Gas Evolution Measurements
(Water Volume Displacement)

		NOD5C1			Avg Rate
		1	2	3	(l/kg/hr)
	Time (hours)	(ml)	(ml)	(ml)	
Day 1	0.00	0.0	0.0	0.0	
	1.00	6.0	5.8	4.5	0.217
	2.00	8.3	7.9	6.6	0.087
	3.00	10.3	9.9	9.1	0.087
	4.00	10.7	9.9	9.1	0.005
	5.00	12.9	11.8	10.6	0.075
	6.00	13.6	12.3	11.2	0.024
	7.00	14.4	13.4	12.2	0.031
	8.00	15.0	13.8	13.3	0.033
	17.50	19.6	18.6	21.0	0.024
Day 2	26.00	22.3	21.3	29.5	0.022
	41.50	26.2	25.1	39.6	0.015
Day 3	50.00	27.8	26.7	43.5	0.011
	65.50	31.9	30.4	49.0	0.011
Day 4	89.50	35.9	34.6	49.4	0.005
Day 5	98.00	37.2	35.8	49.9	0.005
Flammable (F)		X	X		
Ignitible (I)*				X	
Not Flammable (NF)					

* Ignitible = the gas will ignite but will not sustain a continuous flame.

Noduloy 5C1

Specification Chemistry, %:

Al	Si	Ce	Mg	TRE	Ca
0.7-1.2	44-48	0.9-1.2	5.5-6.0	Not sp.	0.8-1.3

Sample I.D. Number: 2126B
Bin Number: 109
Observed Chemistry of Tested Sample, %:

Al	Si	Ce	Mg	TRE	Ca
0.72	44.87	0.91	5.93		1.20

Test 1:
A small quantity (approximately 2 mm diameter) of the above material was placed in a trough of distilled water at 20° C and observed to see whether any gas evolved and if it spontaneously ignited. Test 1 was performed in triplicate on the above material.

Result:
Neither evolution of gas nor spontaneous ignition was observed any of the three times Test 1 was performed.

Test 2:
A small quantity (approximately 2 mm diameter) of the above material was floated on a piece of filter paper in distilled water at 20° C and observed to see whether any gas evolved and if it spontaneously ignited. Test 2 was performed in triplicate on the above material.

Result:
Neither evolution of gas or spontaneous ignition was observed in any of the three times Test 2 was performed.

Test 3:
The test material was formed into three piles approximately 2 cm high by 3 cm wide. An indentation was formed in the top of each pile and a few drops of water were added to each hollow. Each pile was observed to see whether any gas evolved and if it spontaneously ignited. Test 3 was performed in triplicate on the above material.

Result:
Neither evolution of gas nor spontaneous ignition was observed any of the three times Test 3 was performed.

Test 4:
Enough water at 20° C to cover the sample, 10 ml to 20 ml, was added to a dropping funnel. The spout of the dropping funnel was inserted into one hole of a #14, two-hole stopper; a tube for conveying any gas produced into the collection cylinder, a gas buret, was inserted into the other hole of the stopper; the far end of the tube was inserted into the end of the collection cylinder.

The gas buret is glass, 50 ml capacity, marked in individual ml units with each ml subdivided into 0.1 ml increments. The gas buret was filled with water, inverted and stood in a water trough. The gas tube in the previous paragraph was inserted into the bottom end of the gas buret and any gas produced was measured by observing the displacement of the water in the top of the buret.

25 g of the above listed material was added to each of three 100 ml conical flasks with #14 neck size. The stoppers mentioned above were inserted into the neck of the conical flasks. The stopcocks were opened and 10 ml to 20 ml of the 20° C distilled water, enough to completely cover the sample, was allowed to flow into the flasks. A timer was started and readings of any gas evolved were taken every hour for five days. From this data the average rate of gas production per hour was calculated for the five days.

Result:
The Gas Collection data for Noduloy 5C1 is detailed on the following page:

Gas Test on Noduloy 5C1

January 24, 1996

Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr
1	0.7	1.5	0.7	0.039	31	2.1	7.5	7.7	0.000	61	2.1	7.5	7.7	0.000	91	2.1	10.5	13.1	0.004
2	1.3	1.9	1.2	0.020	32	2.1	7.5	7.7	0.000	62	2.1	7.5	7.8	0.001	92	2.1	10.6	13.1	0.001
3	2.0	2.6	2.1	0.031	33	2.1	7.5	7.7	0.000	63	2.1	7.5	8.0	0.003	93	2.1	10.6	13.1	0.000
4	2.0	2.9	2.5	0.009	34	2.1	7.5	7.7	0.000	64	2.1	7.5	8.2	0.003	94	2.1	10.6	13.1	0.000
5	2.0	3.1	2.8	0.007	35	2.1	7.5	7.7	0.000	65	2.1	7.5	8.2	0.000	95	2.1	10.6	13.1	0.000
6	2.0	3.4	3.3	0.011	36	2.1	7.5	7.7	0.000	66	2.1	7.5	8.6	0.005	96	2.1	10.6	13.1	0.000
7	2.0	3.6	3.7	0.008	37	2.1	7.5	7.7	0.000	67	2.1	7.5	8.6	0.000	97	2.1	10.6	13.1	0.000
8	2.0	3.7	4.2	0.008	38	2.1	7.5	7.7	0.000	68	2.1	7.5	8.8	0.003	98	2.1	10.6	13.1	0.000
9	2.0	4.3	4.7	0.015	39	2.1	7.5	7.7	0.000	69	2.1	7.5	8.8	0.000	99	2.1	10.6	13.1	0.000
10	2.0	4.9	5.2	0.015	40	2.1	7.5	7.7	0.000	70	2.1	7.6	8.9	0.003	100	2.1	10.6	13.1	0.000
11	2.0	5.3	5.6	0.011	41	2.1	7.5	7.7	0.000	71	2.1	7.6	8.9	0.000	101	2.1	10.6	13.1	0.000
12	2.0	5.5	5.7	0.004	42	2.1	7.5	7.7	0.000	72	2.1	7.8	9.1	0.005	102	2.1	10.6	13.1	0.000
13	2.0	5.6	6.0	0.005	43	2.1	7.5	7.7	0.000	73	2.1	8.0	9.4	0.007	103	2.1	10.6	13.1	0.000
14	2.0	5.7	6.1	0.003	44	2.1	7.5	7.7	0.000	74	2.1	8.4	9.5	0.007	104	2.1	10.6	13.1	0.000
15	2.0	6.3	6.4	0.012	45	2.1	7.5	7.7	0.000	75	2.1	8.4	9.5	0.000	105	2.1	10.6	13.1	0.000
16	2.0	6.5	6.8	0.008	46	2.1	7.5	7.7	0.000	76	2.1	8.7	9.6	0.005	106	2.1	10.6	13.1	0.000
17	2.0	6.8	6.9	0.005	47	2.1	7.5	7.7	0.000	77	2.1	8.7	9.7	0.001	107	2.1	10.6	13.1	0.000
18	2.0	6.9	7.0	0.003	48	2.1	7.5	7.7	0.000	78	2.1	8.8	9.8	0.003	108	2.1	10.6	13.1	0.000
19	2.1	7.2	7.4	0.011	49	2.1	7.5	7.7	0.000	79	2.1	9.0	9.8	0.003	109	2.1	10.6	13.1	0.000
20	2.1	7.5	7.7	0.008	50	2.1	7.5	7.7	0.000	80	2.1	9.0	9.8	0.000	110	2.1	10.6	13.1	0.000
21	2.1	7.5	7.7	0.000	51	2.1	7.5	7.7	0.000	81	2.1	9.3	10.2	0.009	111	2.1	10.6	13.1	0.000
22	2.1	7.5	7.7	0.000	52	2.1	7.5	7.7	0.000	82	2.1	9.5	10.4	0.005	112	2.1	10.6	13.1	0.000
23	2.1	7.5	7.7	0.000	53	2.1	7.5	7.7	0.000	83	2.1	9.8	12.1	0.027	113	2.1	10.6	13.1	0.000
24	2.1	7.5	7.7	0.000	54	2.1	7.5	7.7	0.000	84	2.1	9.8	12.2	0.001	114	2.1	10.6	13.1	0.000
25	2.1	7.5	7.7	0.000	55	2.1	7.5	7.7	0.000	85	2.1	9.8	12.3	0.001	115	2.1	10.6	13.1	0.000
26	2.1	7.5	7.7	0.000	56	2.1	7.5	7.7	0.000	86	2.1	10.2	12.6	0.009	116	2.1	10.6	13.1	0.000
27	2.1	7.5	7.7	0.000	57	2.1	7.5	7.7	0.000	87	2.1	10.2	12.6	0.000	117	2.1	10.6	13.1	0.000
28	2.1	7.5	7.7	0.000	58	2.1	7.5	7.7	0.000	88	2.1	10.3	12.8	0.004	118	2.1	10.6	13.1	0.000
29	2.1	7.5	7.7	0.000	59	2.1	7.5	7.7	0.000	89	2.1	10.4	12.9	0.003	119	2.1	10.6	13.1	0.000
30	2.1	7.5	7.7	0.000	60	2.1	7.5	7.7	0.000	90	2.1	10.4	12.9	0.000	120	2.1	10.6	13.1	0.000

