40-7708

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November 5, 1996

Mr. Clayton L. Pittiglio, Project Manager
Nuclear Regulatory Commission TWF7F27
11545 Rockville Pike
Rockville, Maryland 20852-2738
Tel. 301-504-3438

Subject: Response to NRC Comments on the Closure Plan for the Elkem Metals Building 78 SDMP site at Elkem Metals Company, Marietta, Ohio

Dear Mr. Pittiglio:

Enclosed are the responses of Union Carbide to comments provided by the Nuclear Regulatory Commission (NRC). The NRC comments were dated August 27, 1996 and received on September 10, 1996.

Additionally, please note a change in personnel and in the point of contact for the site. I have replaced Ernest Kendall as Program Manager for the site. Please direct future correspondence and telephone calls to my attention. It would be helpful if you would copy Sean Norris, of Norris Environmental, on all correspondence.

After your review of the enclosed responses to your questions, a telephone call would be helpful to plan the completion of the draft report in an expedient manner. Hopefully, we will be able to make the changes indicated in the attachment and complete the report. I can be reached at (304)747-5326. My Fax number is (304)747-3680. A directory of the personnel involved in this project has been prepared and is attached for your reference.

Very truly yours,

S. G. Gilbert, P.E.
Program Manager

SGG:dvc
enclosure: Response to Comments
cc: Ms. Donna Moser (NRC)
Mr. Richard Melvin, Elkem Metals
Mr. Sean Norris, Norris Environmental
Mr. Frank Talbot, Ohio Department of Health
Mr. John House, NRC Region III

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Response to NRC 8/17/96 comments on Closure Plan.

GENERAL COMMENTS

1.0 How were background values determined, particularly for the roof and structural surface areas? Why do the data tables in the Appendix of the Final Status Report show multiple background values? It is unclear why the beta backgrounds range from approximately 200 cpm to over 1110 cpm.

The multiple background values for surface measurements in and on Building 78 were derived from daily instrument source checks. Each day, the operation of the survey instruments was checked to see that they were operating properly by conducting source checks. The source checks were performed in a clean location in the field office trailer away from the influence of radioactivity from Building 78. The method included collecting a 5 minute instrument background on a piece of cardboard with little or no activity. A 1 minute daily instrument background was then calculated from the 5 minute count. A radioactive check source was then placed under the detector and a 1 minute source check measurement was collected. The daily instrument efficiency was then calculated and compared to the calibration efficiency to determine if the instrument was operating within the acceptable range as established in the QAPP. The daily instrument background from above changed each day. The tables represent data which was generated over many days during verification surveys. The daily instrument background is the value stated in the data tables. Data generated each day had a different daily instrument background.

No site/material specific background survey was conducted to establish values for building surfaces and structural materials. By using the daily instrument background values to determine the net surface activity, a more conservative net activity level results. Surface background surveys, had they been conducted, would have resulted in a higher background value, and a lower net activity. Using a daily instrument background results in a different value each day for each instrument. The multiple background values shown in the data tables in the Appendix of the Final Status Report are a result of using a daily instrument background for calculations.

The wide range of beta backgrounds reported in the data tables is the result of using two sizes of detectors. Detectors of the same size had similar background values which remained nearly constant from day to day. Values for background for different instrument/detector geometries will vary with the size of the detector. As the building structure and materials presented a variety of measurable areas, for example entire floors versus narrow structural materials, both large area detectors (425 cm^2) and small area detectors (126 cm^2) were used to collect surface verification measurements. The size or active area of a detector will directly effect the background of that detector. The large area detectors measure background over an area 4 times larger than that of a small area detector, so it should be expected that the background of the large area detector would be 4 times that of the small area detector.

2.0 Please illustrate the data conversion process for all survey data. Attempts to recalculate, for example, the beta high dpm/100 cm^2 from the beta maximum cpm have not resulted in values equivalent to those reported in the Final Status Report.

