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Linde Ceramics SEC Petitions

SEC00106 November 1, 1947 through December 31, 1953

SEC00107 January 1, 1954 through July 31, 2006

Linde Ceramics Facility – Tonawanda, New York

Linde Ceramics SEC Petitions – SEC00106 and SEC00107

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Linde Ceramics SEC Petition Application: November 1, 1947 through December 31, 1953

This petition is based upon the following issues that demand SEC status be approved due to the inability of NIOSH to conduct "sufficiently accurate" dose reconstruction determination under the current Linde Ceramics Site Profile, published on January 19, 2006. This SEC petition is based upon the following issues: the incomplete analysis and review of all available source term information available to NIOSH. This is an example of a data collection deficiency that forecloses the ability of NIOSH to reconstruct accurate dose exposure estimates due to the inability to evaluate the precise grade levels of the pitchblende African ore processed at Linde during its operational period from 1942 through 1953.

Additionally, the current Linde Site Profile is being revised by NIOSH based upon deficiencies that form the basis for this SEC application. These deficiencies must be cured by NIOSH due to the dose reconstruction consequences that underestimate radiation exposure for workers. The underestimation, incomplete and unreliable dose exposure data in the current Linde site profile is based upon unreliable personnel dosimetry monitoring data collection as well as incomplete dosimetry data, worker accounts of document destruction and incomplete personnel/medical records. The destruction of documents in a regular process of the off-site incineration of Linde documents performed by Linde workers and attested to by Linde workers in attached affidavit statements.

The Linde Ceramics facility was first designated as a FUSRAP site in 1980, after a radiological survey was conducted by the Oak Ridge National Lab (ORNL) in 1976. The ORNL findings were published in 1978 and confirmed that significant on-site residual contamination existed at Linde as a result of uranium ore processing from MED/AEC activities for the Manhattan Project.[1] In 2004, the Army Corps of Engineers estimated that the remediation work at the Linde site would be completed by 2006.[2] The Army Corps continues to remediate the Linde site and is expected to continue to remove contaminated materials from Linde through 2009.[3] To date, the Army Corps estimates that over 263,000 tons of contaminated materials have been removed from the Linde site.[4]

Building 30 was identified as the most contaminated building at Linde according to dust exposure studies from the 1950s and according to the comprehensive radiation survey conducted in 1976 by ORNL for the

[1] USACE Linde FUSRAP webpage: www.lrb.usace.army.mil/fusrap/linde/index.htm#Documents

[2] USACE Linde Site Fact Sheet March 2004
[3] Id.
[4] Id.

Department of Energy.[5] Moreover, "[d]uring the early 1950s, the dust levels in Building 31 were so high that Linde brought in [redacted] to evaluate the work areas. He confirmed that the dust levels were high and not safe for inside workers. In Building 30, they had the same dust problems."[6]

The incomplete and unreliable Linde Site Profile forecloses NIOSH's ability to conduct "sufficiently accurate" dose reconstruction determinations due to the potential for the underestimation of dose exposure estimates in violation of NIOSH's "claimant favorable" dose reconstruction analytical framework.

NIOSH is currently in the process of revising the Linde site profile due to the fact that the available Linde dosimetry data is not isotope specific for trace raffinate radionuclides. The absence of isotope specific monitoring data forestalls NIOSH's ability to reconstruct a credible dose for dose reconstruction determinations. Consequently, the dose exposure data that NIOSH has relied on does not present a reliable or accurate depiction of worker dose exposures.

Furthermore, the internal dose exposure estimates that solely rely on air concentration dose data for the residual radiation time period has been criticized by experts as unreliable due to a tendency to underestimate internal dose exposure.[7] Accordingly, the exclusive reliance on air concentration data cannot be considered "claimant favorable." NIOSH has conceded this fact and will cure this deficiency in the revised site profile. Specifically, NIOSH has conceded that at Linde the internal exposure model based upon air data concentration data mistakenly ignored available urinalysis bioassay data from 1947 through 1950 and created the potential to underestimate internal exposure dose estimates for dose reconstruction claimants.

The source term data deficiencies also foreclose defining the dose reconstruction determinations based on the current Linde site profile as being claimant favorable and does not allow NIOSH the baseline data exposure estimates needed to overestimate dose exposure or apply a "worst case scenario" analytical framework.

[5] Linde SC&A Audit Report, pages 112-113; Linde Site Profile at page 41
[6] Id. at 112
[7] Id. at 71-72

The current Linde Site Profile has resulted in dose reconstruction decisions that have underestimated dose exposures with the use of unreliable and incomplete dose exposure pathways and estimates. Furthermore, the use of this underestimated, unreliable and incomplete Linde Site Profile dose exposure data demonstrates NIOSH's inability to reconstruct "sufficiently accurate" dose exposure potentials in direct contradiction of the EEOICPA legislative mandate. NIOSH has conceded many areas in need of revision in the Linde site profile. Many of these deficiencies created the potential for the underestimation of dose exposure estimates used in dose reconstruction denial decisions for Linde claimants.

The Linde Site Profile represents an overall dose exposure analytical model that is not "claimant favorable." The Audit Report identified repeated instances of unreliable and underestimated dose exposure data in the Site Profile. Reliance on the Site Profile yields arbitrary and unreliable probability of causation (POC) calculations that cannot be defined as "sufficiently accurate." The Linde Site Profile is based on unsupported assumptions and repeated instances of a failure to evaluate trace radionuclide internal dose exposure pathways as well as repeated instances where employee radiation dose exposure estimates are underestimated.[8] NIOSH cannot reconstruct "sufficiently accurate" dose exposures for Linde employees by relying on the Linde Site Profile. The Audit Report concluded that "[t]he credibility of the site profile and its claim to be claimant favorable appear to be compromised by the many unsupported or poorly justified assumptions that are made throughout."[9]

Trace Radionuclide Dose Exposure

Trace radionuclides identified in the Audit Report, including pro-actinium and actinium, were not considered or evaluated in any manner by NIOSH. This incomplete and unreliable dose exposure analysis is not "claimant favorable" since it did not rely upon a "worst case" scenario dose exposure model. The potential for underestimated dose exposure estimates in the Linde Site Profile was identified repeatedly in the Audit Report. NIOSH has conceded that this failure to account for these dangerous radio-isotopes in individual bioassay data forecloses the ability to reconstruct internal dose exposures. Moreover, this type of radio-isotope data is simply nonexistent for the Linde facility and therefore there is no way for NIOSH to cure this deficiency in the revised site profile. Both the Mallinckrodt SEC and the Ames SEC for its residual radiation renovation workers were in part granted based upon the absence of such crucial bioassay data – the absence of this data prevents NIOSH from reconstructing "sufficiently accurate" internal dose exposures for Linde workers as well.

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[8] Id. at 38
[9] Id.

At the Mound facility, NIOSH concluded that dose reconstruction was not feasible for the SEC time period at issue because the internal dose exposure cannot be reconstructed with sufficient accuracy absent bioassay data addressing raffinate exposure isotopes, including radium, actinium and thorium. The radionuclide intake routes, including both inhalation and ingestion of selected radionuclides, should have included uranium, thorium, radium, *pro-actinium and actinium.* The Audit Report concluded that the lack of measurement and consequent dose exposure assessment for *actinium and pro-actinium* resulted in an incomplete and unreliable dose exposure analytical model.[10] Moreover, the inhalation and/or ingestion of even small amounts of these radionuclides significantly increase the probability of the development of a radiogenic cancer.[11]

Finally, the Audit Report concluded that the "[p]ossible doses from raffinate-related exposures have not been evaluated in the site profile. Inhalation of even small quantities of some raffinates...could result in significant doses to the workers."[12]

NIOSH POC Analysis is Not "Claimant Favorable" Because Internal Dose Exposure Analyses Based Solely on Air Concentration Data Result in Underestimated Dose Exposure Estimates

The use of air concentration data has been criticized by experts as unreliable due to a tendency to underestimate internal dose exposure.[13] Accordingly, the exclusive reliance on air concentration data cannot be considered "claimant favorable." The Audit Report concluded that the "...air concentration data used in the site profile do not appear to be claimant favorable, due to significant expert criticism regarding using air concentration data to estimate worker inhalation intakes at uranium processing facilities."[14] Several studies, including a 1993 Nuclear Regulatory Commission study, "...demonstrate that using air concentration data could lead to underestimating the worker intakes and, subsequently, the internal exposures."[15] The Audit Report also stated that:

> "...the sensitivity of survey instruments, locations of the air samples, and air flow studies of the buildings are not presented in the Linde Site Profile report. It is also important to point out that the air concentration data used are based on results of random grab-air samples in general areas and breathing zones, and not the results of continuous area sampling. Lack of more complete air

[10] Id. at 19 and 45
[11] Id.
[12] Audit Report at page 68
[13] Id. at 71-72
[14] Id.
[15] Id.

> sampling data and neglecting bioassay data could lead to significant uncertainties in worker intakes and underestimation of missed inhalation doses."[16]

NIOSH's decision to ignore available urinalysis data covering the time period from 1947 through 1950 and the concomitant exclusive reliance on air concentration to evaluate dose exposure in the instant case does not provide a "claimant favorable" dose exposure model. The fact that the Site Profile ignores available urinalysis bioassay data in favor of a blanket reliance on air concentration data to measure internal dose exposures inevitably results in dose exposure estimates that are underestimated, unreliable and not "claimant favorable." NIOSH has now conceded this fact.

The Audit Report specifically addressed the dust problems within Building 30. The Audit Report states that:

> "Dust would come off the overhead rafters. Sometimes, they would fall right onto workers' lunch. During the MED period, they stacked all the contaminated burlap bags in storage area of Building 30. These contaminated burlap bags were kept in there until they were removed to be burned in the incinerator in the late 1950s. Many people working in Building 30, including operation personnel, secretaries, and maintenance workers, would sit on those bags resting or eating their lunch. This went on for many years."[17]

NIOSH's decision to ignore available urinalysis data covering the time period from 1947 through 1950 and the concomitant exclusive reliance on air concentration to evaluate dose exposure in the instant case does not provide a "claimant favorable" dose exposure model. The fact that the Site Profile ignores available urinalysis bioassay data in favor of a blanket reliance on air concentration data to measure internal dose exposures inevitably results in dose exposure estimates that are underestimated, unreliable and not "claimant favorable."

Additionally, the Audit Report indicates that "[t]he site profile does not characterize or provide any information on the potential missed worker external doses due to extremity exposure, skin contamination, and whole-body exposure to residual contamination in used burlap bags stored in different locations, such as Building 30. Internal exposure may have resulted from the inhalation and ingestion of radioactive dust accumulating from the burlap bags. The external exposure potential would have resulted from any dust coming in contact with skin as well as the dust that often covered employee's clothing after working in Building 30.[18]

[16] Id.
[17] Id. at 112
[18] Id.

Additionally, the increased radium and radon internal exposure potentials from these burlap bags are also not addressed in the Site Profile.[19] Due to the storage of the burlap bags in Building 30 and the resulting dust accumulations, the internal and external exposure potentials resulting from the transport of African ore in the bags increased the exposure potentials for both radium and radon gas. Such radon and radium exposure from the burlap bags and the significant isotope exposure pathway potential from pro-actinium, actinium and thorium have not been measured in the air data or from the available urinalysis bioassay data cited in the Site Profile covering the time period from 1947 through 1950. This data collection deficiency is particularly significant for Building 30 employees.

The failure to monitor these employees for radioactive dust exposure is a deficiency in data collection. Additionally, the Audit Report indicates that "...the site profile is deficient in evaluating many potential exposure pathways to workers, including rooftops and parking areas contaminated by uranium dust emitted from unfiltered ventilation systems on top of Buildings 14, 30, 31, 37, and 38."[20]

The Audit Report also emphasized that "...the air concentration data used are based on results of random grab air samples in general areas and breathing zones, but not on continuous area sampling measurements in high-risk or high-dose areas. Therefore, SC&A believes that using air concentration data only in the Linde Site Profile can lead to significant uncertainties in worker inhalation intakes, and the eventual underestimation of missed internal doses."[21] Consequently, even the precision of the Site Profile air concentration data is at issue because the data is only based on random air samples and does not take into account air samples from high risk or high dose areas throughout the Linde facility.

The credibility of the Linde Site Profile and NIOSH's claim that the data analyses relied on are "claimant favorable" and based on "worst case" scenarios is compromised significantly by the foregoing deficiencies. Internal radiation doses cannot be reconstructed with "sufficient accuracy" with NIOSH's sole reliance on air monitoring data and a failure to evaluate available urinalysis bioassay data.

NIOSH's approach to dose reconstruction no longer relies on individual monitoring and does not measure isotope specific dose exposure from thorium, actinium and pro-actinium. Instead, NIOSH relies on plant-wide air monitoring data, which is not isotope specific. Accordingly, NIOSH has not demonstrated that it can conduct individual dose reconstructions with "sufficient accuracy."

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[19] Id.
[20] Id.
[21] Audit Report at page 18

Source Term Data Collection

The incomplete assessment of the radiological source term in the Linde Site Profile is a data deficiency that translates into missed and ultimately underestimated and unreliable internal and external dose estimation. The reliance on such unreliable dose estimation for individual internal and external dose reconstruction for uranium and its progeny during the residual radiation time period, results in reconstructed doses that do not satisfy the "sufficiently accurate" accurate standard for dose reconstruction determinations.

The failure to account for numerous sources of both internal and external exposure pathways including Vanadium tailings from concentrated sludge in 15-20% black uranium oxide, yellow-cake concentrated sludge containing between 10 to 15% U3O8, and the incineration of burlap bags and paper bags resulting in increased environmental exposure pathways. Moreover, the New York Operations Report from March 1949 noted the presence of radium cake residues at Linde stored in steel drums at Linde.

Significantly, the fact that NIOSH has not reviewed and evaluated the most authoritative source of information of the types and grades and percentages of uranium content ore that were processed at Linde forestalls any accurate depiction of source term information for the Linde site, either during the operational time period or during the residual radiation time period.[22] This deficiency has consequences for all Site Profile dose exposure estimates and the overall adequacy of the Site Profile for use in dose reconstruction and probability of causation determinations. Research indicates that higher yield uranium ore was processed at Linde after 1943 and all low grade forms of uranium ore were no longer being processed at Linde after 1943. This evidence is in direct contradiction with the Linde Site Profile. The Linde Site Profile's baseline dose exposure data estimates cannot be considered credible. This evidence also provides additional bases for direct comparison to the Mallinckrodt facility and consequently for granting SEC status for Linde from 1947 through 1953.[23]

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[22] The best single source on feed materials is MD History, Book VII, Volume 1, entitled "Feed Materials, Special Procurement, and Geographical Exploration" Endnotes page 687 – Note 2, Chapter 9 [Richard G. Hewlett and Oscar E. Anderson, Jr., 1962 Pennsylvania State University Press, Volume I, A History of the United States Atomic Energy Commission, The New World 1939/1946]

[23] Manhattan: The Army and the Atomic Bomb by Vincent C. Jones, Center for Military History 1985: "At the end of 1942...Linde expanded its black oxide production facilities, but, by late 1943, was phasing out domestic ores and using its facilities to refine higher-yielding African ores." [page 314]; Linde processed black oxide into brown

It is not possible to conduct "sufficiently accurate" and "claimant favorable" dose reconstruction determinations if raffinate exposures cannot be accounted for in dose exposure estimates, when baseline uranium content is dubious, when air concentration data is used and urinalysis bioassay data is ignored and when the Site Profile fails to account for the accurate uranium oxide content processed after 1943 and during green salt processing.