1. All samples 25 gram.
2.Average rate of gas production in L/Kg/Hr=Avg produced(ml)x40/1000ml/L

DOT5C1.XLS

CRS

CLIMAX RESEARCH SERVICES

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CRS Project Number: S-6747

January 27, 1997

Mr. Timothy H. Hall
SKW Metals and Alloys, Inc.
P.O. Box 217
Calvert City, Kentucky 42029

Dangerous When Wet Materials (as set forth in 49 CFR Section 173, Appendix E, Division 4, Sections 1, 2, 3 and 4) Evaluation of Noduloy 5R2, Lab ID: 2127A, Bin Number: 107.

Dear Mr. Hall:

We have completed our gas evolution measurements and the flammability tests, per Code 49 CFR 173, Appendix E division 4, Sections 1, 2, 3 and 4, on the sample material that you submitted in late December 1996. The material we received from SKW was labeled as: Noduloy 5R2. The results were as follows:

(1) no gas was evolved and no spontaneous ignition occurred.

(2) no gas was evolved and no spontaneous ignition occurred.

(3) no gas was evolved and no spontaneous ignition occurred.

(4) while some gas did evolve, the average rate never exceeded 1 liter per kilogram per hour in the sample tested. The gas was flammable and ignitible (gas ignited but would not sustain a continuous flame). It did not spontaneously ignite in any of the tests.

On the basis of these test results, the ferrosilicon material listed above would not fit the definition in 49 CFR Section 173, Appendix E, Division 4, Sections 1, 2, 3 and 4 as "Dangerous When Wet".

Sincerely,

James R. Lakin / by Darcie L. Monroe
Engineering Associate

James R. Lakin
Business Operations Manager

CLIMAX RESEARCH SERVICES

39205 COUNTRY CLUB DRIVE • FARMINGTON HILLS, MI 48331 • (810) 489-0720 • FACSIMILE (810) 489-8997

January 27, 1997

Mr. Timothy H. Hall
SKW Metals and Alloys, Inc.
P.O. Box 217
Calvert City, Kentucky 42029

Re: Gas Evolution Measurements and Flammability Tests.
CRS Project Number: S-6747

Dear Mr. Hall:

We have completed the gas evolution measurements and the flammability tests, per Code 49 CFR 173, Appendix E division 4, Sections 1, 2, 3 and 4, on the sample material that you submitted in late December 1996. The identification of the material submitted and its chemistry specification are listed below.

Noduloy 5R2	Al	Si	Ce	Mg	TRE	Ca
Specification, %:	0.7-1.2	44-48	0.3-0.5	6.0-6.8	0.5-0.85	0.8-1.3
Lab ID: 2127A						
Bin Number: 107						
Chemistry:	0.97	44.26	0.60	6.56	0.84	1.02

Section 1 (Procedure & Results)

A small piece of the aforementioned material, approximately 2 mm in diameter, was placed in a trough of distilled water at 20°C. *No gas evolution was observed, nor did the sample spontaneously ignite.*

Section 2 (Procedure & Results)

A small piece of the material was placed in the center of a filter paper, which was floating in distilled water at 20°C. *No gas evolution was observed, nor did the sample spontaneously ignite.*

Section 3 (Procedure & Results)

A small pile with an indentation in the center, approximately 2cm high by 3cm in diameter, was made of the material. A few drops of water were added to the hollow. *No gas evolution was observed, nor did any of the sample spontaneously ignite.*

Section 4 (Procedure & Results)

Representative samples were taken from the lot of material submitted, and using a hammer and chisel the pieces were crushed individually. The larger pieces and the fines were screened off from each sample. Only material of +20 mesh to -8 mesh was used in the gas evolution tests. Three reaction vessels were set-up and filled with a deionized water. The reaction vessels were 1000 ml beakers each containing a small flask with 25.0 grams of sample material. Above each small flask a 50 ml buret was positioned up-side-down, which was also filled with deionized water and placed over the end of the flask making a water seal. The level in the buret was monitored for the next 5 days. Gas evolution data, measured in milliliters, is attached.