The equation used to convert direct field measurements from cpm to dpm/100 cm^2 is as follows:

$$\frac{total - background}{efficiency * \frac{area}{100cm^2}} = \frac{net}{efficiency * \frac{area}{100cm^2}} = dpm / 100cm^2$$

Where:

total	= total direct field measurement (cpm) i.e.: beta max.
background	= background measurement (cpm)
efficiency	= instrument efficiency
area	= area of detector
net	= *total - background*
dpm	= disintegrations per minute

One common error in the conversion process is a failure to account for the geometry of the detector, which is expressed above as *area*/100 cm^2. As discussed above in response to General Comment 1.0, different sized detectors were used depending on the surface area to be measured.

An example of the calculations for the beta high dpm/100 cm^2 from the beta maximum cpm for two areas using large and small detector are as follows:

Large area detector, Floor grid B1:

$$\frac{1768dpm/100cm^2 - 934dpm/100cm^2}{0.30 * \frac{425}{100cm^2}} = \frac{834dpm/100cm^2}{0.30 * 4.25} = 654dpm/100cm^2$$

Small area detector, South wall grid I-2:

$$\frac{590dpm/100cm^2 - 293dpm/100cm^2}{0.35 * \frac{100}{100cm^2}} = \frac{297dpm/100cm^2}{0.35} = 849dpm/100cm^2$$

SPECIFIC COMMENTS

Building Floor

3.0 Page 11, Section 4.2, "Building Floor": The verification survey to be conducted on grid Q12 after remediation should include scan surveys of the area surrounding the Q12 grid area to ensure against cross contamination.

It is common practice when conducting remedial activities to scan the surrounding areas prior to, during and following the remediation efforts to prevent potential cross-contamination of surrounding areas from occurring. The specific declaration of this practice was inadvertently omitted from the discussion of the building floor as referenced above. Page 11, Section 4.2, Building Floor, paragraph 1, will be changed to read as follows:

"The building floor at grid Q12 exhibits a small area less than 1 square meter in total surface, which exceeds the release criteria for total surface contamination. To eliminate this issue, a small containment will be set up and the surface of the concrete floor will be treated to remove the contamination. Verification survey of grid Q12 and a surface wipe sample will be conducted to demonstrate the removal of the contaminants and this data will then be substituted into the Final Status Report verification data for the Q12 grid following statistical evaluation. The 1 m^2 areas surrounding grid Q12 will be scanned to insure no cross contamination occurs due to the remedial activity."

It should be noted that a dose assessment based on a building occupancy scenario, established in NUREG/CR-5512 "Residual Radioactive Contamination from Decommissioning, Technical Basis for Translating Contamination Levels to Annual Dose. Draft Report for Comment." (US NRC, Jan. 1990), for the floor grid area Q12, results in a acceptable TEDE of 4.3 mrem. Any further remedial actions are directed at reducing areas of concern of residual radioactivity.

Primary Roof

4.0 Page 12, Section 4.4, "Primary Roof": Surface scans and total and removable measurements, as described in NUREG/CR-5849 for unaffected structural areas, should be conducted for those areas of the roof classified as unaffected. As discussed during the teleconference on August 27, 1996, previous characterization data does not adequately serve as final survey data for the unaffected areas of the roof.

The data for characterization of the primary roof was adequate to describe the affected and unaffected areas of the roof. However, as the instrumentation used does not satisfy the guidance criteria for minimum detectable activity for final survey data, the unaffected area of the primary roof will be resurveyed using more sensitive instrumentation to

generate acceptable data for release. Page 12, Section 4.4, Primary Roof will be changed to read as follows:

"The data for the affected area on the primary roof will be reevaluated. The existing verification data for the primary roof was not collected in accordance with the 1 meter by 1 meter grid. The affected area will be revisited and additional surface verification surveys will be conducted on the 1 meter by 1 meter grid system established on the roof. The affected area on the primary roof will be resurveyed to evaluate the affected area and to assure the roof meets the release criteria. This data will be incorporated into the Final Status Report for the primary roof following statistical evaluation along with the discussion of the primary roof characterization data.