At the Mallinckrodt facility the approval SEC status for the time period from 1942 through 1957 was based in part on the pitchblende ores contained high levels of Radium-226 (Ra-226) and Thorium-230, resulted in a significant gamma radiation source and thus produced most of the external whole-body dose received by the workers. Thorium-234 and Protactinium-234, both beta emitters, would have produced most of the skin and extremity dose. The storage and processing released radon and radioactive dusts, potentially resulting in internal doses to the lung and other tissues due to inhalation. The levels of radon releases correlate to the radium content of the ore and its derivatives. Because the concentration of radium and other daughters present at any given time in the ore, in the processed uranium, and in processing residue, depended on the concentration of uranium in the ore, *the levels of radiation doses received by workers would have depended, in part, on the particular uranium ore being processed at a particular time*. The principal source of internal radiation doses for members of the class was radioactive dusts aerosolized through processing of radioactive materials and re-aerosolized after settling on surfaces.[24]

At Mallinckrodt the monitoring data might still have utility for dose reconstructions if NIOSH had access to information on the source terms (the specific quantities and contents of the uranium feedstock) being processed at the facility during the time periods of the dust samplings, and such information on the quantities of the residues as well. However, lacking this source term, residue information, and lacking information to characterize the extent and duration of dust generation associated with manual processes, NIOSH does not have adequate information to estimate reasonably maximum internal radiation doses of members of the class associated with dust exposures.[25] These issues are raised again for the proposed SEC time period for the Linde facility from 1947 through 1953.

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oxide, producing 300 tons of brown oxide. From 1942 through the duration of the war Linde produced 2060 tons of green salt. [Page 316]; Linde processed the tailings from 50 percent uranium oxide into a 20 percent oxide sludge into uranium oxide in 1943 from the US Vanadium Corporation and late in 1943 Linde began to process Congo pitchblende exclusively until the end of 1944. [Page 292, chapter 9]

[24] Mallinckrodt SEC Petition Evaluation Report Petition SEC-00012-1 Uranium Division 1942-57 pages 10-11
[25] Id. at 13-14

The Audit Report Calls into Question the Overall "Claimant Favorable" *Estimated Exposure* Foundation of the Linde Site Profile

The Linde Site Profile represents an overall dose exposure analytical model that is not "claimant favorable." The Audit Report identified repeated instances of unreliable and underestimated dose exposure data in the Site Profile. Reliance on the Site Profile yields arbitrary and unreliable POC calculations that cannot be defined as "sufficiently accurate." The statistical analyses used to establish the dose exposure estimates in the Site Profile are suspect. The Linde Site Profile is based on unsupported assumptions and repeated instances of a failure to evaluate trace radionuclide internal dose exposure pathways as well as repeated instances where employee radiation dose exposure estimates are underestimated.[26] NIOSH cannot reconstruct "sufficiently accurate" dose exposures for Linde employees by relying on the Linde Site Profile.

The Linde Site Profile deficiencies cited in the Audit Report establish that the Site Profile is not a "claimant favorable" reference tool to rely on for dose reconstruction determinations. The Audit concluded that "[t]he credibility of the site profile and its claim to be claimant favorable appear to be compromised by the many unsupported or poorly justified assumptions that are made throughout."[27]

The failure to monitor these employees for radioactive dust exposure is a deficiency in data collection. Additionally, the Audit Report indicates that "...the site profile is deficient in evaluating many potential exposure pathways to workers, including rooftops and parking areas contaminated by uranium dust emitted from unfiltered ventilation systems on top of Buildings 14, 30, 31, 37, and 38."[28]

The Audit Report also emphasized that "...the air concentration data used are based on results of random grab air samples in general areas and breathing zones, but not on continuous area sampling measurements in high-risk or high-dose areas. Therefore, SC&A believes that using air concentration data only in the Linde Site Profile can lead to significant uncertainties in worker inhalation intakes, and the eventual underestimation of missed internal doses."[29] Consequently, even the precision of the Site Profile air concentration data is at issue because the data is only based on random air samples and does not take into account air samples from high risk or high dose areas throughout the Linde facility.

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[26] Id. at 38
[27] Id.
[28] Id.
[29] Audit Report at page 18

The credibility of the Linde Site Profile and NIOSH's claim that the data analyses relied on are "claimant favorable" and based on "worst case" scenarios is compromised significantly by the foregoing deficiencies. Internal radiation doses cannot be reconstructed with "sufficient accuracy" with NIOSH's sole reliance on air monitoring data and a failure to evaluate available urinalysis bioassay data.

The incomplete assessment of the radiological source term in the Linde Site Profile is a data deficiency that translates into missed and ultimately underestimated and unreliable internal and external dose estimation. The reliance on such unreliable dose estimation for individual internal and external dose reconstruction for uranium and its progeny during the residual radiation time period, results in reconstructed doses that do not satisfy the "sufficiently accurate" accurate standard for dose reconstruction determinations.

Significantly, the uranium content of the ores processed by the facility varied substantially, as did other radiologically significant daughter products. Pitchblende ores contained high levels of Radium-226 (Ra-226) and Thorium-230. Radium-226 (in equilibrium with its progeny) constitutes a significant gamma radiation source and thus produced most of the external whole-body dose received by the workers, while Thorium-234 and Protactinium-234, both beta emitters, would have produced most of the skin and extremity dose. In addition, storage and processing released radon and radioactive dusts, potentially resulting in internal doses to the lung and other tissues due to inhalation. The levels of radon releases would have correlated closely to the radium content of the ore and its derivatives. Because the concentration of radium and other daughters present at any given time in the ore, in the processed uranium, and in processing residue, depended on the concentration of uranium in the ore, the levels of radiation doses received by workers would have depended, in part, on the particular uranium ore being processed at a particular time.

If NIOSH does not have reliable and complete internal monitoring data for members of the proposed class, and it does not have enough source term or process information, then NIOSH cannot develop a sufficiently accurate model for dose reconstruction. This is the case at Linde as well as at Mallinckrodt.

Research indicates that higher yield uranium ore was processed at Linde after 1943 and all low grade forms of uranium ore were no longer being processed at Linde after 1943. This evidence is in direct contradiction with the Linde Site Profile. The Linde Site Profile's baseline dose exposure data estimates cannot be considered credible. This evidence also provides additional bases for direct comparison to the Mallinckrodt facility and consequently for granting SEC status for Linde from 1947 through 1953.

It is not possible to conduct "sufficiently accurate" and "claimant favorable" dose reconstruction determinations if raffinate exposures cannot be accounted for in dose exposure estimates, when baseline uranium content is dubious, when air concentration data is used and urinalysis bioassay data is ignored and when the Site Profile fails to account for the accurate uranium oxide content processed after 1943 and during green salt processing.

The monitoring data might still have utility for dose reconstructions if NIOSH had access to information on the source terms (the specific quantities and contents of the uranium feedstock) being processed at the facility during the time periods of the dust samplings, and such information on the quantities of the residues as well. However, lacking this source term, residue information, and lacking information to characterize the extent and duration of dust generation associated with manual processes, NIOSH does not have adequate information to estimate reasonably maximum internal radiation doses of members of the class associated with dust exposures.[30]

NIOSH's decision to ignore available urinalysis data covering the time period from 1947 through 1950 and the concomitant exclusive reliance on air concentration to evaluate dose exposure in the instant case does not provide a "claimant favorable" dose exposure model. The fact that the Site Profile ignores available urinalysis bioassay data in favor of a blanket reliance on air concentration data to measure internal dose exposures inevitably results in dose exposure estimates that are underestimated, unreliable and not "claimant favorable."

The potential for internal as well as external radiation exposure for employees working in Building 30 and in particular for employees that participated in the renovation work in Building 30 emanating from the storage of thousands of contaminated burlap bags and paper bags is not addressed in the Site Profile. Internal exposure may have resulted from the inhalation and ingestion of radioactive dust accumulating from the burlap bags. The external exposure potential would have resulted from any dust coming in contact with skin as well as the dust that often covered employee's clothing after working in Building 30.[31]

[30] Id. at 13-14
[31] Id.

Additionally, the increased radium and radon internal exposure potentials from these burlap bags are also not addressed in the Site Profile.[32] Due to the storage of the burlap bags in Building 30 and the resulting dust accumulations, the internal and external exposure potentials resulting from the transport of African ore in the bags increased the exposure potentials for both radium and radon gas. Such radon and radium exposure from the burlap bags and the significant isotope exposure pathway potential from pro-actinium, actinium and thorium have not been measured in the air data or from the available urinalysis bioassay data cited in the Site Profile covering the time period from 1947 through 1950. This data collection deficiency is particularly significant for Building 30 employees. Furthermore, the incineration of burlap and paper bags may also have significant consequences for environmental exposure pathways.

In conclusion, the credibility of the Site Profile and NIOSH's claim that all dose exposure data is "claimant favorable" is compromised significantly by the lack of analysis of complete and authoritative source material evidence. Moreover, the occupational internal radiation doses received by the members of the proposed class cannot be reconstructed with sufficient accuracy due to the lack of applicable bioassay data, air monitoring data, and source term information.

[32] Id.

Linde Ceramics Special Exposure Cohort Application: January 1, 1954 through July 31, 2006

This petition is based upon the following issues that demand SEC status be approved due to the inability of NIOSH to conduct "sufficiently accurate" dose reconstruction determination under the current Linde Ceramics Site Profile, published on January 19, 2006. The current Linde Site Profile is being revised by NIOSH based upon deficiencies that form the basis for this SEC application. These deficiencies must be cured by NIOSH due to the dose reconstruction consequences that underestimate radiation exposure for workers.

This SEC petition for the residual radiation time period is based upon the following issues: the incomplete analysis and review of all available source term information available to NIOSH. This is an example of a data collection deficiency that forecloses the ability of NIOSH to reconstruct accurate dose exposure estimates due to the inability to evaluate the precise grade levels of the pitchblende African ore processed at Linde during its operational period from 1942 through 1953. The deficient, unreliable and incomplete dosimetry data available to NIOSH for Linde residual radiation workers. The destruction of documents in a regular process of the off-site incineration of Linde documents performed by Linde workers and attested to by Linde workers in attached affidavit statements.

The residual radiation workers performed renovation work in MED buildings without protective equipment, without supervision from safety personnel and without any dosimetry monitoring of the workers to measure internal exposure to uranium dust exposure from inhalation and ingestion of uranium and uranium progeny dust that was aerolized and re-aerolized during renovation practices that included jack hammering of concrete floors and daily exposure to dust that had settled on rafter, equipment and throughout the ventilation system of the former MED buildings that were renovated, including Buildings 30 and 38 which were the most contaminated buildings on the Linde site according to a 1976 Department of Energy radiological survey conducted after much of the renovation work had been conducted by workers in 1957 and from 1961 through 1964.

The employees involved in renovation work were never provided with work uniforms or respiratory protective equipment. Moreover, these employees were not monitored for dust exposure during the renovation work in the 1960s.

Finally, the incomplete and unreliable Linde Site Profile forecloses NIOSH's ability to conduct "sufficiently accurate" dose reconstruction determinations due to the potential for the underestimation of

dose exposure estimates in violation of NIOSH's "claimant favorable" dose reconstruction analytical framework.

NIOSH is currently in the process of revising the Linde site profile due to the fact that the available Linde dosimetry data for the residual radiation time period is not isotope specific for trace raffinate radionuclides. The absence of isotope specific monitoring data forestalls NIOSH's ability to reconstruct a credible dose for dose reconstruction determinations. Accurate individual internal dose reconstructions for uranium and its progeny during the residual radiation time period is not possible under the dose exposure data presented in the Linde Site Profile. Consequently, the dose exposure data that NIOSH has relied on does not present a reliable or accurate depiction of worker dose exposures.

Furthermore, the internal dose exposure estimates that solely rely on air concentration dose data for the residual radiation time period has been criticized by experts as unreliable due to a tendency to underestimate internal dose exposure.[33] Accordingly, the exclusive reliance on air concentration data cannot be considered "claimant favorable." NIOSH has conceded this fact and will cure this deficiency in the revised site profile. NIOSH has conceded that at Linde the internal exposure model based upon air data concentration data mistakenly ignored available urinalysis bioassay data from 1947 through 1950 and created the potential to underestimate internal exposure dose estimates for dose reconstruction claimants.

The source term data deficiencies also foreclose defining the dose reconstruction determinations based on the current Linde site profile as being claimant favorable and does not allow NIOSH the baseline data exposure estimates needed to overestimate dose exposure or apply a "worst case scenario" analytical framework.

Building 30 was identified as the most contaminated building at Linde according to dust exposure studies from the 1950s and according to the comprehensive radiation survey conducted in 1976 by ORNL for the Department of Energy.[34] Moreover, "[d]uring the early 1950s, the dust levels in Building 31 were so high that Linde brought in [redacted] to evaluate the work areas. He confirmed that the dust levels were high and not safe for inside workers. In Building 30, they had the same dust problems."[35]

[33] Id. at 71-72
[34] Linde SC&A Audit Report, pages 112-113; Linde Site Profile at page 41
[35] Id. at 112

Section 2.7 of the Linde Site Profile entitled "Post MED/AEC Operations" states "[t]he highest indoor radiation levels were found in the principal production buildings, 30 and 38."[36] Cleanup and renovation of the MED/AEC buildings occurred in the 1950s and 1960s. Despite attempts to reduce contamination to acceptable levels of radiation, the buildings were still found to be contaminated in radiological surveys after the 1978 ORNL report, and the failure of the renovation work to reduce that contamination, including Building 30, led to the eventual need to demolish these buildings.[37]

The current Linde Site Profile has resulted in dose reconstruction decisions that have underestimated dose exposures with the use of unreliable and incomplete dose exposure pathways and estimates. Furthermore, the use of this underestimated, unreliable and incomplete Linde Site Profile dose exposure data demonstrates NIOSH's inability to reconstruct "sufficiently accurate" dose exposure potentials in direct contradiction of the EEOICPA legislative mandate. NIOSH has conceded many areas in need of revision in the Linde site profile. Many of these deficiencies created the potential for the underestimation of dose exposure estimates used in dose reconstruction denial decisions for Linde claimants.

