



NUCLEAR METALS INC.

25 August 1980

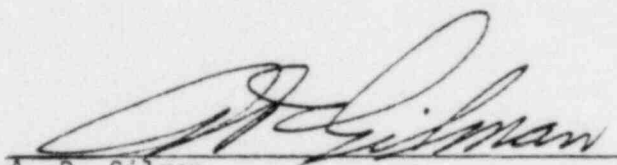
U.S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA. 19406

Attention: Mr. Jerome Roth

Gentlemen:

Attached please find NMI's report of a smoke release incident occurring the night of July 30, 1980.

Sincerely,


A. R. Gilman
Vice President, Safety & Quality

ARG:dg

Attachment

Office Memorandum • NUCLEAR METALS

TO : Files

DATE: 08 August 80

FROM : A. R. Gilman



SUBJECT: REPORT OF SMOKE RELEASE INCIDENT

At 10:12 P.M. on 30 July 80, release of smoke occurred, filling Building D. The building was evacuated, sealed, equipment turned off, and the vents turned on to clear the building of smoke. A clean-up was initiated at 8:00 A.M. on 31 July, and the building returned to service on 01 Aug.

Cause of the smoke was release of magnesium oxide fume from a reduction chamber, caused by incomplete sealing of the chamber. The reaction $2\text{Mg} + \text{UF}_4 = \text{U} + 2\text{MgF}_2$ results in vaporization of magnesium which can escape the chamber.

The corrective action involves greater attention to sealing the chamber, plus use of a graphite disc above the charge to prevent leakage of fumes in the future. The attached safety report defines results of surveys taken.

Office Memorandum . NUCLEAR METALS

TO : A. R. Gilman

DATE: August 7, 1980

FROM : F. P. Cornetta

SUBJECT: REPORT ON HEALTH/SAFETY OPERATIONS RELATIVE TO THE
REDUCTION FURNACE BURN-THRU INCIDENT

At approximately 6:35 A.M. on July 31, 1980, I received a telephone call from the safety monitor - informing me that there had been a "burn thru" in a Building D reduction furnace. When I arrived at NMI the Radiation Safety Officer briefed me about the incident and present conditions, etc.

At this time (7:45 A.M., 7/31/80) a clean up crew was decontaminating the walkway (outside the railing) and the Rep #10 and Rep #11 rooms in Building D. All workers wore protective clothing and Toxic dust respirators. However, air samples taken about 8:00 A.M. revealed the following uranium air concentrations:

<u>Location</u>	<u>Concentration($\mu\text{Ci/ml}$)</u>
12 feet from furnace #2	0
Walkway near the change room	2.78×10^{-10}
Walkway near the Multispindle Machines	1.52×10^{-10}
L. Partington desk	0.55×10^{-10}

In the interest of keeping all exposures to a minimum all workers were asked to leave Building D. Observations at this time (8:15 A.M.) by Safety Dept. Personnel revealed some smoke emanating from reduction furnace #2 and what appeared to be a still active reaction. All doors and windows were checked for security and at approximately 11:00 A.M. a local venting by-pass unit was installed on the furnace. Also a temporary change area was set up outside the blue fire door near the employee entrance.

During this period of time air samples were also taken in the Packaging Area and CAF area as a further check for contamination escaping from the reduction area below.

At approximately 11:00 A.M. all roof stack air samplers were removed and replaced with new, clean samplers.

Stack emission data from samplers in place at the time of the incident until 11:00 A.M., 7/31/80 revealed the following releases to the environs:

<u>Stack</u>	<u>Uranium Air Concentrations ($\mu\text{Ci}/\text{ml}$)</u>	<u>Total Release Before 11:00 A.M. in μCi</u>
E-36	18.3×10^{-12}	71.7
E-50	8.74×10^{-12}	17.4
E-41F	10.32×10^{-12}	136.3
E-42	1.09×10^{-12}	5.5
E-24	8.18×10^{-12}	43.0
E-35	0.513×10^{-12}	3.7
E-41E	16.58×10^{-12}	219.0
E-26	1.49×10^{-12}	9.0

A one hour sample taken after the local vent was placed on the furnace revealed the following releases to the environs:

<u>Stack</u>	<u>Uranium Air Concentrations ($\mu\text{Ci}/\text{ml}$)</u>	<u>Total Release Before 11:00 A.M. in μCi</u>
E-36	258.9×10^{-12}	2.3
E-50	0	0
E-41F	107.9×10^{-12}	3.3
E-42	0	0
E-24	107.9×10^{-12}	1.3
E-35	0	0

A second one hour roof stack sample (taken from 12:00 noon until 1:00 P.M.) revealed the following:

<u>Stack</u>	<u>Uranium Air Concentrations ($\mu\text{Ci}/\text{ml}$)</u>	<u>Activity Released (1 hour sample) (μCi)</u>
E-36	0	0
E-50	0	0
E-41F	0	0
E-24	53.9×10^{-12}	0.659
E-35	21.6×10^{-12}	0.36

A subsequent 28 hour stack sample for Thursday and Friday (7/31/80 until 8/1/80) revealed the following:

<u>Stack</u>	<u>Uranium Air Concentrations ($\mu\text{Ci}/\text{ml}$)</u>	<u>Activity Released (28 hour sample) (μCi)</u>
E-36	0.67×10^{-12}	0.17
E-50	0	0
E-41F	0	0
E-42	0.26×10^{-12}	0.08
E-24	0.22×10^{-12}	0.07
E-35	0.40×10^{-12}	0.19

The total release to the environs was approximately 645 μCi .