The unaffected area of the primary roof will be surveyed at 30 randomly selected measurement locations, as described in NUREG/CR-5849 for unaffected structural areas. A reference grid system (based on 1 m X 1 m roof grid spacing) will be established across the surface of the primary roof to locate unaffected area survey points. Surveys will include scans for total alpha and total beta activity less site background. Removable swipe samples will be collected at each location, and analyzed only if the total alpha surface activity exceeds the removable limits of 200 dpm/100 cm^2."

5.0 Page 12, Section 4.4, "Primary Roof": The computer dose modeling code RESRAD 5.61 does not evaluate dose exposures from building/roof scenarios. Please provide the assumptions to be used in the dose assessment, if intended to be used.

The proper dose modeling for residual radioactive contamination inside (or on) buildings and soil contamination are discussed in NUREG/CR-5512 "Residual Radioactive Contamination from Decommissioning, Technical Basis for Translating Contamination Levels to Annual Dose. Draft Report for Comment." US NRC, Jan. 1990. This dose model was suggested by Mr. David Fauver, NRC, during the teleconference on August 27, 1996, and is the appropriate model to evaluate dose exposures for this site for building/structures and equipment, including all surface contamination (alpha and beta) areas. The following paragraphs and assumptions will be inserted after paragraph 2, Page 12, Section 4.4, Primary Roof:

"If the resurvey of the affected area indicates surface contamination above the release criteria, a dose assessment based on NUREG/CR-5512 will be used to evaluate if further remediation is warranted. The assumptions to be used for the dose assessment are based on a Building Occupancy (Surface Activity) Scenario as the residual radioactivity would be associated with a surface or thin-layer surface source. The scenario considers chronic exposure to an individual for 2000 h/yr., in a commercial facility and include external exposure from surface sources, inhalation and ingestion of the removable contamination. Table 3.2, 'Annual Total Effective Dose Equivalent Factors for the Building Occupancy (Surface Activity) Scenario', NUREG/CR-5512, gives a TEDE conversion factor for Th-nat of 3.7E-3 mrem/dpm/100 cm^2. This conversion factor, when multiplied by the surface activity average (Th-nat) dpm/100 cm^2, results in an associated TEDE for the primary roof of Building 78. Upon completion of the resurvey of the affected area on the

primary roof, if the data indicates any areas which exceed the release criteria, a dose assessment will be calculated using the following:

$$TEDE, mrem = (C, dpm/100\ cm^2)(H_{E,50})$$

where:

TEDE = total effective dose equivalent, mrem
C = average beta (Th-nat) dpm/100 cm^2
$H_{E,50}$ = 3.7×10^{-3} mrem/dpm/100 cm^2 = total effective dose equivalent conversion factor"

This scenario has previously been used for the primary roof affected area as presented on page 6-9 of the Final Status Report for Elkem Metals Building 78 SDMP Site at Elkem Metals Company, Marietta, Ohio (Norris, 1995). The results presented in the report for a dose assessment on the primary roof were based on the highest reported 1 m^2 average beta concentration of 1361 dpm/100 cm^2. The assessment was performed for natural thorium and decay products and assumed that the contamination measured (1361 dpm/100 cm^2) would be totally removable. The actual concentrations were 1361 dpm/cm^2 direct, with 0 dpm/100 cm^2 removable. The associated dose for the primary roof was reported as:

$$TEDE, mrem = (C, dpm/100\ cm^2)(H_{E,50}) = 5.0\ mrem$$

where:

TEDE = total effective dose equivalent, mrem
C = 1361 dpm/100 cm^2 average beta (Th-nat)
$H_{E,50}$ = 3.7×10^{-3} mrem/dpm/100 cm^2 = total effective dose equivalent conversion factor

This assessment was conducted on the worst case 1 m^2 average beta on the primary roof. The draft guidance proposes an objective TEDE of 3 mrem, and a maximum of 15 mrem. The 5 mrem TEDE for the roof of is one third of the proposed maximum. Furthermore, this scenario is very conservative as it assumes a worker will spend 2000 hours per year on the roof which is not a normal occupancy area.