The Linde Site Profile represents an overall dose exposure analytical model that is not "claimant favorable." The Audit Report identified repeated instances of unreliable and underestimated dose exposure data in the Site Profile. Reliance on the Site Profile yields arbitrary and unreliable probability of causation (POC) calculations that cannot be defined as "sufficiently accurate." The Linde Site Profile is based on unsupported assumptions and repeated instances of a failure to evaluate trace radionuclide internal dose exposure pathways as well as repeated instances where employee radiation dose exposure estimates are underestimated.[38] NIOSH cannot reconstruct "sufficiently accurate" dose exposures for Linde employees by relying on the Linde Site Profile. The Audit Report concluded that "[t]he credibility of the site profile and its claim to be claimant favorable appear to be compromised by the many unsupported or poorly justified assumptions that are made throughout."[39]

Trace Radionuclide Dose Exposure

Trace radionuclides identified in the Audit Report, including pro-actinium and actinium, were not considered or evaluated in any manner by NIOSH. This incomplete and unreliable dose exposure analysis is not "claimant favorable" since it did not rely upon a "worst case" scenario dose exposure

[36] Linde Site Profile at page 74
[37] Audit Report at pages 112-113
[38] Id. at 38
[39] Id.

model. The potential for underestimated dose exposure estimates in the Linde Site Profile was identified repeatedly in the Audit Report. NIOSH has conceded that this failure to account for these dangerous radio-isotopes in individual bioassay data forecloses the ability to reconstruct internal dose exposures. Moreover, this type of radio-isotope data is simply nonexistent for the Linde facility and therefore there is no way for NIOSH to cure this deficiency in the revised site profile. Both the Ames SEC for its residual radiation renovation workers and the Mallinckrodt SEC were in part granted based upon the absence of such crucial bioassay data – the absence of this data prevents NIOSH from reconstructing "sufficiently accurate" internal dose exposures for Linde workers as well.

At the Mound facility, NIOSH concluded that dose reconstruction was not feasible for the SEC time period at issue because the internal dose exposure cannot be reconstructed with sufficient accuracy absent bioassay data addressing raffinate exposure isotopes, including radium, actinium and thorium.

The radionuclide intake routes, including both inhalation and ingestion of selected radionuclides, should have included uranium, thorium, radium, *pro-actinium and actinium.* The Audit Report concluded that the lack of measurement and consequent dose exposure assessment for *actinium and pro-actinium* resulted in an incomplete and unreliable dose exposure analytical model.[40] Moreover, the inhalation and/or ingestion of even small amounts of these radionuclides significantly increase the probability of the development of a radiogenic cancer.[41]

Additionally, the Audit Report determined that the Site Profile failed to consider and evaluate worker exposure to pro-actinium and actinium in the data presented in the section entitled "Dose Reconstruction Summary, 1955 to present."[42] This section of the Site Profile summarized the guidelines for reconstructing internal and external dose exposures after 1954.[43]

Finally, the Audit Report concluded that the "[p]ossible doses from raffinate-related exposures have not been evaluated in the site profile. Inhalation of even small quantities of some raffinates…could result in significant doses to the workers."[44]

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[40] Id. at 19 and 45
[41] Id.
[42] Id. at 68
[43] Linde Site Profile at page 76
[44] Audit Report at page 68

The available Linde dosimetry data for the residual radiation time period at the Linde site is not isotope specific for trace raffinate radionuclides. The absence of isotope specific monitoring data forestalls NIOSH's ability to reconstruct a credible dose reconstruction determinations. Accurate individual internal dose reconstructions for uranium and its progeny during the residual radiation time period is not possible under the dose exposure data presented in the Linde Site Profile. Consequently, the dose exposure data that NIOSH has relied on does not present a reliable or accurate depiction of worker dose exposures by the fact that the data is not isotope specific.

NIOSH POC Analysis is Not "Claimant Favorable" Because Internal Dose Exposure Analyses Based Solely on Air Concentration Data Result in Underestimated Dose Exposure Estimates

The internal dose exposure estimates that solely rely on air concentration dose data for the renovation time period for Building 30. The use of air concentration data has been criticized by experts as unreliable due to a tendency to underestimate internal dose exposure.[45] Accordingly, the exclusive reliance on air concentration data cannot be considered "claimant favorable."

The Audit Report concluded that the "...air concentration data used in the site profile do not appear to be claimant favorable, due to significant expert criticism regarding using air concentration data to estimate worker inhalation intakes at uranium processing facilities."[46] Several studies, including a 1993 Nuclear Regulatory Commission study, "...demonstrate that using air concentration data could lead to underestimating the worker intakes and, subsequently, the internal exposures."[47] The Audit Report also stated that:

> "...the sensitivity of survey instruments, locations of the air samples, and air flow studies of the buildings are not presented in the Linde Site Profile report. It is also important to point out that the air concentration data used are based on results of random grab-air samples in general areas and breathing zones, and not the results of continuous area sampling. Lack of more complete air sampling data and neglecting bioassay data could lead to significant uncertainties in worker intakes and underestimation of missed inhalation doses."[48]

NIOSH's decision to ignore available urinalysis data covering the time period from 1947 through 1950 and the concomitant exclusive reliance on air concentration to evaluate dose exposure in the instant case does not provide a "claimant favorable" dose exposure model. The fact that the Site Profile ignores

[45] Id. at 71-72
[46] Id.
[47] Id.
[48] Id.

available urinalysis bioassay data in favor of a blanket reliance on air concentration data to measure internal dose exposures inevitably results in dose exposure estimates that are underestimated, unreliable and not "claimant favorable." NIOSH has now conceded this fact.

The Audit Report specifically addressed the dust problems within Building 30. The Audit Report states that:

> "Dust would come off the overhead rafters. Sometimes, they would fall right onto workers' lunch. During the MED period, they stacked all the contaminated burlap bags in storage area of Building 30. These contaminated burlap bags were kept in there until they were removed to be burned in the incinerator in the late 1950s. Many people working in Building 30, including operation personnel, secretaries, and maintenance workers, would sit on those bags resting or eating their lunch. This went on for many years."[49]

NIOSH's decision to ignore available urinalysis data covering the time period from 1947 through 1950 and the concomitant exclusive reliance on air concentration to evaluate dose exposure in the instant case does not provide a "claimant favorable" dose exposure model. The fact that the Site Profile ignores available urinalysis bioassay data in favor of a blanket reliance on air concentration data to measure internal dose exposures inevitably results in dose exposure estimates that are underestimated, unreliable and not "claimant favorable."

Additionally, the Audit Report indicates that "[t]he site profile does not characterize or provide any information on the potential missed worker external doses due to extremity exposure, skin contamination, and whole-body exposure to residual contamination in used burlap bags stored in different locations, such as Building 30. Internal exposure may have resulted from the inhalation and ingestion of radioactive dust accumulating from the burlap bags. The external exposure potential would have resulted from any dust coming in contact with skin as well as the dust that often covered employee's clothing after working in Building 30.[50]

At an Advisory Board meeting held on March 26, 2007, the deficiencies identified in the Audit Report were addressed with representatives from NIOSH. Dr. James Neton from NIOSH addressed the internal and external exposure potentials resulting from the storage of the burlap bags in Building 30. Dr. Neton stated:

> If we look at it from the perspective of the ore itself, the progeny in the ore in addition to the uranium. When the bags were empty, they stacked the bags up in piles, and the workers recollect sitting and eating lunch on them because they were nice and comfortable outdoors. And I know

[49] Id. at 112
[50] Id.

> the bags were supposedly empty, but since it's burlap, and they've got a lot of uranium dust, they probably had some activity which may be small for one bag, but if you've got lots of bags and your sitting on it, maybe that's an important contributor..."[51]

Additionally, the increased radium and radon internal exposure potentials from these burlap bags are also not addressed in the Site Profile.[52] Due to the storage of the burlap bags in Building 30 and the resulting dust accumulations, the internal and external exposure potentials resulting from the transport of African ore in the bags increased the exposure potentials for both radium and radon gas. Such radon and radium exposure from the burlap bags and the significant isotope exposure pathway potential from pro-actinium, actinium and thorium have not been measured in the air data or from the available urinalysis bioassay data cited in the Site Profile covering the time period from 1947 through 1950. This data collection deficiency is particularly significant for Building 30 employees.

The failure to monitor these employees for radioactive dust exposure is a deficiency in data collection. Additionally, the Audit Report indicates that "...the site profile is deficient in evaluating many potential exposure pathways to workers, including rooftops and parking areas contaminated by uranium dust emitted from unfiltered ventilation systems on top of Buildings 14, 30, 31, 37, and 38."[53]

Employees conducted renovation work in Building 30. They broke up concrete for hours at a time and subsequently inhaled and ingested the resulting high levels of airborne dust.[54] Furthermore, employees also cleaned and removed renovation debris from Building 30.[55]

The Audit Report described the work involved in the first attempt to renovate Building 30 in 1957, including ".... jack-hammering the contaminated concrete floor. Dust was kicked up everywhere."[56] Additionally, "Building 30 underwent a second renovation from 1961–1968. During renovation, there were [sic] jack-hammering of the concrete/dirt floors, removal and replacement of beams, shearing or cutting of steel and aluminum materials, and spray painting over previously existing paint...The primary

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[51] Statement from James Neton, NIOSH representative at the Advisory Board Linde Working Group Meeting on March 26, 2007, Advisory Board Meeting Transcript at page 98
[52] Id.
[53] Id.
[54] Testimony of co-worker [redacted] before the NYS Workers' Compensation Board, dated July 30, 1996, pages 13-98.
[55] Testimony of co-worker, [redacted] before the NYS Workers' Compensation Board, dated July 30, 1996, pages 13-98.
[56] Audit Report at page 114

concern with Building 30, which processed uranium during production years, during this period was the residual contamination both in and outside the building."[57]

NIOSH's failure to evaluate the available urinalysis bioassay data from 1947 through 1950 to estimate the dose exposures for the Building 30 renovation workers from the 1960s precludes the accurate evaluation of exposure to and inhalation of radioactive uranium dust. This Site Profile data deficiency is another example of NIOSH relying on underestimated dose exposure data in dose reconstruction decisions.

At the Advisory Board meeting evaluating the Linde Site Profile on March 26, 2007, a NIOSH representative conceded that the use of urinalysis bioassay data is more reliable to assess dose exposure potentials than the sole reliance on air concentration data.[58] The NIOSH representative indicated that the potential availability of newly uncovered urinalysis bioassay data would establish a preferred dose exposure analytical model.

The Audit Report also emphasized that "...the air concentration data used are based on results of random grab air samples in general areas and breathing zones, but not on continuous area sampling measurements in high-risk or high-dose areas. Therefore, SC&A believes that using air concentration data only in the Linde Site Profile can lead to significant uncertainties in worker inhalation intakes, and the eventual underestimation of missed internal doses."[59] Consequently, even the precision of the Site Profile air concentration data is at issue because the data is only based on random air samples and does not take into account air samples from high risk or high dose areas throughout the Linde facility.

The credibility of the Linde Site Profile and NIOSH's claim that the data analyses relied on are "claimant favorable" and based on "worst case" scenarios is compromised significantly by the foregoing deficiencies. Internal radiation doses cannot be reconstructed with "sufficient accuracy" with NIOSH's sole reliance on air monitoring data and a failure to evaluate available urinalysis bioassay data.

The MED/AEC buildings at Linde remained contaminated despite repeated attempts over a number of years during the 1950s and 1960s to renovate these buildings. The ORNL 1978 radiological survey established the necessity of designating Linde as a FUSRAP site in 1980. The resulting dust exposure from these failed renovation activities and the daily inhalation and ingestion of uranium dust combined

[57] Id.
[58] Statement from Cindy Bloom, NIOSH representative at the Advisory Board Linde Working Group Meeting on March 26, 2007, Transcript at page 38
[59] Audit Report at page 18

with the lack of personnel monitoring for radiation exposure, the lack of protective safety equipment, and the failure to enforce safety procedures during renovation work all demonstrate the radiogenic cancer risk for Building 30 workers. These workers were exposed to varying high levels of surface and airborne contamination of uranium and its progeny. They were not monitored for internal intakes of uranium and were not supplied with effective respiratory protection equipment.

NIOSH's approach to dose reconstruction no longer relies on individual monitoring and does not measure isotope specific dose exposure from thorium, actinium and pro-actinium. Instead, NIOSH relies on plant-wide air monitoring data, which is not isotope specific. Accordingly, NIOSH has not demonstrated that it can conduct individual dose reconstructions with "sufficient accuracy."

Members of the proposed class for the renovation and remediation operations were potentially exposed to varying high levels of surface and airborne contamination of uranium and its progeny. They were not monitored for internal intakes of uranium and were not supplied with effective respiratory protection equipment.

Furthermore there is a significant degree of a lack of information and data collection regarding personal monitoring, source term from the site where the members of the proposed class worked. Occupational internal radiation doses received by the members of the proposed class cannot be reconstructed with sufficient accuracy due to the lack of applicable bioassay data, air monitoring data, and source term information.

The fact that NIOSH has not reviewed and evaluated the most authoritative source of information of the types and grades and percentages of uranium content ore that were processed at Linde forestalls any accurate depiction of source term information for the Linde site, either for the residual radiation time period or during the operational time period.

Re-Designation of Linde Site – AWE Facility Versus DOE Facility

The EEOICPA only provides for residual radiation coverage for AWE facilities and not for DOE facilities.[60] On September 5, 2007 the Department of Labor (DOL) re-designated Buildings 30, 31, 37

[60] "AWE facility" and "DOE facility" definitions referenced by the Department of Labor in EEOICPA Bulletin 07-07 are defined in the EEOICPA at 42 USC 73841 (5) and (12), respectively.

and 38 at Linde Ceramics from an "AWE facility" to a "DOE facility". Consequently, the NIOSH defined residual radiation contamination time period for Linde workers employed in these four buildings is now eliminated from compensation coverage under the Part B Program of the EEOICPA.[61] Any Linde worker who began working at the Linde facility in one of these four buildings after 1953 is no longer eligible for compensation under the Part B program.

The only way a Linde employee who began working at Linde after 1953 would now be eligible for compensation under the dose reconstruction program is if that employee can prove "affirmatively" that they worked in Building 14 at the Linde site. Building 14 is now the only building at Linde that remains defined as an "AWE facility" and eligible for residual radiation compensation coverage under Part B. The presumption is that any Linde worker submitting a Part B compensation claim for work in the residual radiation time period worked in one of the four buildings now designated as a DOE facility. The DOL has not provided any explanation for the residual radiation coverage distinction between Buildings 30, 31, 37 and 38 versus Building 14 beyond the fact that the DOE had a proprietary interest in these buildings during the 1940s but did not have such an interest in Building 14. Why such a proprietary interest should translate into workers being denied their right to submit a claim for development of a radiogenic cancer has not been explained by the DOL.

Practically, the majority of Linde workers employed at Linde during the residual radiation time period worked in Buildings 30, 31, 37 and 38. These workers primarily participated in renovation work within these four buildings that were highly contaminated from uranium ore processing for the Manhattan Project during the 1940s. Workers inhaled and ingested dangerous levels of uranium dust during renovation work and were never provided with protective equipment that would have reduced their exposure to dangerous levels of residual radiation.