Following the gas evolution tests, the burets were submerged, still up-side-down, up to the stopcocks in water. A small flame was placed near the tip of the

buret and the stopcock was opened to allow the gas inside the burets to be pushed out into the flame by the water pressure. Flammability observations are noted at the bottom of the gas evolution data. The gas was not analyzed to determine its composition.

If you have questions about the test or these results please contact me. Thank you for doing business with us.

Sincerely,

James R. Lakin /by DARCIE L. MONROE

James R. Lakin
Business Operations Manager

Engineering Associate

Gas Evolution Measurements
(Water Volume Displacement)

		Noduloy 5R1			Avg Rate
		1	2	3	(l/kg/hr)
	Time (hours)	(ml)	(ml)	(ml)	
Day 1	0.00	0.0	0.0	0.0	
	1.00	3.5	4.4	6.4	0.191
	2.00	6.3	7.2	11.0	0.136
	3.00	8.1	9.2	14.0	0.091
	4.00	9.2	10.6	16.9	0.072
	5.00	9.8	11.6	18.2	0.039
	6.00	10.6	12.7	19.6	0.044
	7.00	12.0	14.6	20.8	0.052
	8.00	12.3	14.9	21.7	0.040
Day 2	22.25	18.6	23.5	29.6	0.021
Day 3	46.25	31.9	32.2	50.0	0.024
	54.75	34.2	34.2	50.0	0.007
Day 4	70.25	37.5	37.2	50.0	0.005
Day 5	98.75	43.6	41.9	50.0	0.005

Flammable (F)		X	
Ignitible (I)*	X		
Not Flammable (NF)			X

* Ignitible = the gas will ignite but will not sustain a continuous flame.

Noduloy 5R2

Specification Chemistry, %:

Al	Si	Ce	Mg	TRE	Ca
0.7-1.2	44-48	0.3-0.5	6.0-6.8	0.5-.85	0.8-1.3

Sample I.D. Number: 2127B
Bin Number: 107
Observed Chemistry of Tested Sample, %:

Al	Si	Ce	Mg	TRE	Ca
0.97	44.26	0.60	6.56	0.84	1.02

Test 1:
A small quantity (approximately 2 mm diameter) of the above material was placed in a trough of distilled water at 20° C and observed to see whether any gas evolved and if it spontaneously ignited. Test 1 was performed in triplicate on the above material.

Result:
Neither evolution of gas nor spontaneous ignition was observed any of the three times Test 1 was performed.

Test 2:
A small quantity (approximately 2 mm diameter) of the above material was floated on a piece of filter paper in distilled water at 20° C and observed to see whether any gas evolved and if it spontaneously ignited. Test 2 was performed in triplicate on the above material.

Result:
Neither evolution of gas or spontaneous ignition was observed in any of the three times Test 2 was performed.

Test 3:
The test material was formed into three piles approximately 2 cm high by 3 cm wide. An indentation was formed in the top of each pile and a few drops of water were added to each hollow. Each pile was observed to see whether any gas evolved and if it spontaneously ignited. Test 3 was performed in triplicate on the above material.

Result:
Neither evolution of gas nor spontaneous ignition was observed any of the three times Test 3 was performed.

Test 4:
Enough water at 20° C to cover the sample, 10ml to 20ml, was added to a dropping funnel. The spout of the dropping funnel was inserted into one hole of a #14, two-hole stopper; a tube for conveying any gas produced into the collection cylinder, a gas buret, was inserted into the other hole of the stopper; the far end of the tube was inserted into the end of the collection cylinder.

The gas buret is glass, 50 ml capacity, marked in individual ml units with each ml subdivided into 0.1 ml increments. The gas buret was filled with water, inverted and stood in a water trough. The gas tube in the previous paragraph was inserted into the bottom end of the gas buret and any gas produced was measured by observing the displacement of the water in the top of the buret.

25 g of the above listed material was added to each of three 100 ml conical flasks with #14 neck size. The stoppers mentioned above were inserted into the neck of the conical flasks. The stopcocks were opened and 10 ml to 20 ml of the 20° C distilled water, enough to completely cover the sample, was allowed to flow into the flasks. A timer was started and readings of any gas evolved were taken every hour for five days. From this data the average rate of gas production per hour was calculated for the five days.

Result:
The Gas Collection data for Noduloy 5R2 is detailed on the following page:

Gas Test on Noduloy, 5R2

January 16, 1996

Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr
1	10.0	17.0	0.0	0.360	31	21.0	30.6	15.0	0.000	61	21.5	32.5	15.2	0.000	91	21.5	32.5	15.2	0.000
2	14.8	18.5	6.8	0.175	32	21.0	30.6	15.0	0.000	62	21.5	32.5	15.2	0.000	92	21.5	32.5	15.2	0.000
3	17.9	21.2	8.6	0.101	33	21.0	30.6	15.0	0.000	63	21.5	32.5	15.2	0.000	93	21.5	32.5	15.2	0.000
4	20.8	24.6	13.1	0.144	34	21.0	30.6	15.0	0.000	64	21.5	32.5	15.2	0.000	94	21.5	32.5	15.2	0.000
5	20.9	27.5	13.4	0.044	35	21.0	30.6	15.0	0.000	65	21.5	32.5	15.2	0.000	95	21.5	32.5	15.2	0.000
6	20.9	27.9	14.8	0.024	36	21.0	30.6	15.0	0.000	66	21.5	32.5	15.2	0.000	96	21.5	32.5	15.2	0.000
7	21.0	28.0	15.0	0.005	37	21.0	30.6	15.0	0.000	67	21.5	32.5	15.2	0.000	97	21.5	32.5	15.2	0.000
8	21.0	28.0	15.0	0.000	38	21.0	30.6	15.0	0.000	68	21.5	32.5	15.2	0.000	98	21.5	32.5	15.2	0.000
9	21.0	28.0	15.0	0.000	39	21.0	30.6	15.0	0.000	69	21.5	32.5	15.2	0.000	99	21.5	32.5	15.2	0.000
10	21.0	28.0	15.0	0.000	40	21.0	30.6	15.0	0.000	70	21.5	32.5	15.2	0.000	100	21.5	32.5	15.2	0.000
11	21.0	29.0	15.0	0.013	41	21.0	30.6	15.0	0.000	71	21.5	32.5	15.2	0.000	101	21.5	32.5	15.2	0.000
12	21.0	29.0	15.0	0.000	42	21.0	30.6	15.0	0.000	72	21.5	32.5	15.2	0.000	102	21.5	32.5	15.2	0.000
13	21.0	29.0	15.0	0.000	43	21.0	30.6	15.0	0.000	73	21.5	32.5	15.2	0.000	103	21.5	32.5	15.2	0.000
14	21.0	29.0	15.0	0.000	44	21.0	30.6	15.0	0.000	74	21.5	32.5	15.2	0.000	104	21.5	32.5	15.2	0.000
15	21.0	29.4	15.0	0.005	45	21.0	31.5	15.0	0.012	75	21.5	32.5	15.2	0.000	105	21.5	32.5	15.2	0.000
16	21.0	29.4	15.0	0.000	46	21.1	31.5	15.0	0.001	76	21.5	32.5	15.2	0.000	106	21.5	32.5	15.2	0.000
17	21.0	29.4	15.0	0.000	47	21.1	31.6	15.0	0.001	77	21.5	32.5	15.2	0.000	107	21.5	32.5	15.2	0.000
18	21.0	30.6	15.0	0.016	48	21.2	31.6	15.0	0.001	78	21.5	32.5	15.2	0.000	108	21.5	32.5	15.2	0.000
19	21.0	30.6	15.0	0.000	49	21.2	32.0	15.0	0.005	79	21.5	32.5	15.2	0.000	109	21.5	32.5	15.2	0.000
20	21.0	30.6	15.0	0.000	50	21.3	32.1	15.1	0.004	80	21.5	32.5	15.2	0.000	110	21.5	32.5	15.2	0.000
21	21.0	30.6	15.0	0.000	51	21.3	32.1	15.1	0.000	81	21.5	32.5	15.2	0.000	111	21.5	32.5	15.2	0.000
22	21.0	30.6	15.0	0.000	52	21.4	32.2	15.2	0.004	82	21.5	32.5	15.2	0.000	112	21.5	32.5	15.2	0.000
23	21.0	30.6	15.0	0.000	53	21.4	32.4	15.2	0.003	83	21.5	32.5	15.2	0.000	113	21.5	32.5	15.2	0.000
24	21.0	30.6	15.0	0.000	54	21.5	32.5	15.2	0.003	84	21.5	32.5	15.2	0.000	114	21.5	32.5	15.2	0.000
25	21.0	30.6	15.0	0.000	55	21.5	32.5	15.2	0.000	85	21.5	32.5	15.2	0.000	115	21.5	32.5	15.2	0.000
26	21.0	30.6	15.0	0.000	56	21.5	32.5	15.2	0.000	86	21.5	32.5	15.2	0.000	116	21.5	32.5	15.2	0.000
27	21.0	30.6	15.0	0.000	57	21.5	32.5	15.2	0.000	87	21.5	32.5	15.2	0.000	117	21.5	32.5	15.2	0.000
28	21.0	30.6	15.0	0.000	58	21.5	32.5	15.2	0.000	88	21.5	32.5	15.2	0.000	118	21.5	32.5	15.2	0.000
29	21.0	30.6	15.0	0.000	59	21.5	32.5	15.2	0.000	89	21.5	32.5	15.2	0.000	119	21.5	32.5	15.2	0.000
30	21.0	30.6	15.0	0.000	60	21.5	32.5	15.2	0.000	90	21.5	32.5	15.2	0.000	120	21.5	32.5	15.2	0.000

1. All samples 25 gram.
2.Average rate of gas production in L/Kg/Hr=Avg produced(ml)x40/1000ml/L

CLIMAX RESEARCH SERVICES

39205 COUNTRY CLUB DRIVE • FARMINGTON HILLS, MI 48331 • (810) 489-0720 • FACSIMILE (810) 489-8997

CRS Project Number: S-6747

February 5, 1997

Mr. Timothy H. Hall
SKW Metals and Alloys, Inc.
P.O. Box 217
Calvert City, Kentucky 42029

Dangerous When Wet Materials (as set forth in 49 CFR Section 173, Appendix E, Division 4, Sections 1, 2, 3 and 4) Evaluation of SRF 50, Lab ID: 2133A, Bin Number: 307.

Dear Mr. Hall:

We have completed our gas evolution measurements and the flammability tests, per Code 49 CFR 173, Appendix E division 4, Sections 1, 2, 3 and 4, on the sample material that you submitted in late December 1996. The material we received from SKW was labeled as: SRF 50. The results were as follows:

(1) no gas was evolved and no spontaneous ignition occurred.

(2) no gas was evolved and no spontaneous ignition occurred.

(3) no gas was evolved and no spontaneous ignition occurred.

(4) while some gas did evolve, the average rate never exceeded 1 liter per kilogram per hour in the sample tested. The gas was nonflammable in all cases, and it did not spontaneously ignite in any of the tests.

On the basis of these test results, the ferrosilicon material listed above would not fit the definition in 49 CFR Section 173, Appendix E, Division 4, Sections 1, 2, 3 and 4 as "Dangerous When Wet".

Sincerely,

James R. Lakin / by Darlene L. Monroe
Engineering Associate

James R. Lakin
Business Operations Manager

CLIMAX RESEARCH SERVICES

39205 COUNTRY CLUB DRIVE • FARMINGTON HILLS, MI 48331 • (810) 489-0720 • FACSIMILE (810) 489-8997

February 5, 1997

Mr. Timothy H. Hall
SKW Metals and Alloys, Inc.
P.O. Box 217
Calvert City, Kentucky 42029

Re: Gas Evolution Measurements and Flammability Tests.
CRS Project Number: S-6747

Dear Mr. Hall:

We have completed the gas evolution measurements and the flammability tests, per Code 49 CFR 173, Appendix E division 4, Sections 1, 2, 3 and 4, on the sample material that you submitted in late December 1996. The identification of the material submitted and its chemistry specification are listed below.

SRF 50	Al	Si	Ca	Sr
Specification, %:	<0.5	44-48	<0.1	0.8-1.2
Lab ID: 2133A				
Bin Number: 307				
Chemistry:	0.37	46.12	0.01	0.86

Section 1 (Procedure & Results)

A small piece of the aforementioned material, approximately 2 mm in diameter, was placed in a trough of distilled water at 20°C. *No gas evolution was observed, nor did the sample spontaneously ignite.*

Section 2 (Procedure & Results)

A small piece of the material was placed in the center of a filter paper, which was floating in distilled water at 20°C. *No gas evolution was observed, nor did the sample spontaneously ignite.*

Section 3 (Procedure & Results)

A small pile with an indentation in the center, approximately 2cm high by 3cm in diameter, was made of the material. A few drops of water were added to the hollow. *No gas evolution was observed, nor did any of the sample spontaneously ignite.*

Section 4 (Procedure & Results)

Representative samples were taken from the lot of material submitted, and using a hammer and chisel the pieces were crushed individually. The larger pieces and the fines were screened off from each sample. Only material of +20 mesh to -8 mesh was used in the gas evolution tests. Three reaction vessels were set-up and filled with a deionized water. The reaction vessels were 1000 ml beakers each containing a small flask with 25.0 grams of sample material. Above each small flask a 50 ml buret was positioned up-side-down, which was also filled with deionized water and placed over the end of the flask making a water seal. The level in the buret was monitored for the next 5 days. Gas evolution data, measured in milliliters, is attached.