The areas outside all Building D doors leading to other work areas were monitored and secured (signs were also posted) to prevent access.

Air samples taken inside Building D at 11:00 A.M. and 3:00 P.M. on July 31, 1980 revealed the following uranium air concentrations:

Location	Uranium Air Concentrations ($\mu\text{Ci}/\text{ml}$)	
	(11:00 A.M.)	(3:00 P.M.)
Multispindle Machine Area	1.92×10^{-10}	1.01×10^{-10}
Reduction Area	1.29×10^{-10}	0.51×10^{-10}
Foreman's Desk	1.15×10^{-10}	3.83×10^{-10}
Weld Area	0.35×10^{-10}	-

Surface wipes taken before the clean-up operation began in Building D, revealed Uranium-238, Thorium-234 and Protactinium-234 contamination levels as follows:

Uranium-238 (Alpha) contamination: levels between 200 and 1400 dpm.

Thorium-234 and Protactinium-234 contamination levels: between 1000 and 27,000 dpm.

Between 4:45 A.M. and 6:45 P.M. on July 31, 1980 (during clean-up operations inside Building D typical airborne uranium concentrations were 0.26×10^{-10} $\mu\text{Ci}/\text{ml}$ and 0.48×10^{-10} $\mu\text{Ci}/\text{ml}$).

A contamination survey of all areas outside of Building D revealed two contaminated locations:

Location	Alpha Contamination from U-238	Beta Contamination From Th-234 and Pa-234
Reduction Area Mandoor	11.5 dpm	12.8 dpm
Mandoor Near the Multi-Spindle Machines	28.7 dpm	12.8 dpm

Areas outside Building D were again surveyed after clean-up operations to substantiate the removal of all contamination.

About 3:00 P.M. on July 31, 1980, I instructed a special crew - organized to conduct cleaning operations under the supervision of the safety department. These operations began about 3:30 P.M. and continued that night.

The Multispindle area was cleaned and surveyed by 6:30 P.M. and normal work began after 11:00 P.M. All other areas were cleaned and surveyed by 11:00 P.M. on July 31, 1980.

On August 1, 1980 the entire building was functioning normally except that no reductions were allowed.

Office Memorandum • NUCLEAR METALS

TO : A. R. Gilman ✓

DATE: August 22, 1980

FROM : R. B. MacKay ✍

SUBJECT: Report to Files Covering the Findings of the Committee Assigned to Evaluate the Reduction "Blowout" of July 30, 1980

Reduction No. 1289 was prepared during the A-Shift on 30 July 1980. The vessel was charged to yield a nominal 1400 pound derby. The closed steel vessel was loaded into furnace #2 at approximately 5:10 p.m. by the B-Shift. The first sighting of a significant problem occurred at about 10:10 p.m. ... approximately 5-hours into the heating cycle. It was apparent that the steel reduction vessel had failed in some manner. Fumes were escaping from a hole in the top of the furnace and the work area filled with smoke. The work area was promptly secured until such time as the area could be cleaned up and the furnace and reduction vessel were cool enough for handling. The area was available for routine work within 24-hours of the first observation.

The records (travel card) for Reduction No. 1289 were in a plastic envelope attached to the top of Furnace No. 2. They were burned during the incident. However, the shift log, associated records and a de-briefing with shift Foremen and operating personnel would indicate that Reduction No. 1289 was prepared in a routine manner consistent with other successful reductions produced the same day. It was firmly believed that the blend was a good one, that no wet UF_4 had been used in preparing the blend and that the condition of both the graphite liner and steel vessel components were excellent.

A committee consisting of H. F. Sawyer (Facilities Manager), E. J. Martin (Production Manager), R. F. Huber (Senior Engineer) and V. Minutolo (Reduction Consultant) was assigned failure analysis responsibilities. Investigations began on Monday 4 August 1980. The following comments summarize their findings:

A. Reduction Furnace

1. No significant furnace damage occurred. Routine efforts would quickly bring it back into production status.
 - vacuum the furnace chamber.
 - replace insulation in the furnace cover.
 - secure a small hole in the furnace cover by welding a steel disc over the opening.
 - check out wiring, thermocouples and furnace controls.

Memo: Report to Files Covering the Findings of the Committee Assigned to Evaluate the Reduction "Blowout" of July 30, 1980

B. Steel Vessel

- all 36 bolts were in place.
- Only barely perceptible leakage occurred through the flange, there was no erosion at the flange.
- an irregularly shaped 1" to 2" diameter hole had been melted through the cover.
- a standard double cover had been used.
- the graphite liner had a crack extending down from the lip.
- the hole in the cover was directly over the crack; however, it was not readily apparent that the crack itself made much of a contribution to the leak.
- A thick dolomite cap was present (5" to 6" thick).
- A "normal" derby had been produced.

The committee concluded that the probable single biggest contribution to the "blowout" was inadequate tamping of the cap close to the inside diameter of the graphite crucible.

RBM/jws

cc: E. J. Arnold
R. F. Huber
E. J. Kosinski
V. Minutolo
E. J. Martin
H. F. Sawyer
W. B. Tuffin