NIOSH cannot make reliable distinction to differentiate between workers in Buildings 30, 31, 37 and 38 without an evaluation of bumping policy and the proper evaluation of worker exposures within Building 14. This cannot be accomplished without interviewing surviving Linde workers or Linde "site experts" as they are termed in the Linde Audit report. The re-designation of Buildings 30, 31, 37 and 38 also does not account for the fact that Building 14 had a lunch room and unless NIOSH assesses how many residual radiation workers regularly ate lunch in Building 14 during the residual radiation time period, NIOSH

[61] The NIOSH defined residual radiation time period for the Linde Ceramics facility is 1954-1987; 1993-1995; 1997- July 2006.

cannot presume that residual radiation workers were only exposed or worked in Buildings 30, 31, 37 and 38.

The renovation/remediation workers from the late 1950s and 1960s were never monitored for radiation exposure or inhalation/ingestion of uranium dust. Moreover, there were no industrial safety procedures in place during these periods of renovation/remediation. Consequently, the internal exposure potentials from re-suspension of alpha particles from uranium dust exposure and trace radionuclide isotopes were not evaluated and cannot be evaluated for these workers.

NIOSH has conceded that the failure to account for uranium progeny exposure from residual surface contamination is not possible under current Linde Site Profile. New data from November 30th ORAU report to the Linde Working Group addressed the internal exposure from dust and debris inhalation and will be used in the revised Site Profile.

Source Term Data Collection Deficiencies

The incomplete assessment of the radiological source term in the Linde Site Profile is a data deficiency that translates into missed and ultimately underestimated and unreliable internal and external dose estimation. The reliance on such unreliable dose estimation for individual internal and external dose reconstruction for uranium and its progeny during the residual radiation time period, results in reconstructed doses that do not satisfy the "sufficiently accurate" accurate standard for dose reconstruction determinations.

The failure to account for numerous sources of both internal and external exposure pathways including Vanadium tailings from concentrated sludge in 15-20% black uranium oxide, yellow-cake concentrated sludge containing between 10 to 15% U3O8, and the incineration of burlap bags and paper bags resulting in increased environmental exposure pathways. Moreover, the New York Operations Report from March 1949 noted the presence of radium cake residues at Linde stored in steel drums at Linde.

Significantly, the fact that NIOSH has not reviewed and evaluated the most authoritative source of information of the types and grades and percentages of uranium content ore that were processed at Linde forestalls any accurate depiction of source term information for the Linde site, either during the

operational time period or during the residual radiation time period.[62] This deficiency has consequences for all Site Profile dose exposure estimates and the overall adequacy of the Site Profile for use in dose reconstruction and probability of causation determinations. Research indicates that higher yield uranium ore was processed at Linde after 1943 and all low grade forms of uranium ore were no longer being processed at Linde after 1943. This evidence is in direct contradiction with the Linde Site Profile. The Linde Site Profile's baseline dose exposure data estimates cannot be considered credible.

It is not possible to conduct "sufficiently accurate" and "claimant favorable" dose reconstruction determinations if raffinate exposures cannot be accounted for in dose exposure estimates, when baseline uranium content is dubious, when air concentration data is used and urinalysis bioassay data is ignored and when the Site Profile fails to account for the accurate uranium oxide content processed after 1943 and during green salt processing.

At the Mallinckrodt facility the approval SEC status for the time period from 1942 through 1957 was based in part on the pitchblende ores contained high levels of Radium-226 (Ra-226) and Thorium-230, resulted in a significant gamma radiation source and thus produced most of the external whole-body dose received by the workers. Thorium-234 and Protactinium-234, both beta emitters, would have produced most of the skin and extremity dose. The storage and processing released radon and radioactive dusts, potentially resulting in internal doses to the lung and other tissues due to inhalation. The levels of radon releases correlate to the radium content of the ore and its derivatives. Because the concentration of radium and other daughters present at any given time in the ore, in the processed uranium, and in processing residue, depended on the concentration of uranium in the ore, *the levels of radiation doses received by workers would have depended, in part, on the particular uranium ore being processed at a particular time*. The principal source of internal radiation doses for members of the class was radioactive dusts aerosolized through processing of radioactive materials and re-aerosolized after settling on surfaces.[63] At Mallinckrodt the monitoring data might still have utility for dose reconstructions if NIOSH had access to information on the source terms (the specific quantities and contents of the uranium feedstock) being processed at the facility during the time periods of the dust samplings, and such information on the

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[62] The best single source on feed materials is MD History, Book VII, Volume 1, entitled "Feed Materials, Special Procurement, and Geographical Exploration" Endnotes page 687 – Note 2, Chapter 9 [Richard G. Hewlett and Oscar E. Anderson, Jr., 1962 Pennsylvania State University Press, Volume I, A History of the United States Atomic Energy Commission, The New World 1939/1946]

[63] Mallinckrodt SEC Petition Evaluation Report Petition SEC-00012-1 Uranium Division 1942-57 pages 10-11

quantities of the residues as well. However, lacking this source term, residue information, and lacking information to characterize the extent and duration of dust generation associated with manual processes, NIOSH does not have adequate information to estimate reasonably maximum internal radiation doses of members of the class associated with dust exposures.[64]

The K-65 residues remaining after uranium extraction contain many of the uranium decay products that had been in secular equilibrium with the 238U and 235U [uranium] isotopes." But because the Belgian Congo pitchblende (ore) that was processed at the Mallinckrodt Chemical Works in the late 1940s contained such high levels of uranium (60 to 65% pure, as compared to one percent found in American ore), the rare isotopes of the uranium-235 decay chain that are not detected in United States' uranium ore residues are detected in the Belgian Congo.

The monitoring data might still have utility for dose reconstructions if NIOSH had access to information on the source terms (the specific quantities and contents of the uranium feedstock) being processed at the facility during the time periods of the dust samplings, and such information on the quantities of the residues as well. However, lacking this source term, residue information, and lacking information to characterize the extent and duration of dust generation associated with manual processes, NIOSH does not have adequate information to estimate reasonably maximum internal radiation doses of members of the class associated with dust exposures for renovation/remediation work in 1957 and throughout the 1960s.[65]

Linde Ceramics SEC Petitions Addendum

[64] Id. at 13-14
[65] Id.

SEC Tracking Numbers: SEC00106 and SEC00107

Additional Issues and Supplementary Evidence Supporting Linde Ceramics SEC Petitions SEC00106 and SEC00107

Linde Ceramics SEC Petition – November 1, 1947 through December 31, 1953

1. Source Term Data Deficiency: Joe Guido (ORAU) indicated during the "Linde Burlap Bag Issue" technical conference call held on February 13, 2008 in response to a question from Kathy Robertson–DeMers that NIOSH/ORAU had not reviewed any classified documents for Linde. The most authoritative document available detailing the feed procurement for the Linde facility during the 1940s is a classified document identified as Manhattan District History, Book VII, Volume 1, Section 1[66]. This document published by the MED identifies all of the feed material procurement at Linde during the operational time period. The document remains classified at the National Archives. Sections 2, 3, and 4 of this classified document have been declassified. These declassified sections detail the U.S. government's contractual agreements to purchase pitchblende uranium ore from the Belgian Congo during the 1940s.

This source term data deficiency forms the foundation for the Linde Ceramics SEC Petitions for the time periods encompassing November 1, 1947 through December 31, 1953 and January 1, 1954 through July 31, 2006.

I have attached three exhibits detailing this issue:

- Exhibit 1: The Linde Burlap Bag Issue Technical Call Notes, dated 2/15/08, provided by SC&A
- Exhibit 2: The first page of the declassified material received from the National Archives for the Manhattan District History, Book VII, Volume 1, Sections 2, 3 and 4

[66] The best single source on feed materials is MD History, Book VII, Volume 1, entitled "Feed Materials, Special Procurement, and Geographical Exploration" Endnotes page 687 – Note 2, Chapter 9 [Richard G. Hewlett and Oscar E. Anderson, Jr., 1962 Pennsylvania State University Press, Volume I, A History of the United States Atomic Energy Commission, The New World 1939/1946]

- Exhibit 3: The FOIA request response letter for Manhattan District History, Book VII, Volume 1 submitted to the Center for Military History and now being processed by the National Archives

2. The second set of attached exhibits includes two memoranda dated February 26, 1944 and March 6, 1944 [marked at Exhibit 4 and Exhibit 5, respectively]. These declassified memoranda provide information regarding the K-65 studies conducted at the Linde facility, most probably within Building 14, although the precise MED buildings where the studies were conducted is not clear. This evidence further illustrates the extent to which NIOSH has not assessed the complete source term information for the Linde facility and the types and grades of pitchblende ore that were processed at Linde during the operational time period.

3. According to the November 29, 2007 NIOSH Response report provided to the Linde Working Group, NIOSH planned to assess whether there were any high risk or high dose tasks unaccounted for in current Linde Site Profile. The attached exhibits are memoranda detailing that Linde workers conducted off-site work at the Lake Ontario Ordnance Works (LOOW) including the unloading of steel drums containing K-65 residue from the Mallinckrodt facility. These memoranda indicate that Linde crews were assigned to this unloading work at the LOOW in 1949 and 1951. The exposure potential of this "high dose work" is noted in the memoranda, particularly with respect to exposure to leaking drums that had been dented or otherwise damaged upon receipt at the LOOW. [Exhibit 6: Dated, March 11, 1949; Exhibit 7: Dated, October 14, 1949; Exhibit 8: Dated, February 26, 1951]

4. Additionally, Linde workers were also exposed to steel drums containing radium cake as is noted in the March 1949 NYOO Progress Report at pages 6 and 10. These radiation exposures time frames and the resulting radiation doses incurred by Linde workers are not accounted for in the current Linde Site Profile. The SEC proposed class encompassing the time period from November 1, 1947 through December 31, 1953 were affected by these exposure incidents. There is no clear indication from the attached memoranda and NYOO report that all of the Linde workers that participated in this off-site work were monitored in a consistent manner. Consequently, there is no evidence that any monitoring procedures were complete or reliable. Additionally, there is no bioassay data available for these LOOW workers that would have provided a truer depiction of exposure to K-65 residues or radium and radon dose exposures. Moreover, the allowable concentrations of dose exposures

permitted and established by the NYOO were arbitrary in nature and not based on specific safety guidelines that were verifiable to assess whether these workers were exposed to safe doses that actually protected workers from the high levels of exposure from both the K-65 residues and the radium cake and the associated exposure to radon from both the K-65 and the radium cake. [Exhibit 9: Dated April 7, 1949: Monthly Status and Progress Report for March 1949]

The incomplete assessment of the radiological source term in the Linde Site Profile is a data deficiency that translates into missed and ultimately underestimated and unreliable internal and external dose estimation. The reliance on such unreliable dose estimation for individual internal dose reconstruction for uranium and its progeny during the SEC proposed time period from 1947 through 1953 and the residual radiation time period, results in reconstructed doses that do not satisfy the "sufficiently accurate" standard for dose reconstruction determinations.

The foregoing exhibits demonstrate the incomplete assessment of source term data, worker dose exposures both on-site and off-site at the LOOW and the consequent extent to which the current Linde Site Profile is an incomplete and unreliable document to be used for any dose reconstruction determinations for the proposed SEC class of petitioners presented herein.

5. I have also attached affidavit statements from former Linde workers that further illustrate these deficiencies within the current Linde Site Profile. The statements are from the following Linde workers: [redacted]

- Significantly [redacted] is the SEC designated representative for the SEC class defined by the time period from November 1, 1947 through December 31, 1953 and [redacted] has provided details regarding the work of conducted by the SEC designated representative for the SEC class defined by the time period from January 1, 1954 through July 31, 2006, [redacted] who is deceased. [redacted] is represented by his widow, [redacted]

- Finally, [redacted] has provided a statement detailing his recollections regarding the regular procedures at Linde for the incineration of unknown boxes of documents. The documents were incinerated off-site at Kenmore Mercy Hospital and not at the on-site Linde incinerator.

Linde Ceramics SEC Petition – SEC Tracking Number: SEC00107

Linde Ceramics SEC Petition – January 1, 1954 through July 31, 2006

The incomplete assessment of the radiological source term in the Linde Site Profile is a data deficiency that translates into missed and ultimately underestimated and unreliable internal and external dose estimation. The reliance on such unreliable dose estimation for individual internal dose reconstruction for uranium and its progeny during the SEC proposed time period from 1954 through 2006 encompassing the NIOSH defined residual radiation time period, results in reconstructed doses that do not satisfy the "sufficiently accurate" standard for dose reconstruction determinations.

The K-65 studies conducted at Linde during 1944 and possibly beyond 1944, would have affected the degree and nature of the residual contamination in the MED buildings where the studies were conducted, including the uranium progeny dose exposure that workers would have been exposed which would have affected the radiological exposure potentials for Linde residual radiation workers.

I have also included worker statement detailing instances where requested medical records were missing. Moreover, records for sick workers were often missing or incomplete whereas requests from workers who were not sick were generally not subject to any significant delays and the requests were often granted without any problems with missing or incomplete records.

1. Air study results from 1948 and 1949 NYOO Report indicate that Linde workers were exposed to as much as 33 times the acceptable levels of alpha emissions and may have been exposed to levels as high as 106 times the acceptable levels of alpha emissions. The NYOO Report also notes that since the "acceptable levels" have been established based upon animal studies, there is no way to determine whether these levels of exposure will provide enough protection for the exposed workers. Specifically, the report states "The preferred alpha level of 70 disintegrations per minute per cubic meter (d/m/m3) for alpha emitting dust is based on animal studies. To date there has been insufficient industrial experience with uranium to make it possible for us to state to what extent this level affords a margin of safety for the workers." [See Exhibit 10: NYOO Report at page 5, dated January 1949 and air sampling studies conducted from October 1948 through November 1948; Exhibit 11:

NYOO Report dated April 1, 1949: Health Hazards in NYOO Facilities Producing and Processing Uranium, pages 12, 23-24]

2. This fact is never mentioned in the current Linde Site Profile and represents yet another instance of dose exposure underestimation potential for the exposed workers in the 1947 through 1953 time period as well as for the residual radiation workers exposed to alpha emitting dust during the time period from 1954 through 2006.

3. Additionally, the memorandum dated July 13, 1948, speaks to the inhalation of dust hazards associated with Step III production resulting from "brown oxide dumping operations" and how the air samples "indicate an extremely high concentration of radioactive material." [See Exhibit 12]

4. Furthermore, the residual radiation workers that conducted renovation work were exposed to dangerous levels of alpha emitting dust that would have resulted from the uranium processing from the Linde operational time period. In the excerpt from the attached report entitled "Decontamination of Buildings Used for Processing Alpha Emitters" prepared by the NYOO AEC and authors [redacted] and [redacted] dated April 29, 1954, the report indicates at page 19:

Decontamination operations such as sandblasting, vacuum cleaning, pneumatic jack hammering, should be performed with extreme care. Dust protective respirators should be worn by operators during all dry cleaning operations to prevent the operator's exposure to excessive radioactive airborne dust concentrations. Work clothing, gloves, etc. should be specially issued, laundered or even burned after use to prevent spread of airborne radioactive contamination. [Exhibit 13]

5. The renovation work described in the attached affidavit statements from former Linde workers, includin[redacted] indicates how these workers performed renovation work throughout the 1960s and 1970s without any protective equipment, without any work clothes, and how they would go home with there regular clothing covered in dust and wash their clothes at home. These workers performed many of the renovation activities identified in the Klevin, et al. report including vacuum cleaning and jack hammering. These workers were exposed to radioactive airborne dust and re-suspended airborne alpha emissions. The inhalation and ingestion of these particles by workers without the benefit of any

protective equipment and specifically without the benefit of respirators stands in direct contradiction of the directive presented by the NYOO AEC in this 1954 report.