Following the gas evolution tests, the burets were submerged, still up-side-

down, up to the stopcocks in water. A small flame was placed near the tip of the buret and the stopcock was opened to allow the gas inside the burets to be pushed out into the flame by the water pressure. Flammability observations are noted at the bottom of the gas evolution data. The gas was not analyzed to determine its composition.

If you have questions about the test or these results please contact me. Thank you for doing business with us.

Sincerely,

James R. Lakin / by Darcie I. Monroe Engineering Associate
James R. Lakin
Business Operations Manager

Gas Evolution Measurements
(Water Volume Displacement)

		SRF 50			Avg Rate
		1	2	3	(l/kg/hr)
	Time (hours)	(ml)	(ml)	(ml)	
Day 1	0.00	0.0	0.0	0.0	
	1.00	0.0	0.1	0.0	0.001
	2.00	0.1	0.1	0.0	0.001
	3.00	0.1	0.1	0.0	0.000
	4.00	0.2	0.2	0.1	0.004
	5.00	0.3	0.3	0.2	0.004
	8.25	0.2	0.2	0.3	0.000
Day 2	20.25	0.1	0.2	3.2	0.003
	28.75	0.4	0.2	6.8	0.006
Day 3	44.25	1.1	0.5	10.6	0.004
	52.25	9.9	0.5	17.4	0.026
Day 4	68.25	36.9	0.5	32.2	0.035
	76.50	40.2	0.4	33.7	0.008
Day 5	92.25	46.5	1.2	36.6	0.008
	100.75	48.7	1.4	38.9	0.007
Flammable (F)					
Ignitible (I)*					
Not Flammable (NF)		X	X	X	

* Ignitible = the gas will ignite but will not sustain a continuous flame.

SRF-50

Specification Chemistry, %:

Al	Si	Ca	Sr
<0.50	44-48	<0.10	0.8-1.2

Sample I.D. Number: 2133B
Bin Number: 307
Observed Chemistry of Tested Sample, %:

Al	Si	Ca	Sr
0.37	46.12	0.01	0.86

Test 1:
A small quantity (approximately 2 mm diameter) of the above material was placed in a trough of distilled water at 20° C and observed to see whether any gas evolved and if it spontaneously ignited. Test 1 was performed in triplicate on the above material.

Result:
Neither evolution of gas nor spontaneous ignition was observed any of the three times Test 1 was performed.

Test 2:
A small quantity (approximately 2 mm diameter) of the above material was floated on a piece of filter paper in distilled water at 20° C and observed to see whether any gas evolved and if it spontaneously ignited. Test 2 was performed in triplicate on the above material.

Result:
Neither evolution of gas or spontaneous ignition was observed in any of the three times Test 2 was performed.

Test 3:
The test material was formed into three piles approximately 2 cm high by 3 cm wide. An indentation was formed in the top of each pile and a few drops of water were added to each hollow. Each pile was observed to see whether any gas evolved and if it spontaneously ignited. Test 3 was performed in triplicate on the above material.

Result:
Neither evolution of gas nor spontaneous ignition was observed any of the three times Test 3 was performed.

Test 4:
Enough water at 20° C to cover the sample, 10ml to 20ml, was added to a dropping funnel. The spout of the dropping funnel was inserted into one hole of a #14, two-hole stopper; a tube for conveying any gas produced into the collection cylinder, a gas buret, was inserted into the other hole of the stopper; the far end of the tube was inserted into the end of the collection cylinder.

The gas buret is glass, 50 ml capacity, marked in individual ml units with each ml subdivided into 0.1 ml increments. The gas buret was filled with water, inverted and stood in a water trough. The gas tube in the previous paragraph was inserted into the bottom end of the gas buret and any gas produced was measured by observing the displacement of the water in the top of the buret.

25 g of the above listed material was added to each of three 100 ml conical flasks with #14 neck size. The stoppers mentioned above were inserted into the neck of the conical flasks. The stopcocks were opened and 10 ml to 20 ml of the 20° C distilled water, enough to completely cover the sample, was allowed to flow into the flasks. A timer was started and readings of any gas evolved were taken every hour for five days. From this data the average rate of gas production per hour was calculated for the five days.

Result:
The Gas Collection data for SRF-50 is detailed on the following page:

Gas Test on SRF-50

January 24, 1996

Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr
1	0.0	0.0	0.0	0.000	31	2.0	0.0	0.0	0.000	61	3.0	0.0	0.0	0.000	91	3.1	0.5	0.0	0.000
2	0.0	0.0	0.0	0.000	32	2.0	0.0	0.0	0.000	62	3.0	0.0	0.0	0.000	92	3.1	0.5	0.0	0.000
3	1.0	0.0	0.0	0.013	33	2.0	0.0	0.0	0.000	63	3.0	0.0	0.0	0.000	93	3.1	0.5	0.0	0.000
4	1.0	0.0	0.0	0.000	34	2.0	0.0	0.0	0.000	64	3.0	0.0	0.0	0.000	94	3.1	0.5	0.0	0.000
5	2.0	0.0	0.0	0.013	35	2.0	0.0	0.0	0.000	65	3.0	0.0	0.0	0.000	95	3.1	0.5	0.0	0.000
6	2.0	0.0	0.0	0.000	36	2.0	0.0	0.0	0.000	66	3.1	0.0	0.0	0.001	96	3.1	0.5	0.0	0.000
7	2.0	0.0	0.0	0.000	37	2.0	0.0	0.0	0.000	67	3.1	0.0	0.0	0.000	97	3.1	0.5	0.0	0.000
8	2.0	0.0	0.0	0.000	38	2.0	0.0	0.0	0.000	68	3.1	0.0	0.0	0.000	98	3.1	0.5	0.0	0.000
9	2.0	0.0	0.0	0.000	39	2.0	0.0	0.0	0.000	69	3.1	0.5	0.0	0.007	99	3.1	0.5	0.0	0.000
10	2.0	0.0	0.0	0.000	40	2.0	0.0	0.0	0.000	70	3.1	0.5	0.0	0.000	100	3.1	0.5	0.0	0.000
11	2.0	0.0	0.0	0.000	41	2.0	0.0	0.0	0.000	71	3.1	0.5	0.0	0.000	101	3.1	0.5	0.0	0.000
12	2.0	0.0	0.0	0.000	42	2.0	0.0	0.0	0.000	72	3.1	0.5	0.0	0.000	102	3.1	0.5	0.0	0.000
13	2.0	0.0	0.0	0.000	43	2.0	0.0	0.0	0.000	73	3.1	0.5	0.0	0.000	103	3.1	0.5	0.0	0.000
14	2.0	0.0	0.0	0.000	44	2.0	0.0	0.0	0.000	74	3.1	0.5	0.0	0.000	104	3.1	0.5	0.0	0.000
15	2.0	0.0	0.0	0.000	45	2.0	0.0	0.0	0.000	75	3.1	0.5	0.0	0.000	105	3.1	0.5	0.0	0.000
16	2.0	0.0	0.0	0.000	46	2.0	0.0	0.0	0.000	76	3.1	0.5	0.0	0.000	106	3.1	0.5	0.0	0.000
17	2.0	0.0	0.0	0.000	47	2.0	0.0	0.0	0.000	77	3.1	0.5	0.0	0.000	107	3.1	0.5	0.0	0.000
18	2.0	0.0	0.0	0.000	48	2.0	0.0	0.0	0.000	78	3.1	0.5	0.0	0.000	108	3.1	0.5	0.0	0.000
19	2.0	0.0	0.0	0.000	49	2.0	0.0	0.0	0.000	79	3.1	0.5	0.0	0.000	109	3.1	0.5	0.0	0.000
20	2.0	0.0	0.0	0.000	50	2.2	0.0	0.0	0.003	80	3.1	0.5	0.0	0.000	110	3.1	0.5	0.0	0.000
21	2.0	0.0	0.0	0.000	51	2.2	0.0	0.0	0.000	81	3.1	0.5	0.0	0.000	111	3.1	0.5	0.0	0.000
22	2.0	0.0	0.0	0.000	52	2.6	0.0	0.0	0.005	82	3.1	0.5	0.0	0.000	112	3.1	0.5	0.0	0.000
23	2.0	0.0	0.0	0.000	53	2.9	0.0	0.0	0.004	83	3.1	0.5	0.0	0.000	113	3.1	0.5	0.0	0.000
24	2.0	0.0	0.0	0.000	54	3.0	0.0	0.0	0.001	84	3.1	0.5	0.0	0.000	114	3.1	0.5	0.0	0.000
25	2.0	0.0	0.0	0.000	55	3.0	0.0	0.0	0.000	85	3.1	0.5	0.0	0.000	115	3.1	0.5	0.0	0.000
26	2.0	0.0	0.0	0.000	56	3.0	0.0	0.0	0.000	86	3.1	0.5	0.0	0.000	116	3.1	0.5	0.0	0.000
27	2.0	0.0	0.0	0.000	57	3.0	0.0	0.0	0.000	87	3.1	0.5	0.0	0.000	117	3.1	0.5	0.0	0.000
28	2.0	0.0	0.0	0.000	58	3.0	0.0	0.0	0.000	88	3.1	0.5	0.0	0.000	118	3.1	0.5	0.0	0.000
29	2.0	0.0	0.0	0.000	59	3.0	0.0	0.0	0.000	89	3.1	0.5	0.0	0.000	119	3.1	0.5	0.0	0.000
30	2.0	0.0	0.0	0.000	60	3.0	0.0	0.0	0.000	90	3.1	0.5	0.0	0.000	120	3.1	0.5	0.0	0.000

1. All samples 25 gram.
2.Average rate of gas production in L/Kg/Hr=Avg produced(ml)x40/1000ml/L

CLIMAX RESEARCH SERVICES

39205 COUNTRY CLUB DRIVE • FARMINGTON HILLS, MI 48331 • (810) 489-0720 • FACSIMILE (810) 489-8997

CRS Project Number: S-6747

February 5, 1997

Mr. Timothy H. Hall
SKW Metals and Alloys, Inc.
P.O. Box 217
Calvert City, Kentucky 42029

Dangerous When Wet Materials (as set forth in 49 CFR Section 173, Appendix E, Division 4, Sections 1, 2, 3 and 4) Evaluation of SRF 75, Lab ID: 2132A, Bin Number: 506.

Dear Mr. Hall:

We have completed our gas evolution measurements and the flammability tests, per Code 49 CFR 173, Appendix E division 4, Sections 1, 2, 3 and 4, on the sample material that you submitted in late December 1996. The material we received from SKW was labeled as: SRF 75. The results were as follows:

(1) no gas was evolved and no spontaneous ignition occurred.

(2) no gas was evolved and no spontaneous ignition occurred.

(3) no gas was evolved and no spontaneous ignition occurred.

(4) while some gas did evolve, the average rate never exceeded 1 liter per kilogram per hour in the sample tested. The gas was ignitible (gas will ignite but will not sustain a continuous flame) in all cases, but it did not spontaneously ignite in any of the tests.

On the basis of these test results, the ferrosilicon material listed above would not fit the definition in 49 CFR Section 173, Appendix E, Division 4, Sections 1, 2, 3 and 4 as "Dangerous When Wet".

Sincerely,

James R. Lakin /by Debbie I. Monroe Engineering Associate

James R. Lakin
Business Operations Manager

CLIMAX RESEARCH SERVICES

39205 COUNTRY CLUB DRIVE • FARMINGTON HILLS, MI 48331 • (810) 489-0720 • FACSIMILE (810) 489-8997

February 5, 1997

Mr. Timothy H. Hall
SKW Metals and Alloys, Inc.
P.O. Box 217
Calvert City, Kentucky 42029

Re: Gas Evolution Measurements and Flammability Tests.
CRS Project Number: S-6747

Dear Mr. Hall:

We have completed the gas evolution measurements and the flammability tests, per Code 49 CFR 173, Appendix E division 4, Sections 1, 2, 3 and 4, on the sample material that you submitted in late December 1996. The identification of the material submitted and its chemistry specification are listed below.