Respectfully submitted,

[redacted]

SEC Designated Representative for the Linde Ceramics SEC Petitioner Class

[redacted]

Dated: March 19, 2008

SECTION A

Special Exposure Cohort Petition
under the Energy Employees Occupational Illness Compensation Act

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

OMB Number: 0920-0639 Expires: 05/31/2007

Petitioner Authorization Form

Use of this form is voluntary. Failure to use this form will not result in the denial of any right, benefit,

Instructions:

If you wish to petition HHS to consider adding a class of employees to the Special Exposure Cohort and you are NOT either a member of that class, a survivor of a member of that class, or a labor organization representing or having represented members of that class, then 42 CFR Part 83, Section 83.7(c) requires that you obtain written authorization. You can obtain such authorization from either an employee who is a member of the class or a survivor of such an employee. You may use this form to obtain such authorization and submit the completed form to NIOSH with the related petition. **Please print legibly.**

For Further Information: If you have questions about these instructions, please call the following NIOSH toll-free phone number and request to speak to someone in **the Office of Compensation Analysis and Support** about an SEC petition: **1-800-356-4674.**

Authorization for Individual or Entity to Petition HHS on Behalf of a Class of Employees for Addition to the Special Exposure Cohort

I, [redacted]
Name of Class Member or Survivor

Street Address of Class Member or Survivor Apt. # P.O. Box

[redacted]
City, State, Zip Code of Class Member or Survivor

do hereby authorize:

[redacted]
Name of Petitioner

[redacted]
Address of Petitioner Apt. # P.O. Box

[redacted]
City, State and Zip Code of Petitioner

to petition the Department of Health and Human Services on behalf of a class of employees that includes:

[redacted]
Name of Class Member (employee, not the employee's survivor)

for the addition of the class to the Special Exposure Cohort, under the Energy Employee's Occupational Illness Compensation Program Act (42 U.S.C. §§ 7384-7385).

In providing this authorization, I recognize that the petitioner named above will have all the rights of a petitioner as provided for under 42 CFR Part 83.

[redacted] 3-3-08
Signature of Class Member or Survivor Date

Name or Social Security Number of First Petitioner: [redacted]

Public Burden Statement

Public reporting burden for this collection of information is estimated to average 3 minutes per response, including time for reviewing instructions, gathering the information needed, and completing the form. If you have any comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, send them to CDC Reports Clearance Officer, 1600 Clifton Road, MS-E-11, Atlanta GA, 30333; ATTN:PRA 0920-0639. Do not send the completed petition form to this address. Completed petitions are to be submitted to NIOSH at the address provided in these instructions. Persons are not required to respond to the information collected on this form unless it displays a currently valid OMB number.

Use of this form is voluntary. Failure to use this form will not result in the denial of any right, benefit, or privilege to which you may be entitled.

Name or Social Security Number of First Petitioner: [redacted]

Special Exposure Cohort Petition
under the Energy Employees Occupational Illness Compensation Act

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

OMB Number: 0920-0639 Expires: 05/31/2007

Petitioner Authorization Form

Use of this form is voluntary. Failure to use this form will not result in the denial of any right, benefit,

Instructions:

If you wish to petition HHS to consider adding a class of employees to the Special Exposure Cohort and you are NOT either a member of that class, a survivor of a member of that class, or a labor organization representing or having represented members of that class, then 42 CFR Part 83, Section 83.7(c) requires that you obtain written authorization. You can obtain such authorization from either an employee who is a member of the class or a survivor of such an employee. You may use this form to obtain such authorization and submit the completed form to NIOSH with the related petition. **Please print legibly**.

For Further Information: If you have questions about these instructions, please call the following NIOSH toll-free phone number and request to speak to someone in **the Office of Compensation Analysis and Support** about an SEC petition: **1-800-356-4674**.

Authorization for Individual or Entity to Petition HHS on Behalf of a Class of Employees for Addition to the Special Exposure Cohort

I, [redacted]
Name of Class Member or Survivor

[redacted]
Street Address of Class Member or Survivor Apt. # P.O. Box

[redacted]
City, State, Zip Code of Class Member or Survivor

do hereby authorize:

[redacted]
Name of Petitioner

[redacted]
Address of Petitioner Apt. # P.O. Box

[redacted]
City, State and Zip Code of Petitioner

to petition the Department of Health and Human Services on behalf of a class of employees that includes:

[redacted]
Name of Class Member (employee, not the employee's survivor)

for the addition of the class to the Special Exposure Cohort, under the Energy Employee's Occupational Illness Compensation Program Act (42 U.S.C. §§ 7384-7385).

In providing this authorization, I recognize that the petitioner named above will have all the rights of a petitioner as provided for under 42 CFR Part 83.

[redacted] March 3, 2008
Signature of Class Member or Survivor Date

Name or Social Security Number of First Petitioner: [redacted]

Public Burden Statement

Public reporting burden for this collection of information is estimated to average 3 minutes per response, including time for reviewing instructions, gathering the information needed, and completing the form. If you have any comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, send them to CDC Reports Clearance Officer, 1600 Clifton Road, MS-E-11, Atlanta GA, 30333; ATTN:PRA 0920-0639. Do not send the completed petition form to this address. Completed petitions are to be submitted to NIOSH at the address provided in these instructions. Persons are not required to respond to the information collected on this form unless it displays a currently valid OMB number.

Use of this form is voluntary. Failure to use this form will not result in the denial of any right, benefit, or privilege to which you may be entitled.

Name or Social Security Number of First Petitioner: [redacted]

SECTION B

Exhibit 1

Linde: Burlap Bag Issue
Technical Call Notes
February 13, 2008

Teleconference Participants

SC&A	NIOSH/ORAUT	Advisory Board Linde WG	Linde Workers	Others
K. R-DeMers	C. Crawford	J. Beach	[redacted]	[redacted]
J. Mauro	J. Guido	G. Roessler		
S. Ostrow				

Notes

1. Steve Ostrow began the teleconference by stating that it was a "technical call" between SC&A and NIOSH/ORAUT as planned at the January 8, 2008 Advisory Board Linde Working Group meeting in Las Vegas, to discuss the open item concerning uranium ore containing burlap bags at the Linde site. He then summarized some of the background information leading to this teleconference.

2. Joe Guido summarized the findings related to the bags presented in the "NIOSH Response: Linde TBD Issues" report of November 29, 2007, which establishes a time-line for the disposition of the bags, primarily based on written records.

3. The participants discussed what other than African ore (Step 1 material) might have been present in burlap bags, which, apparently, were covered by paper bags. Joe Guido noted that the records indicate that uranium oxide concentrate (Step 3 material) arrived at the site in drums. He explained that there is a radiological distinction between the Step 1 and the Step 3 material since the former contains uranium progeny (especially, radium, which is important to external dose), while the latter contains relatively little.

4. Kathy Robertson-DeMers questioned whether NIOSH/ORAUT had examined transportation records or classified records for Linde and Mr. Guido said that he "didn't think so" to the former and "no" to the latter.

5. [redacted] a former Linde worker, presented some background information about his employment at the site, from [redacted] 1951 to [redacted] 1993 (with some breaks in service) and recounted his recollection of the burlap bags. He remembered that there were two pallets of bags containing some material in Building 30 in the time period around August 1951. He and his friends would get drinks, stand by the pile of bags, and place their cups on the bags. He was told by one co-worker that the bags were left over from the Manhattan project. He was asked about the appearance of the bags and he replied that they looked like large canvas sandbags.

Exhibit 2

BOOK VII Vol. I
Sections 2, 3, 4 Declassified

FOIA Request 08-006

From: **Shirer, Frank Mr CMH** (Frank.Shirer@hqda.army.mil)
Sent: Wed 3/05/08 7:09 AM
To: [redacted]

Dear [redacted]

I have completed coordination with the National Archives concerning your request for the declassification and release of "Manhattan District History, Book VII, Vol. 1: Feed Materials, Special Procurement, and Geographical Exploration" by Mr. Gavin, Hadden, Armed Forces Special Weapons Project, Department of Defense, 1947.

The NARA FOIA office has determined that they are indeed the owner of the history volume with the authority to declassify and release it. I have formally forwarded your request to them in today's mail and am sending you formal notification via regular mail.

Respectfully,

Frank R. Shirer
Chief, Historical Resources Branch
U.S. Army Center of Military History
202-685-3098; DSN 325-3098
202-685-4593 (Fax)

Exhibit 3

This document consists of 1 pages
No. 4 of 4 copies, Series A

Exhibit 4

EIDM 0-227-b-MS

26 February 1944

JEV:ff

Subject: Experimentation on high-grade ores at the Linde Air Products Company

To: The Area Engineer, Tonawanda Area, Tonawanda, New York

1. Information has been received from the Medical Section to the effect that the use of 65% ores in place of the 10% ores effectively increases the radiation to personnel and the Rn content of the atmosphere by approximately eight times. In general, it is considered by the Medical Section that laboratory operations will be quite safe and that the problem of radiation will not be great; the present film monitoring will provide assurance of safety for the workmen.

2. It is understood that a previous visit by the Medical Section resulted in a recommendation that additional exhaust ventilation be provided at the ball mill. This recommendation should be put in effect.

3. It is requested that information be forwarded to this office on whether or not the wearing of film badges has been instituted. It is felt that any laboratory workers experimenting on the 65% ores should be cautioned that the wearing of such film badges is an essential safety measure.

For the Area Engineer:

Yellow Copy destroyed 4/10/44

CANFIELD HADLOCK
Major, Corps of Engineers,
Assistant.

Copies 1 & 2 - Addressee
3 - Read. File
4 - Class. File

CLASSIFIED FILES
U. S. ENGINEER OFFICE
MADISON SQUARE AREA
DISPATCHED
FEB 28 1944

Copy 1 of 1, Series B - Capt. Ferry 1238

2

Exhibit 5

Subject: Experimentation on high-grade ores at the Linde Air Products Company. (26 February 1944.)

EIDM T-12 1st. Ind.

Office of the Area Engineer, Tonawanda Area, Tonawanda, N.Y., 2 March 1944. To: The Area Engineer, Madison Square Area, New York, N.Y. (Attention: Major Canfield Hadlock).

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1. Reference paragraph 2 basic communication, exhaust ventillation was installed and first operated about 13 February.

2. Reference paragraph 3 basic communication, first distribution of film-containing badges was made on 31 January. Seventeen badges were issued to thoseworkers who were most likely to come in contact with tolerance doses of exposure. Issuance of new badges is made weekly to the following:

2 Moore Operators
1 Moore Tailings Operator
Ball Mill Operator
Foreman
9 Loaders
1 Loader Foreman
1 Sampler
1 Pachuca Digest Operator

3. Laboratory experiments on the 65% ore have been temporarily discontinued. It is possible that no more experiments will be done, but if work is resumed, it will probably continue no longer than three or four weeks. We, therefore, feel that establishment of a film-containing badge survey would hardly be worthwhile.

E. L. Van Horn

E. L. VAN HORN,
Captain, Corps of Engineers,
Area Engineer.

FOR REPLY BY none
ANSWERED BY 3/6
REFERENCE
DATE

Cy 2A destr 7/13/46 Ea

Exhibit 6

This document consists of 1 pages
No. 2 of 4 copies, Series A

F. J. Epp, Manager, Tonawanda Sub-Office March 11, 1949

J. E. Morgan, Assistant Director, Production Division, New York

HANDLING OF K-65 DRUMS

REFER TO SYMBOL: PU:EGB

As previously mentioned, it will be necessary to handle the above-mentioned drums with extreme care. It may be necessary to hold these drums in storage for a period as long as 25 years and the drums have been prepared in such a manner that they should last this long if handled carefully.

The inside surface of the drums which you will receive has been coated with a corrosion resistant lacquer liner. As additional protection, the K-65 cake will be enclosed in a plastic bag. Recent tests at St. Louis have indicated that with poor handling by the fork lift operator, it is possible to dent the drums to the extent that the liner is broken. Such a break in the liner exposes an area to rapid corrosion. Such corrosion would mean early failure of the drum and would necessitate a costly re-barreling operation.

It is, therefore, recommended that you impress on all operators the need for careful handling. It is also recommended that you be on hand during the start-up of operations at the Lake Ontario Ordnance Works to see that the operators are carrying out the following instructions:

1. Fork lift trucks will approach the drums slowly and accurately.
2. Drums are to be lowered gently.
3. Drums left on outside paved areas are to be covered with tarpaulins.
4. Such outside storage areas should be well drained so that there will be no possibility of the drums standing in pools of water.
5. Any drums which arrive in a damaged condition or which are unavoidably damaged in handling are to be separated and marked.
6. The forks of the trucks should be padded to lessen the chance of denting. It is suggested that lengths of inner tube would serve this purpose.
7. The fork lift operators should practice their handling operations on a few old barrels before commencing operations with the cake drums.

cc: J. J. Koenig, St. Louis Area

Description of Damage to Drums

Several drums in each lot had heavy dents which appear to have been put in by the lift truck when the car was loaded. It was not apparent that any of the drums were damaged during the unloading operation. In railroad cars 2, 4 and 5 part of the load shifted in transit. As a result of this, some of the drums appeared to have buckled in the middle so that there was slight bulging on both ends. The paint was probably removed from the roller rims by the drums coming together in transit.

Radiation Measurements

Gamma Radiation

Several radiation measurements were made on the railroad cars and on individual drums by spot check. A Zeus was used for gamma radiation measurements. Gamma radiation levels in mr/hr are given in the table below:

LOT NUMBER	1	2	3	4	5	6
Through sides of car	300	300	200	220	140 to 230	150
Through ends of car	-	10 & 100	-	5 & 70	10 & 36	36
Top of car	-	140	-	-	-	-
Surface of drums (Spot checks)	400 to 600	700 to 900	200 to 600	-	300 to 600	300 to 400

Higher readings were obtained on that end of the car to which the load had shifted.

When the first three lots had been stored in the igloo, radiation measurements were made. No radiation was found to be coming from the back, sides or top of the igloo. 10 mr/hr gamma radiation was measured on the outer surface of the closed door at the front of the igloo.

Surface Contamination in Railroad Cars

On the floor of the railroad cars, after unloading, contamination was found which emitted alpha radiation. From 20,000 to 50,000 dis/min/100 sq.cm. of surface was detected in the 4th, 5th, and 6th cars received. Beta and gamma radiation three inches from any surface in the empty car measured less than 2 mr/hr.

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[redacted]

F. M. Belmore, Director, Production Division — October 14, 1949

E. F. Reichard

REHABILITATION OF LAKE ONTARIO ORDNANCE WORKS 4000w

SYMBOL: PU:EFR

As you know, Mr. A. Levine has studied the problems involved in the subject project and has drawn up several alternate proposals for rehabilitation work. These proposals have been discussed with the Administrative Operations and Health & Safety Divisions.

The minimum contemplated work would be for facilities to permit prosecution of our present radioactive waste disposal program and local supervision of AEC activities in the Buffalo-Niagara Falls-Lockport Area. This minimum (alternate A) work would include the following, with high spot costs estimated by A. Levine.

Alternate "A"

1.	Improvements to Bldg. #704 (Supervisor's Office)	$6,000
2.	Improvements to Bldg. #716 (Parking Garage) including small boiler installation	4,500
3.	Patch Bldg. #717, (Large storage warehouse)	2,500
4.	Patch Bldg. #723, (Small bldg. for storage of perishable equipment)	1,100
5.	Modification to electrical, water and sewage systems	4,000
6.	Contingencies	2,900
	Total	$21,000

The above work would accommodate the area office activities, guarding, and unloading and storage of K-65 and other radioactive processing residues and surplus AEC equipment.

[redacted] BMA

Exhibit 7

OFFICE→	Uran.-Thor.				
SURNAME→	Reichard				
DATE→	10/14/49				

Other times were also recorded. The average time required to load the trailer with 12 drums at the railroad siding by the igloo, move the drums to the igloo, unload and return was 22½ minutes.

To load 22 drums at the open air storage, move to igloo, unload and return required approximately 1 hour.

Recorded Exposures to Personnel

Nine Linde employees have been exposed to radiation during the K-65 unloading operation. Three employees were exposed as lift truck operators, five were exposed as movemen using hand trucks and one as health physics supervisor on the unloading and storage operations. Exposures in milliroentgens recorded by pocket meters and dates they were received are given:

		3/23	3/30	4/7	4/8	4/11	4/20	Total
H. Seyfang	Lift Oper.	110	120	60	160	50	40	540
H. Marcinkowski	" "	75	60	-	-	-	45	180
T. Bullock	" "	-	-	60	190	40	-	290
R. Cook	Moveman	-	210	240	320	-	120	890
L. Papa	"	190	-	240	300	-	70	800
L. Selva	"	-	130	100	370	-	120	720
S. Bellomo	"	-	-	-	-	90	-	90
R. Backert	"	-	-	-	-	80	-	80
R. Heatherton	Health Physicist	100	70	70	120	50	40	450

Highest exposures were on April 7 and 8 when material was being stored in the igloo.

Discussion of Radiation Exposures

Exposures to personnel are undoubtedly higher than is necessary. To hasten the work and to eliminate a very great safety hazard which would be present if a lift truck were used entirely to unload a car, the men were required to move drums with a hand truck. To save time in moving material from the open air storage area to the igloo, men were again placed on the trailer to move the drums so that the size of the load could be doubled. Painting the drums with a brush contributed greatly to exposures.

It is estimated that one person unloading one carload lot with a barrel truck should not receive more than 250 mr. to any part of the body. The hands will receive about the same exposure as the feet and slightly less to the rest of the body. The total exposure to any part of the lift truck operator's body should not exceed 80 to 90 mr. from handling 96 drums once.

The driver of the tractor which was used to pull the trailer received practically no exposure. The cab was approximately 20 ft. from the front of the load. Radiation in the cab was less than 1 mr/hr with a full load on the trailer.

Prescribed Method of Unloading and Storing K-65

To keep radiation exposures at a minimum, it would be desirable to unload all drums at the igloo area to eliminate extra handling. This is not possible at the present time since neither the igloos nor the unloading platform are within the fenced area. The platform by the railroad siding, if repaired, could easily accommodate four carload lots. Either a lift truck or hand truck could be used to remove the drums from the cars to the platform, and from the platform to the trailer. Two lift trucks should be used at the igloo, one to carry the drums to the door of the igloo and the other working inside removing the drums from the door and storing them in the igloo. A rise of about 12 inches before the igloo and the narrow dimensions of the doorway make it a difficult task to carry each drum inside and store it with the same truck.

If the radon concentrations in the igloo one month after storage of the first drums would permit the lift truck operator to enter the igloo, it would be better to store each lot in the igloo as it is unloaded. In this manner, six lots per month could be unloaded and stored by four men with no person receiving more than 600 mr. of gamma radiation per month. This assumes that extreme care will be exercised by each person so as not to expose himself more than is necessary.

R. C. Heatherton
Health Physicist

RCH:mo
cc: Dr. B. S. Wolf
Mr. M. Eisenbud
Mr. F. J Epp
Dr. A. G. Cranch
Mr. A. R. Holmes
Mr. E. C. Kent
File

Copied: April 27, 1949 for Mr. P. B. Klevin

Exhibit 8

W. B. Harris February 26, 1951

The design and installation of a mechanism for removing ring clamps and covers from drums may take several weeks. I do not think we should wait for this and thereby sacrifice protection which can be had much sooner. It would be satisfactory to continue removing the covers by hand if more shielding were provided.

Rec. #20 - Inspect drums more carefully for dents and eliminate those

The temporary barrier can be improved by adding an additional 1½ to 2" of steel or 3/4 to 1" of lead on the conveyor side. In addition, the shield should be extended to the wall of the thawhouse on the worker's right. The other side of the barrier should be higher, thicker and possibly wider. A wall of concrete block or brick could be built up on this side. A chest shield designed to give maximum protection without greatly sacrificing freedom of arm and body movement should be attached to the face of the barrier. This can be done by sloping the shield toward the conveyor.

Finally, radiation exposure can be reduced by shielding the lift trucks. The type of shielding which was proposed by the Production Division would be unnecessarily unwieldy and expensive. We have advised against it. Equipping the trucks with shields which move with the forks on the other hand would give the necessary protection and would be satisfactory from the standpoint of operation. Three-eights of an inch of lead or 3/4" of steel would reduce the radiation exposure to the fork lift operator by about 50%. Two such thicknesses would reduce the original exposure by 75%.

Most of the dust exposure results from a single cause, the hand-dumping of residual K-65 from drums. Directly, there is a very high dust exposure from the operation itself; indirectly the operation is responsible for general contamination, which eventually becomes airborne. Either the practice should be discontinued or a dumping hood should be installed at the earliest possible date.

Recommendations

Because of the dust exposure and high radiation exposure, the following recommendations are repeated. We strongly urge their completion.

*	Rec. #11	made	Nov. 1, 1950	pertaining to	conveyor motorization.
*	Rec. #15	"	"	"	a dumping hood.
*	Rec. #18	"	Nov. 27 "	"	shielding for drum.
*	Rec. #19	"	"	"	facilities for drum storage.
**	Rec. #21	"	Jan. 22, 1951	"	supplied air respirators.

* No action has been taken on these to date.
** This recommendation has been partially complied with.

Exhibit 9

Unique Document # 3710220608400000

This document consists of 38 pages. 1779
No. 12 of 16 copies, Series A

[redacted]

* 19940002384 *
DOE-OR
[redacted]

MONTHLY STATUS AND PROGRESS REPORT 727210

FOR MARCH 1949

BEST COPY AVAILABLE

A Report Submitted

by the

New York Operations Office

Special Review
Final Determination
Unclassified
By: 4-9-84
Date: P F. Brown
this page only

REPOSITORY Oak Ridge Oper. Records Holding Area
COLLECTION Doc. 19447294
BOX No. Folder #2 Bldg. 2714-M
FOLDER 4NN-326-87-8 8of45

DEPARTMENT OF ENERGY DECLASSIFICATION REVIEW	
1ST REVIEW-DATE: 11/23/94	DETERMINATION (CIRCLE NUMBER(S))
AUTHORITY: DADC DADC ADD	1. CLASSIFICATION RETAINED
NAME: J. D Wm	2. CLASSIFICATION CHANGED TO:
2ND REVIEW-DATE: 2-3-95	3. CONTAINS NO DOE CLASSIFIED INFO
AUTHORITY: ADD	4. COORDINATE WITH:
NAME: [redacted]	5. CLASSIFICATION CANCELLED
	6. CLASSIFIED INFO BRACKETED
	7. OTHER (SPECIFY):

April 7, 1949

W. E. Kelley, Manager

[redacted]

1188840

[redacted]

MONTHLY STATUS AND PROGRESS REPORT

FOR MARCH 1949

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[redacted]

III. PRODUCTION

A new plan for distribution of uranium feed materials was developed. A special conveyor unit for unloading powdered pitchblende ore from tank cars is being tested to determine the feasibility of this method of shipping. Construction plans for Middlesex feed material Warehouse are being pushed to completion. The first shipment of radium cake was made from Mallinckrodt Chemical Works to Lake Ontario under the new plan of handling and storage.

Methods of speeding design work on the new Mallinckrodt Chemical Works metal plant were discussed. Cost studies are being conducted to determine optimum metal and green salt production rates. The graphite procurement situation improved considerably during the past month. Metal rolling operations are proceeding as scheduled. Harshaw submitted engineering proposals for new green salt and process gas reactors.

Considerable progress was made in research projects at Battelle Memorial Institute on the recovery of thorium and uranium from monazite sands.

Acceptable beryllium castings from the bottom-pull type furnaces were produced last month by The Beryllium Corporation. A conference was held in Washington to plan production of beryllium assemblies for use in the Materials Development Reactor. A survey was made of the extrusion plant at Adrian, Michigan, to arrange for installation of facilities to do AEC work. A survey is being made to locate suitable shops for machining beryllium shapes. Attention has been given to health problems in beryllium flake production. Plans for the new Brush Beryllium Co. plant at Luckey, Ohio, are going forward, and considerable surplus equipment has been secured from Y-12. Work has begun on the pilot plant for the Sheer-Korman process.

Considerable progress has been made in the powder metallurgy research program, and various techniques of beryllium production and fabrication are being investigated. The construction of zirconium casting apparatus has been authorized. Increased AEC requirements of zirconium have necessitated new arrangements with Foote Mineral Co. and the Bureau of Mines. Rohn and Haas expressed optimism as to the potentialities of the ion exchange method for the separation of hafnium from zirconium. The third formal meeting of the Zirconium Advisory Committee was held in New York on March 23, 1949.

NYOO Accountability Branch records were audited by Washington representatives. The Vulcan Crucible Steel Co. was visited by an NYOO representative and SF material accountability procedures were reviewed. Procedures were set up to code all government bills of lading for control of costs. NYOO confirmed to Washington the draft of revised rules on classification of SF forms.

New arrangements have been made for gold analyses of radium sludge. A large part of the flow of analytical work to the National Bureau of Standards was stopped during the month. This work will be diverted to the New Brunswick Laboratory. The Harshaw Chemical Co. was visited by an NYOO analytical representative and recommendations were made to improve procedure.

[redacted]

Re-drumming of the captured soda salt was begun at Middlesex. To date, approximately 75% of the entire amount of material has been re-drummed. It is being placed in reconditioned steel drums which are coated on the inside with an asphaltum-type paint to increase corrosion resistance.

Radium Cake Handling and Storage

Technical representatives of the New York Operations Office conducted a study of radium cake handling and associated problems. This investigation resulted from the African Metals Corporation's request that the Commission store all such cake produced after April 1, 1949. In the study it was concluded that drum storage of radium cake in the "igloos" at Lake Ontario Ordnance Works is the most economical solution to the problem for the Commission.

In accordance with this decision, the first shipment of cake to Lake Ontario for storage has already been made. During the month final arrangements were made for the arrival of this shipment, and a technical representative of the New York Operations Office attended the first unloading operations. The condition of the drums and drum liners was checked, and various recommendations for improvement were made to Mallinckrodt. The unloading crew from Linde performed their work satisfactorily, despite the limited temporary handling facilities. A fork-lift truck equipped with special metal shielding for radiation protection and with forks placed in vertical position for drum handling was sent from Middlesex to the Lake Ontario Ordnance Works to assist in unloading the radium cake.

The drums which arrived in this first shipment were specially treated to resist corrosion. They contained a lacquer liner and a polyethylene bag. Of the 96 drums which arrived, it was observed that approximately 12 were dented. Only one of these dents was serious enough to cause breakage of the lacquer liner. It was observed that the polyethylene bags in the few drums checked had small tears. It is believed that this can be eliminated by an improved loading technique which is now being followed at Mallinckrodt Chemical Works. Studies will continue at Lake Ontario as future cake shipments are received in order to find the best solution to the materials handling, radiation, and radon evolution problems involved.

Thorium and Uranium Recovery from Monazite Sand

Progress is being made on research projects at Battelle Memorial Institute dealing with the recovery of thorium and uranium from monazite sands. These are two major steps in the treatment of the monazite raw material. In the first step, the mineral is broken up and the phosphates are removed; in the second, the resultant mixture of thorium, uranium, and rare earth oxides is dissolved in nitric acid to provide a suitable solution for solvent extraction steps.

Caustic Soda Dissolution. Preliminary studies show that treatment of finely ground monazite sand with hot aqueous caustic soda represents an excellent method of breaking up the mineral. The sodium hydroxide solution is recycled; the sodium phosphate formed is removed by crystallization.

[redacted]

Exhibit 10

SECRET

This document consists of 51 pages
No. 1 of 6 copies, series A

Linde-1

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I. The operational process for one complete furnace run at the Ceramics Plant Step III building.

A. 30 cartons of brown oxide (75# each) are dumped into drums on scale at loading hood.

B. 192 trays are filled with brown oxide and leveled.

C. 192 trays are loaded onto buggies (each buggy carries 48 trays) and moved to furnace oven.

D. 192 trays are lifted from buggy and placed into furnace tubes.

E. Oven charged with hydrogen fluoride and then cooled.

F. 192 trays of green salt are removed from oven and loaded onto buggies.

G. 192 trays are dumped into hoppers at unloading hood.

H. 4 hoppers are moved from hood and transported to chain hoist to blender platform.

I. Connections are made and hoppers are lifted one at a time for weighing, let down and connections broken.

J. Connection made a second time and hoppers raised to platform. Dust removal devices are adjusted, and hopper emptied into pulverizer.

K. Small dust collector emptied into hopper. This hopper too is lifted to platform and emptied.

L. Sleeve ring unbolted from top rim of blender. Sleeve drawn up and top lid bolted in place. Blender allowed to rotate for two hours.

M. Bottom plate unbolted and removed star valve bolted in place.

N. Nineteen cans of green salt are filled on scales, roughly adjusted to 135 lbs. net; can lid and rim put in place but not bolted down.

O. Weights are finally adjusted by Weighmaster and can rims tightened with bolt and nuts.

P. Cans are green salt conveyed to storage area in Step I building for further disposition.

From the monthly production figures available it was found that each shift performed approximately 0.75 complete furnaces runs per 8½ hour work day. All data used in evaluating an employees exposure to radioactive dust has corrected to the actual production figures.

II. Major job location and breakdown, Ceramics Plant - Linde Air Products.

A. First group "A" operator - located in Recovery Room, Step III building, Ammonia room, Step II building. 1 man/shift, 3 shifts/day, total 3 men.