SRF 75	Al	Si	Ca	Sr
Specification, %:	<0.5	74-79	<0.1	0.8-1.2
Lab ID: 2132A				
Bin Number: 506				
Chemistry:	0.41	74.20	0.01	0.91

Section 1 (Procedure & Results)

A small piece of the aforementioned material, approximately 2 mm in diameter, was placed in a trough of distilled water at 20°C. *No gas evolution was observed, nor did the sample spontaneously ignite.*

Section 2 (Procedure & Results)

A small piece of the material was placed in the center of a filter paper, which was floating in distilled water at 20°C. *No gas evolution was observed, nor did the sample spontaneously ignite.*

Section 3 (Procedure & Results)

A small pile with an indentation in the center, approximately 2cm high by 3cm in diameter, was made of the material. A few drops of water were added to the hollow. *No gas evolution was observed, nor did any of the sample spontaneously ignite.*

Section 4 (Procedure & Results)

Representative samples were taken from the lot of material submitted, and using a hammer and chisel the pieces were crushed individually. The larger pieces and the fines were screened off from each sample. Only material of +20 mesh to -8 mesh was used in the gas evolution tests. Three reaction vessels were set-up and filled with a deionized water. The reaction vessels were 1000 ml beakers each containing a small flask with 25.0 grams of sample material. Above each small flask a 50 ml buret was positioned up-side-down, which was also filled with deionized water and placed over the end of the flask making a water seal. The level in the buret was monitored for the next 5 days. Gas evolution data, measured in milliliters, is attached.

Following the gas evolution tests, the burets were submerged, still up-side-

down, up to the stopcocks in water. A small flame was placed near the tip of the buret and the stopcock was opened to allow the gas inside the burets to be pushed out into the flame by the water pressure. Flammability observations are noted at the bottom of the gas evolution data. The gas was not analyzed to determine its composition.

If you have questions about the test or these results please contact me. Thank you for doing business with us.

Sincerely,

James R. Lakin /by Darcie L. Monroe Engineering Associate

James R. Lakin
Business Operations Manager

Gas Evolution Measurements
(Water Volume Displacement)

		SRF 75			
		1	2	3	Avg Rate
	Time	(ml)	(ml)	(ml)	(l/kg/hr)
	(hours)				
Day 1	0.00	0.0	0.0	0.0	
	1.00	0.0	0.1	0.0	0.001
	2.00	0.2	0.3	0.2	0.008
	3.00	0.3	0.8	0.5	0.012
	4.00	0.5	1.1	0.6	0.008
	5.00	0.8	1.4	1.6	0.021
	8.25	0.7	7.9	3.6	0.034
Day 2	20.25	3.3	12.6	32.8	0.041
	28.75	7.8	21.1	41.5	0.034
Day 3	44.25	16.2	30.6	48.2	0.021
	52.25	23.7	36.1	50.0	0.025
Day 4	68.25	35.2	44.2	50.0	0.016
	76.50	37.8	45.7	50.0	0.007
Day 5	92.25	42.5	49.1	50.0	0.007
	100.75	45.0	50.0	50.0	0.005
Flammable (F)					
Ignitible (I)*		X	X	X	
Not Flammable (NF)					

* Ignitible = the gas will ignite but will not sustain a continuous flame.

SRF-75

Specification Chemistry, %:

Al	Si	Ca	Sr
<0.50	74-79	<0.10	0.8-1.2

Sample I.D. Number: 2132B
Bin Number: 506
Observed Chemistry of Tested Sample, %:

Al	Si	Ca	Sr
0.41	74.2	0.01	0.91

Test 1:
A small quantity (approximately 2 mm diameter) of the above material was placed in a trough of distilled water at 20° C and observed to see whether any gas evolved and if it spontaneously ignited. Test 1 was performed in triplicate on the above material.

Result:
Neither evolution of gas nor spontaneous ignition was observed any of the three times Test 1 was performed.

Test 2:
A small quantity (approximately 2 mm diameter) of the above material was floated on a piece of filter paper in distilled water at 20° C and observed to see whether any gas evolved and if it spontaneously ignited. Test 2 was performed in triplicate on the above material.

Result:
Neither evolution of gas or spontaneous ignition was observed in any of the three times Test 2 was performed.

Test 3:
The test material was formed into three piles approximately 2 cm high by 3 cm wide. An indentation was formed in the top of each pile and a few drops of water were added to each hollow. Each pile was observed to see whether any gas evolved and if it spontaneously ignited. Test 3 was performed in triplicate on the above material.

Result:
Neither evolution of gas nor spontaneous ignition was observed any of the three times Test 3 was performed.

Test 4:
Enough water at 20° C to cover the sample, 10ml to 20ml, was added to a dropping funnel. The spout of the dropping funnel was inserted into one hole of a #14, two-hole stopper; a tube for conveying any gas produced into the collection cylinder, a gas buret, was inserted into the other hole of the stopper; the far end of the tube was inserted into the end of the collection cylinder.

The gas buret is glass, 50 ml capacity, marked in individual ml units with each ml subdivided into 0.1 ml increments. The gas buret was filled with water, inverted and stood in a water trough. The gas tube in the previous paragraph was inserted into the bottom end of the gas buret and any gas produced was measured by observing the displacement of the water in the top of the buret.

25 g of the above listed material was added to each of three 100 ml conical flasks with #14 neck size. The stoppers mentioned above were inserted into the neck of the conical flasks. The stopcocks were opened and 10 ml to 20 ml of the 20° C distilled water, enough to completely cover the sample, was allowed to flow into the flasks. A timer was started and readings of any gas evolved were taken every hour for five days. From this data the average rate of gas production per hour was calculated for the five days.

Result:
The Gas Collection data for SRF-75 is detailed on the following page:

Gas Test on SRF-75

January 16, 1996

Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr	Time Hr.	1 (ml)	2 (ml)	3 (ml)	Avg Rate L/Kg/Hr
1	10.0	0.0	0.0	0.133	31	23.0	0.0	0.0	0.000	61	23.8	0.0	0.0	0.000	91	23.8	0.5	0.5	0.000
2	18.0	0.0	0.0	0.107	32	23.0	0.0	0.0	0.000	62	23.8	0.0	0.0	0.000	92	23.8	0.5	0.5	0.000
3	23.0	0.0	0.0	0.067	33	23.0	0.0	0.0	0.000	63	23.8	0.0	0.0	0.000	93	23.8	0.5	0.5	0.000
4	23.0	0.0	0.0	0.000	34	23.0	0.0	0.0	0.000	64	23.8	0.0	0.0	0.000	94	23.8	0.5	0.5	0.000
5	23.0	0.0	0.0	0.000	35	23.0	0.0	0.0	0.000	65	23.8	0.0	0.0	0.000	95	23.8	0.5	0.5	0.000
6	23.0	0.0	0.0	0.000	36	23.0	0.0	0.0	0.000	66	23.8	0.0	0.0	0.000	96	23.8	0.5	0.5	0.000
7	23.0	0.0	0.0	0.000	37	23.0	0.0	0.0	0.000	67	23.8	0.0	0.0	0.000	97	23.8	0.5	0.5	0.000
8	23.0	0.0	0.0	0.000	38	23.0	0.0	0.0	0.000	68	23.8	0.0	0.0	0.000	98	23.8	0.5	0.5	0.000
9	23.0	0.0	0.0	0.000	39	23.0	0.0	0.0	0.000	69	23.8	0.0	0.0	0.000	99	23.8	0.5	0.5	0.000
10	23.0	0.0	0.0	0.000	40	23.0	0.0	0.0	0.000	70	23.8	0.5	0.5	0.013	100	23.8	0.5	0.5	0.000
11	23.0	0.0	0.0	0.000	41	23.0	0.0	0.0	0.000	71	23.8	0.5	0.5	0.000	101	23.8	0.5	0.5	0.000
12	23.0	0.0	0.0	0.000	42	23.0	0.0	0.0	0.000	72	23.8	0.5	0.5	0.000	102	23.8	0.5	0.5	0.000
13	23.0	0.0	0.0	0.000	43	23.0	0.0	0.0	0.000	73	23.8	0.5	0.5	0.000	103	23.8	0.5	0.5	0.000
14	23.0	0.0	0.0	0.000	44	23.0	0.0	0.0	0.000	74	23.8	0.5	0.5	0.000	104	23.8	0.5	0.5	0.000
15	23.0	0.0	0.0	0.000	45	23.6	0.0	0.0	0.008	75	23.8	0.5	0.5	0.000	105	23.8	0.5	0.5	0.000
16	23.0	0.0	0.0	0.000	46	23.6	0.0	0.0	0.000	76	23.8	0.5	0.5	0.000	106	23.8	0.5	0.5	0.000
17	23.0	0.0	0.0	0.000	47	23.6	0.0	0.0	0.000	77	23.8	0.5	0.5	0.000	107	23.8	0.5	0.5	0.000
18	23.0	0.0	0.0	0.000	48	23.6	0.0	0.0	0.000	78	23.8	0.5	0.5	0.000	108	23.8	0.5	0.5	0.000
19	23.0	0.0	0.0	0.000	49	23.7	0.0	0.0	0.001	79	23.8	0.5	0.5	0.000	109	23.8	0.5	0.5	0.000
20	23.0	0.0	0.0	0.000	50	23.8	0.0	0.0	0.001	80	23.8	0.5	0.5	0.000	110	23.8	0.5	0.5	0.000
21	23.0	0.0	0.0	0.000	51	23.8	0.0	0.0	0.000	81	23.8	0.5	0.5	0.000	111	23.8	0.5	0.5	0.000
22	23.0	0.0	0.0	0.000	52	23.8	0.0	0.0	0.000	82	23.8	0.5	0.5	0.000	112	23.8	0.5	0.5	0.000
23	23.0	0.0	0.0	0.000	53	23.8	0.0	0.0	0.000	83	23.8	0.5	0.5	0.000	113	23.8	0.5	0.5	0.000
24	23.0	0.0	0.0	0.000	54	23.8	0.0	0.0	0.000	84	23.8	0.5	0.5	0.000	114	23.8	0.5	0.5	0.000
25	23.0	0.0	0.0	0.000	55	23.8	0.0	0.0	0.000	85	23.8	0.5	0.5	0.000	115	23.8	0.5	0.5	0.000
26	23.0	0.0	0.0	0.000	56	23.8	0.0	0.0	0.000	86	23.8	0.5	0.5	0.000	116	23.8	0.5	0.5	0.000
27	23.0	0.0	0.0	0.000	57	23.8	0.0	0.0	0.000	87	23.8	0.5	0.5	0.000	117	23.8	0.5	0.5	0.000
28	23.0	0.0	0.0	0.000	58	23.8	0.0	0.0	0.000	88	23.8	0.5	0.5	0.000	118	23.8	0.5	0.5	0.000
29	23.0	0.0	0.0	0.000	59	23.8	0.0	0.0	0.000	89	23.8	0.5	0.5	0.000	119	23.8	0.5	0.5	0.000
30	23.0	0.0	0.0	0.000	60	23.8	0.0	0.0	0.000	90	23.8	0.5	0.5	0.000	120	23.8	0.5	0.5	0.000

1. All samples 25 gram.
2.Average rate of gas production in L/Kg/Hr=Avg produced(ml)x40/1000ml/L

C.C. E. Bredniak
H. Wang

11/22/2000

DOT testing of Stab50 and Unstab50 40x325 mesh material

Test A:

Place approx 2mm of the test material in a trough of distilled water (at least 20°C) and observe for evolution of gas. If any evolution observed, check for spontaneous combustion of evolved gases. Pass or Fail test.

	Stab50	Unstab50
Trial 1	P	P
Trial 2	P	P
Trial 3	P	P

Water temp= 24°C

Test B:

Place approx 2mm of the test material on a piece of filter paper. Float the paper and material in a container with distilled water (at least 20°C) and observe for gas evolution and spontaneous combustion of any evolved gases. Pass or Fail test.

	Stab50	Unstab50
Trial 1	P	P
Trial 2	P	P
Trial 3	P	P

Water temp= 24°C

Test C:

Make a conical pile of the test material, approx 2cm high and 3cm wide at the base. Press a small indention at the top and fill with distilled water (at least 20°C). Observe for any gas evolution and spontaneous combustion of any evolved gases. Pass or Fail test.

	Stab50	Unstab50
Trial 1	P	P
Trial 2	P	P
Trial 3	P	P

Water temp= 24°C

Test D:

Place 25g of material in a 50ml conical flask. Add 35ml of distilled water (at least 20°C) to flask and quickly stopper with a 1-hole OO stopper. Stopper hole has glass tubing connected to rubber tubing that leads to the gas collection buret (Stab50 gas test apparatus). Start timer immediately, noting the initial buret reading for air displacement. Read gas readings on buret every hour for 7 hours. If, at the 7th hour, the evolution rate is decreasing or not increasing at all, and if the total gas evolved is less than 40ml/25g of material, the test material has passed. If the evolution rate is increasing after 7 hours, continue the test for a total period of 5 days.

Water temp= 23°C

Hour	Stab50-1	Stab50-2	Stab50-3	Unstab50-1	Unstab50-2	Unstab50-3
Initial	2.8	2.7	2.9	4.1	3.7	3.7
1	3.4	2.8	3.7	4.9	3.8	4.1
2	3.6	2.9	3.9	5.1	4.2	4.6
3	3.9	3.6	4.2	5.2	4.3	4.7
4	3.9	3.6	4.2	5.5	4.3	4.7
5	3.9	3.6	4.2	5.5	4.6	5.0
6	3.9	3.6	4.2	5.5	4.6	5.0
7	3.9	3.6	4.2	5.5	4.6	5.0
Result	P	P	P	P	P	P