1. Operates recovery unit equipment such as primary and secondary condensers, absorption tower, filter presses, acid receiving tanks, conductivity cell, etc.

2. Operates ammonia refrigeration system.

3. Fill acid weigh tanks.

4. Control temperatures as specified by technical staff.

B. Second group "A" operator - same location. 1 man/shift, 3 shifts/day, total 3 men.

1. Same operation as first group "A" operator except that duration of stay in each building varies.

C. Third group "A" operator - located in Step III building. 1 man/shift, 3 shifts/day, total 3 men.

1. Opens furnace tubes in furnace oven.

2. Pulls trays from tube and loads onto buggy.

3. Loads 8 trays from buggy into tube.

4. Puts doors on tubes and fastens in place with wedges.

5. Acts as utility operator in process area.

D. Group "B" operators - located in Step III building. 3 men/shift, 3 shifts/day, total 9 men.

1. Opens 24 - 75# cartons of brown oxide per shift. Removes lid and tears paper liner.

2. Carries brown oxide cartons from storage basket to brown oxide scale.

3. Straightens out metal trays.

4. Loads trays with brown oxide and loads onto buggy.

5. Opens 12 furnace tubes of oven.

6. Pulls 72 trays green salt from oven and loads onto buggy.

7. Loads 72 trays brown oxide from buggy into tubes.

8. Puts doors on tubes and fastens in place with wedges.

9. Dumps trays of green salt from buggy into hopper at unloading hood.

10. Moves and weighs portable hopper containing green salt at pulverizer platform.

11. Makes and breaks connections placing hopper cover on hopper.

12. Pushes at green salt at pulverizer with stick forcing same down.

13. Empties dust collectors to portable hopper.

14. Removes sleeve connections from pulverizer and blender. Places lid on blender.

15. Removes lid from blender and connects green salt feed to blender.

16. Loads green salt into can and places lid on can. Does not seal.

17. Removes cans of green salt to weight adjustment area.

E. Group "C" operators - located in Step III area. 2 men/shift, 3 shifts/day total 6 men.

1. Same operations as group "B" operators.

F. Mill Wrights "A" and "C" - located Step III building, M.A. building. 2 men/shift, 3 shifts/day, total 6 men.

Do maintenance and install machinery.

G. Weighmaster - located in Step III area, M.A. building, Receiving Step I and office. 1 man/shift, 1 shift/day, total 1 man.

1. Weighs 135# cans of green salt and seals. Step III building.

2. Weighs incoming brown oxide at receiving platform step I building.

The other jobs considered in this report are the foremen, group leaders, janitors, loaders, maintenance personnel, laundry men, chemists, first aid nurse, AEC and Linde office personnel and Fire Marshall, etc. for which there are no breakdown available other than those shown on the job analysis sheets in Appendix A of this report.

III. Job Analysis Sheets - Purpose

The job analysis sheets give a detailed analysis of the operational - time relationship of each employee at the Ceramics Plant. This consists of a statement of the total time spent on a particular job with an additional breakdown as to the number of minutes and number of times each task is performed each shift.

In addition, the average alpha concentration as obtained from the sample record sheets are recorded. This average alpha concentration multiplied by the total time is depicted in the last column. The average alpha concentration per 8½ hour day is determined by deviding alpha concentration times total time by the total number of hours (minutes) per shift.

Finally assuming that the average man inhales 10 cubic meters of air per day, the daily alpha inhalation can be determined by multiplying the average alpha concentration by 10 cubic meters.

The intensity of the beta activity of the radioactive dust present was noted. However, these dusts present a minor hygienic hazard as compared with the alpha emitting dust.

Discussion

The information contained in the job analysis sheets is summerized in Table I below. It should be recognized that in evaluating the quantity of dust inhaled we estimate the relationship of any given sample to the worker's total exposure time. We have endeavored to obtain complete job analysis for all operations, but it is understood that errors in judgment and irregularities of operations are apt to introduce deviations of more or less importance. However, we are of the opinion that the data, as summerized, represent a fair estimate of the levels to which employees are exposed, and that such revisions as may be required with the accumulation of more data should not effect the order of magnitude of the results reported here.

The preferred alpha level of 70 disintegrations per minute per cubic meter ($d/m/m^3$) for alpha emitting dust is based on animal studies. To date there has been insufficient industrial experience with uranium to make it possible for us to state to what extent this level affords a margin of safety for the workers.

TABLE I - CERAMICS PLANT - LINDE AIR PRODUCTS

Occupation	No. of Employees	Approx. % of Total personnel	Multiples of the Preferred level
Foreman Step III	3	2.2	0.9
Group leader Step III	3	2.2	0.9
First "A" Operator	3	2.2	0.6
Second "A" operator	3	2.2	0.9
Third "A" operator	3	2.2	2.5
Group "B" operator	9	6.6	32.0
Group "C" operator	6	4.4	32.0
Millwrights "A" and "C"	6	4.4	0.5
Janitor Step III *	3	2.2	0.9
Weighmaster	1	0.8	0.9
Labor group foreman	1	0.8	0.5
Loaders	4	3.0	0.6
Janitor	1	0.8	0.4
Laundry man	2	1.5	0.2
Maint. Foremen & group leader	2	1.5	0.35
Electrician	3	2.2	0.35
Painters, Welders, Pipefitter	6	4.4	0.4
Time keeper	1	0.8	0.4
Tool crib attendant	3	0.8	0.2
Carpenters	2	1.5	0.08
Chemist	3	2.2	0.3
AEC & Linde office employees	45	33.0	0.09
First aid nurse	3	2.2	0.14
Guards	22	16.5	0.13
Fire marshall	1	0.8	0.14

* Air Samples used in evaluating exposures were general air samples of areas.

It is apparent from these data that 13% of the total plant personnel are exposed to hazardous concentrations of dust. These concentrations range between 2.5 and 32.0 times the preferred level of 70 $d/m/m^3$. The remaining 87% of the Linde Plant are exposed to 0.08 to .9 of the preferred level. The percent distribution of personnel by alpha dust concentration is shown in Figure I. This gives a breakdown of personnel by department with their actual multiple of the preferred level. Figure 2 shows the distribution of occupations by dust concentration levels with the number of personnel involved in each occupation.

Length of exposure is an important factor in estimating possible incidence of disease. An analysis of plant personnel records reveals that seventeen men have been exposed to levels of 32 times the present maximum permissable level of alpha emitting dusts for about five years.

It was found that when a tolerance concentration of alpha was present, the beta concentration was never more than 0.001 times tolerance (40,000 beta disint/m/m^3).

For this reason it is felt that exposure to beta emitting dusts is of negligable consequence compared to any concomitant alpha dust exposure.

One operation performed by groups "B" and "C" employees has not been included in the exposure evaluation of these employees. In this operation the employee carries 2 - 75# cartons of brown oxide and dumps their contents into a barrel located in the brown loading hood. A visual observation of operations during the time of sampling did not reveal any air concentrations which could conceivably be interpreted at the levels which were found. Excluding these samples, groups "B" and "C" employees receive concentrations of 32 times the preferred alpha level for an 8½ hour day. With this operation included, the same group receives an exposure of 106 times the preferred level during the same time.

SECRET

Exhibit 11

HEALTH HAZARDS IN NYOO FACILITIES PRODUCING AND PROCESSING URANIUM

(A Status Report - April 1, 1949)

RESTRICTED DATA

This [illegible] contains restricted data as defined in the Atomic Energy Act of 1946. Copy No. 1 of 7 copies. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited.

Medical Division
New York Operations Office
U. S. Atomic Energy Commission

Issued April 18, 1949

Special Rereview
Final Determination
Unclassified
By: K. A. Walter
Date: Aug. 6, 1980
T. F. Davis

CLASSIFICATION CANCELLED
DATE 12/10/71
For The Atomic Energy Commission
J. H. Kahn/cmh
Chief, Declassification Branch
DIVISION OF CLASSIFICATION

SECRET

volatilizes leaving behind an "ash" having 0.1% of the original mass, but containing practically all of the UX_1-UX_2. This residue thus has a beta activity of approximately 1 millicurie per gram. A serious beta hazard arises out of the fact that in a typical day, 2500 grams of this ash containing 2.5 curies of UX_1-UX_2 are produced from the process.

A similar separation occurs in the processes at Mallinckrodt Chemical Works Plant 4 and Electro Metallurgical Company. In these plants, uranium metal, with UX_1-UX_2 in approximate equilibrium is purified by vacuum recasting at a temperature which volatilizes various impurities in the metal, including the UX_1-UX_2. These impurities condense on the cooler surfaces of the furnace interior and this deposit is the source of intense beta exposure during charging, discharging, cleaning and repair of the furnaces.

3. Radioactive Dust

The occupational exposure to alpha emitting dust appears to be the most serious potential medical problem presented by the operation of these plants. Most of the process steps are inherently dusty because dry, finely divided uranium compounds are handled in large quantities and there has been, in general, little or no mechanical handling designed into the processes.

LINDE AIR PRODUCTS

In this plant, which employs 65 men in the process area, there is low level exposure to beta radiation and a moderately severe uranium dust exposure. The plant process is described in Appendix I.

Exposure Data

Beta Radiation. The weekly film badge exposures at this plant are summarized in Figure 12. It will be noted that except for one badge, none were over 300 mrep/wk and most of the badges in this plant are consistently less than 50 mrep/wk. The whole body exposure to radiation in this plant is considered to be satisfactory.

Uranium Dust. This plant has been surveyed by the Industrial Hygiene Section and the findings are given in Figure 13. Fifteen employees are shown to be exposed to 33 times the preferred level of 70 alpha d/m per cubic meter of air. This dust is dispersed in operations such as the transfer of brown oxide to weighing drums, scooping the oxide onto trays, transfer of the trays to and from the green salt reactor, and other manual operations involving powdered uranium compounds. Recommendations giving means for reducing the dust concentrations have been submitted to the Production Division but uncertainties as to the future of this plant make it doubtful that any major plant improvements will be made. Minor changes are being made in the process area as a result of the recommendations. Although no definitive figures are available, the few results received to date indicate some improvement. It is expected that in 18 months or less this plant will be shut down and maintained in a stand-by condition. We have discussed with the Production Division the policy

question of whether sufficient changes should be made in facilities which are to be in stand-by status so that satisfactory standards of plant hygiene can be achieved if and when operations are resumed. No conclusion has been reached on this question.

THIS DOCUMENT CONSISTS OF [illegible]
NO. 1 OF 5 COPIES, SERIES A.

Exhibit 12

THE LINDE AIR PRODUCTS COMPANY
UNIT OF UNION CARBIDE AND CARBON CORPORATION
UCC
CERAMICS PLANT
POST OFFICE BOX 95
KENMORE 17, NEW YORK

July 13, 1948

U. S. Atomic Energy Commission
Office of the New York Directed Operations
P. O. Box 30, Ansonia Station
New York 23, New York

NYO FILE NO. 70 Hawk

Attention: Mr. F. M. Belmore

Gentlemen:

Reference is made to your letter of June 29 and the report attached thereto on the subject of dust hazards in the Ceramics Plant.

The writer agrees that the results of air samples taken in the Step III area around the brown oxide dumping operation and the hopper dumping and pulverizing operation indicate an extremely high concentration of radioactive material. When these results were passed along to our Mr. Heatherton a month ago, it was realized that immediate steps to improve the situation in these areas should be taken.

The writer is pleased to report that as a consequence of revisions recently made to the dust collecting equipment around the hopper dumping and pulverizing operation, the air contamination in this area has shown readings as low as 311 alpha dis/min/cubic meter. This is a considerable improvement over the readings taken in May which reached as high as 22,000 alpha dis/min/cubic meter from the same area.

In connection with the brown oxide dumping operation, it has been determined that conditions could be improved by placing the scales and hopper receiving the brown oxide under the hood at a point between the two tray loading tables. This work was completed during the shutdown of last week. The results of the change on air contamination should be available at an early date.

Mr. R. C. Heatherton, Health Physicist of the Ceramics Plant, is closely following this problem.

TO FILE
AUG 20 1948

SPECIAL REREVIEW
FINAL DETERMINATION
UNCLASSIFIED
By: KA Walter
Date: 9/30/80
Ted Davis 9/29/80

Very truly yours,

THE LINDE AIR PRODUCTS COMPANY
CERAMICS PLANT

E. C. Kent

Superintendent

E.C.Kent:jag

SECRET

E-14759

UNITED STATES ATOMIC ENERGY COMMISSION

NYO-4600

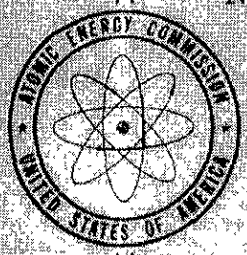
DECONTAMINATION OF BUILDINGS USED FOR PROCESSING ALPHA EMITTERS

By
Paul B. Klevin
William B. Harris
Hanson I. Blatz

Exhibit 13

April 29, 1954

New York Operations Office, AEC



Technical Information Service, Oak Ridge, Tennessee

Encl-3

3. Decontamination operations such as sandblasting, vacuum cleaning, pneumatic jack hammering, should be performed with extreme care. Dust protective respirators should be worn by operators during all dry cleaning operations to prevent the operator's exposure to excessive radioactive airborne dust concentrations. Work clothing, gloves, etc., should be specially issued, laundered or even burned after use to prevent spread of airborne radioactive contamination.

SECTION C

I [redacted] worked for Linde, a branch of Union Carbide which changed to Praxair Inc. in 1989. I was in the position of [redacted] for 25 years. Before the year 1993 I was contacted by phone to pick up more boxes from Bldg 10, and take off of property to Kenmore Mercy Hospital incinator to be burned. I donot know who called me, or if the missage was on my answer machine. So I sent a general service man to pick up the boxes and deliver to a man on dock of Kenmore Mercy. This happened more then once! on different intervals

[redacted]

3/13/08

3/13/08

NICHOLAS WILLIAM BOUCOUNIS
Notary Public, State of New York
My Commission Expires Jan. 7, 2012

March 13, 2008

To whom it may concern:

I [redacted] worked as a [redacted] in Bldg. #14 Tonawanda Laboratory. This was at that time the Silicone Proving Lab department from 1953 through 1957. This Bldg. #14 and its entire infrastructure were loaded with dust and debris left over from the Manhattan Project. This dust & debris was on every piece of equipment and infrastructure I touched while fastening and installing piping.

The Utility tunnel running under ground the entire length of the Tonawamda property (Linde Site). This tunnel required a PM program of a walk through inspection weekly. Two maintenance personnel were required to perform this inspection and report any problems. One Job assignment I had was removing rusted steel un-strut and replaces them with stainless steel en-struts. These supports keep all the steam, condensate lines, electrical conduit lines, and other utility piping. Away and above the ground surface water that filtered into the Utility tunnel on its way to the various sump pumps pits.

Bldg. #30 some time in the 1970 or 1980 as a maintenance foreman my crew or Millwrights and maintenance mechanics had an assignment to remove four (4) gravity ventilators from the roof of Bldg. #30. With the assistance of the Rigging Dept. we moved them to Bldg. #53 tank car assembly building. There I was instructed by the safety engineers to have my maintenance personnel to scrape off the green paint and expose the metal underneath. Then a technician was called from Bldg. #52 by the name of [redacted] to take readings with his Geiger counter of the paint chips and the exposed metal of the ventilators. He got some readings as I recall but I and m Maintenance personnel were never informed what those readings were.

Bldg. #38 during the Blizzard of 1976 a fire main supplying water to the sprinkler system was fractured when a window was blown out from the strong and sub-zero cold. This fractured water main strayed water all over and all the dust and debris was sprayed all over the personnel including me the Forman who was directing the maintenance personnel.

As a Millwright in the 1967 thru 1974 on a least six (6) occasions my assignments were to replace or rotate the shear blades on the 25# ton Niagara shear located in the bar stock area of Bldg. #30.After the shear blades were replace or rotated and operator would test the shear to make sure the blades were aligned orrectly. When the shear was tested and cut large flat steel sheets of various thicknesses. The hammering and down ward thrust of the shear would cause vibrations through out the Bldg. and this would cause dust and debris to come raining down from overhead.

Bldg. #31 was the same as al the other Bldg .loaded with dust and debris just waiting to come raining down on all the personnel who were assigned to work there as maintenance of chemical operators.

None of these buildings has lunch rooms or bread rooms so all the personnel took lunch and breaks on the job site. There was a cafeteria located in Bldg #1.This was a good ten minutes away from most job sites and with only a 30 minute lunch so most every body took there breads on the job.

When we asked Safety engineers about how dangerous it was to work in the various building were uranium was refined was there any danger from radiation. One

Engineer told me not to be concerned we would get more exposure from radiation from the radium on the luminous dial of a wrist watch.
Another Safety Engineer told me the remedial clean up took care of any radiation left over from the Manhattan Project. Later on in my career I asked another Safety Engineer in his office about any radiation danger he then pointed to some technical manuals located on a shelf behind his desk and said I should read all the information printed in these manuals. I am not familial with all the techicinal jargon and I could not understand much of the printed information or was he about to clarify this information. We were all left in the dark and continued to work in the contaminated waste dump with very little protection if any and keep in the dark until personnel started to come down with various Cancers and other problems.

[redacted]

On the 13th of March, 2008
[redacted]
personally appeared before me to sign this document

RUDOLPH A. DeMARCO, JR.
Notary Public, State of New York
Reg. No. 01DE6135080
My Commission Expires Oct. 11, 2009

Rudolph A DeMarco

[redacted]

March 18, 2008

To Whom It May Concern

My name is [redacted] and I worked at the Linde Plant from 1952 To 1991. During this period and especially during the late 1950 and 1960's, I was assigned and worked pre-dominately in building #30.

During this time frame I drove Tow motors and used hand lift trucks To move skids and materials from one end of the building To the other end. I also was an inspector thruout the entire re-mediation removation period (1962 - 1970).

Many confusing explanations were attached To the Telmonology of renovating or remediating this building. What we actually were doing was remediation duties to this contaminated building without knowledge of there being residual harmful contamination present from the Manhatten Project. While this remediation was continuously going on the dust from the upper flooring was being blown down To the floor below. This constant airborn dust would get into the soup, coffee and drinks of all of us em-plogees who ate lunch at our work stations in building #30. the reason we ate lunch at our work areas was because there was no cafeteria in this building.

No one from the Company ever informed us That the residue from the Constant jack hammering of the floors (To Remove and Replace Machinery) and overhead dust was contaminated. We were not told this could be a safety problem or instructed to use proper safety equipment.

Building #30 was a building where the uranium ore and other materials were processed and shipped to the

(II)

Mallenarout Co., refined and shipped back.
I was diagnosed with one of the cancers associated with uranium contamination (Bladder Cancer) in 1989 and 1991 on 2 seperate occassions and have currently been denied compensation because I did not reach the 50% rule. (my contested estimate is 46%)

[redacted]

2-18-08

[redacted]

Notary Public, State Of New York
No. [redacted]
Qualified In Erie County
Commission Expires Feb. 18, [redacted]

My name is [redacted] and I worked at Linde from [redacted] 1951 to [redacted] 1952 ; [redacted] 1954 to [redacted] 1955 and from [redacted] /1955 to [redacted] /1992. I was diagnosed with bladder cancer [redacted] 04.

I requested my medical records from [redacted] [Linde] and all I received was notices to my foreman that I had taken a physical. There were no results of any of my physicals.

Prior to going into the service I worked as an inventory clerk and a lift truck operator which took me into bldg. 30 and other bldgs on the property.

Upon returning to Linde from the military service I was afforded a job as a material handler along with [redacted] who also had returned from the service. There had been a layoff and as a result we were afforded this position. This was in bldg 30 also known as the truck shop. Our job was to issue parts for trucks as requested by fabricators and mechanics. We were stationed in a wire enclosed area. Above our area was a large heater unit, and when it was turned on [heat in winter and cool in summer] the dust would fly out of it covering us and the material. All this dust had to be cleaned up. When there was a loud noise or when a fabricator using an overhead crane hit the crane stops, again the dust from the rafters would rain down on us. We had to eat our lunch in these conditions. During this time they were installing more overhead cranes. As they were installed more dust was knocked down on the workers and they complained about all the dust

As A point of interest, [redacted] has been diagnosed with lung cancer and had one lung removed.

Also there have been 8 people that I know of that have been diagnosed with bladder cancer that worked in bldg. 30. Two or more have passed away from it.

I then went to lift truck operator and was stationed in bldg. 30. I also assisted the store keepers with material issues there.

At one time there were people in bldg. 30 wearing disposable coveralls and carrying Geiger counters. When asked if they found anything they ignored the question.

I then went into the rigging dept. where I worked as a lift truck operator, Rigger B, Rigger A, and crane operator. In these positions I worked in all the

bldgs. On the Linde property, including blgds. 30 and 14.

As a lift truck operator one job comes to mind in particular. It was in bldg 30. There was a room in back of 30 where they stored African Uranium ore during the Mahattan Project. The walls of this room were about a foot to a foot and a half thick made of cement. It took a special torch to cut them up. A maintance man cut them up and as he cut them up, dust filled the area we were in. We were not given any protective clothing or equipment. So the dust went with us wherever we went including home. The blocks were lifted out by a rigging crew and placed on the forks of my lift truck. I took them to yard 70, a storage area. This job took us considerable length of time to complete. We were exposed to radiation dust, which we unaware of.

As a rigger when I worked in bldg 14, we had to move large tanks aroud inside the bldg.. We had to climb on top of the tanks to hook up the chains and cables and came in contact with and breathed the dust on top. Some of these tanks we laid down and transported them to an outside storage area. When we tipped them over the dust flew all over.

I loaded and unloaded the annealing furnace numerous times. The furnace along with bldgs. 38, 31, 6, 14, 19, 30 were contaminated and have since been dismantled and sent out for decontamination. I worked in everyone of these bldgs.

At one time during my time at Linde, I was laid off as a rigger and went to the maintenance dept., where I was a trades helper. In this capacity I was a pipe fitters helper, working with [redacted] and I were assigned the job of removing piping from a tunnel which ran from the lab. To the power house. [a very unpleasant job]. This tunnel also ran along side of bldg. 14. The tunnel was very damp. We had to cut some of the piping out with a torch, blowing dust and water all over us. We had to carry these pipes by hand outside and replace them with new ones. We were on this job a long time.

This tunnel has since been dug up and replaced by the Corp. of Engineers, because of high readings of radioactivity.

After that I was recalled to the rigging dept.. In this capacity of rigger and crane operator ,I worked in yard 70 which was a storage area for plates of steel and aluminum. We would work in this area loading and unloading trucks plus moving the plates around the area onto support blocks. This area has also been declared as showing high levels of radiation. A couple of feet deep has been dug up and sent for decontamination.

Then I went into the fabrication shop as a utility man. My job was to work on press brakes and punch presses, metal cutting shears, etc.. In this capacity I worked with material from bldg 30 and yard 70.

I was then promoted to foreman where I stayed until I retired in 1992.

Having worked in these various positions and areas for all those years and I was never told that I was in dangerous areas that could affect my health in the future. I never questioned my job assignments or sites.

Respectfully

[redacted]

KRISTEN M. McDONOUGH
No. 01MC6135115
Notary Public, State of New York
Qualified in Erie County
My Commission Expires 10/11/2009

Burlap Bag Issue

I, [redacted], was hired by Linde Air Products Co. on [redacted] 1951. I was hired as an [redacted]. I was assigned to work with [redacted]. In performance of our duties we had to go to Building 30 (Ceramic Building). We did our job and on the way out of the building we stopped by the coffee machine to get a cup of coffee & took it to a set down area. We set our coffee on top of 2 pallets of what I thought were sand bags. [redacted] told me these weren't sand bags but bags of ore left over from the Manhatten Project. I asked [redacted] what they did with the bags. He told me they were dumped into a mixer and mixed up until it looked like a wet cement. Al did not know where the process went from there. We then went back to our desks in Building 2.

I went into the Army in July of 1952. I came back to Linde in 1954. When I got back Building 30 was remodeled into a state of the art shipping department & receiving department as well as a stock room and warehouse.

I retired in 1993. The above statement is true and accurate to the best of my knowledge.

[redacted]

On the 13th of March, 2008 [redacted] appeared personally before me and signed this document

RUDOLPH A. DeMARCO, JR.
Notary Public, State of New York
Reg. No. 01DE6135080
My Commission Expires Oct. 11, 2009

Rudolph A. DeMarco Jr.

The Linde Company had a unique type of seniority system for the hourly work force. This seniority system was a negotiated procedure applied to layoffs & recalls for the 25 years I worked there from 1953-1978. In 1981 I became this Local's International Representative and the layoff-recall seniority remained unchanged till the hourly work force was eliminated in 1998. This system was originally implemented to avoid layoffs during slow or slack periods that frequently occurred in certain areas of the plant.

Employees were moved around (bumped or transferred) to various jobs in Buildings 14, 30, 31, 37 & 38. In those instances employees were assigned to those areas temporarily & did all types of work. Even when employees held specific job titles or classifications (eg. Storeman, Chemical Operator, Welder, Fabricator or Rigger) they could be assigned to do other work beyond what his classification called for.

Around 1960 when I was assigned to Building #30 as a Storeman/Keeper, myself,

and other employees working in this building moved occasionally go upstairs to the second landing where there was a room which had bags (burlap) lying on a skid. We placed pieces of 3 inch bar stock under these empty burlap bags to use for weight lifting during slack time. Eventually during the renovation (remediation) period sometime in the mid 60's ~~these~~ this pile of bags & other debris were removed from this upper landing.

During the 25 years I worked there many confusing explanations were offered involving the terminology of renovation versus remediation. It is a proven fact all hourly employees, especially those using motorized equipment like lift trucks, tow motors, high lift tow motors, hand trucks etc. were actually during the renovations of Building 30 & 31, performing remediation duties in all these contaminated buildings, without knowledge of these being residual harmful contamination always present from the Manhattan Project.

[redacted]

PAMELA M. ITALIA
Notary Public, State of New York
Qualified in Erie County
My Commission Expires 3/20/11

I met [redacted] in 1962 when he started at the Linde Company as a janitor, in the janitorial department. One of his primary duties was to [redacted] area, which was utilized by all the [redacted] employees who worked in and around Building #30. This restroom was exclusively used by truck drivers, Building 30 employees riggers + subcontractors. It became filthy during the course of any day. The floor itself was in bad shape because of broken tile was littered with debris, cigarette butts, toilet paper, lunch wrapers etc. [redacted] function was to sweep, mop + sanitize this large toilet facility on more than one occasion daily.

During this period from around 1962-1968 the Company was also completely renovating or again remediating this entire building. This remediation included tearing down the upper landing gratings, scaffoldings + wooden blocking on the upper tier. The dust from above was not vacuumed but brushed off the old framework + equipment for eventual painting.

In the 1966-1967 time frame [redacted] was assigned as the only Maintainence trades

helper to jack hammer the concrete floor in order to remove + then move certain large machines (shear +, cut off saws + a torch machine) to another location in the bar stock area about 15 feet from the original area. I personally observed him doing all of the jack hammering + removing of the concrete + dirt from this excavation.

The dust the jack hammering created was compounded by the black dust, continuously falling from the work being done elsewhere + overhead. This dust landed on lunches, in coffee + soups of the employees working below, like [redacted]

This bar stock area, along with the men's restroom area were later designated + identified as being highly contaminated with radiation residue. [redacted] worked this assignment for about 4-6 months until the new machines were installed.

No one had any knowledge of this contamination because the Company took no air samples or conducted any tests on exposure levels, nor did they instruct employees to use any safety equipment or take any safety precautions. They acted like it was a normal business as usual type renovation process.

Respectfully submitted,

[redacted]

PAMELA M. ITALIA
Notary Public, State of New York
Qualified in Erie County
My Commission Expires 3/22/14

I am [redacted] and started working at Linde Tonawanda [redacted] 1951 as a chemical operator in Building 14, assigned to work in various operations through out the building, this building was also known as the "Pruning hub" because of the many diffrent process going on. On may occasions we would experience eruptions + explosions the would rock the building, sending dust, debris + noxious fumes through out the building. On many occasions I was assigned to take 55 gallon drums of material to open pits on the Linde property and dump there contoniers into these pits we refered to these as "lime lake". Some of the times the drums were opened up to let the materials pour out and some time the entire drum was thrown in. There was a storage area out side of building 29T on the property were these drums were stored bfore being loaded on a truck to be dumped on the propety or removed off the property. The contractor was [redacted] and his son Steve. I worked on the back of his dump truck for a few months but never left the propety with him. This assignment for me was called a "yard man" my chemical operator job was eliminated. [redacted]

SWORN TO BEFORE ME THIS 18 DAY OF March 2008

Nancy Lagattuta

NANCY LAGATTUTA
#01LA6017128
Notary Public, State of New York
Qualified in Erie County
My Commission Expires 12/07/2010

3/18/08

In building 14 we had a lunch room that was used by every one due to the fact that it was one of the few on the property, and on a daily bases many of the workes ate their lunches and took their breaks especially during in clement weather. There was smoking in most areas of the building except in the lunch room.

One addition to the barrel dumping, there were some made of stainless steel, quite heavy and with stainless steel rims around the girth of the drum. My fellow employee, [redacted] and I always had the feeling that these drums and the materials were toxic, and maybe dumping was not the thing we should be doing.

I was diagnosed with Prostate Cancer in August 1994 and operated on in April of 1995. I am now a patient at Roswell Park Cancer Institute having been diagnosed with polycythemia vera in November 2006 a Myeloproliferative disorder of the blood with no known cure and that only a chemo therapy drug and will do so for the rest of my life.

[redacted] 3/18/08

NANCY LAGATTUTA
#01LA6017128
Notary Public, State of New York
Qualified in Erie County
My Commission Expires 12/07/2010

SWORN TO AND SUBSCRIBED BEFORE ME THIS 18 DAY OF March 2008 Nancy Lagattuta