Open Land

6.0 Page 15, Section 4.6, "Open Land": Please provide correlation data that illustrates the relation between contact instrument estimates of soil concentration and the analytical results of soil samples for actual soil concentration.

A correlation between contact instrument readings (soil concentration estimates) and analytical results was proposed to allow composite samples to reduce analytical costs for the project. While contact instrument readings are an effective estimate of the soil concentrations on the site, the wide range of soil concentrations for radium, thorium and potassium have resulted in a poor correlation between estimates and analyses. Page 15, Section 4.6, "Open Land" of the Closure Plan will be revised to read as follows:

"The affected area around the concrete ore pad has several areas of soil remediation which have previously been sampled and surveyed for verification. To facilitate a stronger statistical basis for release of the site, the underrepresented areas around the excavations will be sampled and surveyed for verification. A 10m X 10m grid system will be established across the affected area around the concrete ore pad and surrounding soils as depicted in Figure 5. The grid will be further divided into 5m by 5m quadrant blocks. Quadrant blocks which do not currently exhibit a verification soil sample will be sampled and surveyed. Any quadrant block which has one or more samples already representing the block will not be sampled again. If a quadrant block exhibits two or more samples, those samples will be averaged to represent the soil concentration within the quadrant. A 100 % gamma scan of each affected 100 m^2 grid block will be conducted. Contact and 1-meter gamma radiation measurements will be made at locations equidistant between the center and each of the four corners of each of the remaining 10m X 10m grid blocks resulting in one sample per quadrant. Systematic soil samples will be collected at the same points (four per 10 meter grid block) in the affected area. Soil sample analyses for verification samples will consist of isotopic thorium (Th-228, Th-230, Th-232) and radium-226.

The data for each sample will be evaluated along with the existing verification soil samples to determine if the average for each 10m X 10m grid block meets the release criteria. The data will be further evaluated to assure that the upper bound of the 95% confidence interval for each grid meets the release criteria."

7.0 Page 16, Section 4.6, "Open Land": Survey units, not grid units, should be statistically evaluated to demonstrate that the activity within a survey unit satisfies the 95% confidence level. The activity of each individual measurement should be evaluated to ensure that the averaging criteria in NUREG/CR-5849 are satisfied. Please provide procedures for demonstrating that averaging criteria are met.

The terms 'survey units' and 'grid blocks' are essentially synonymous with respect to open land. For example, NUREG/CR-5849, Section 2.2, "Soil Activity" Page 2.3 states, "For your (sic) land areas, averaging is based on a 100 m^2 (10 m X 10 m) grid area.". Section 4.2.2, "Establishing Reference Grid Systems" Page 4.12 states "... survey units may combine contiguous rooms or land areas having the same potential contamination classification. The size of a survey unit should be chosen to assure that the total number of data points and/or the spacing (frequency) of measurement/sampling satisfy the requirements of Section 4.2.3." Section 4.2.3 "Open Land Areas", "Affected Areas", states that "Areas of suspected elevated activity, ... are evaluated by sampling and analyses ... and results are compared with criteria (see Sections 2.2 and 8.5)", and that "systematic soil sampling of each affected area grid block is performed". Section 8.5 "Comparison With Guideline Values" Page 8.7, • soil, discusses the calculations used to compare the residual activity with the release criteria, and states "... the average activity in the 100 m^2 contiguous area containing the region of elevated is then determined to assure that it is within the guideline value." (sic).

While all of these references lead the reader to the conclusion that a survey unit for outdoor areas is a 10 m X 10 m grid block area, we understand Mr. Fauver's suggestion that the survey units for soils be expanded to include all of the contiguous area as one

survey unit, i.e.: all of the soils areas around the concrete pad would be considered as one survey unit. The Closure Plan was prepared on the premise that each 100 m^2 grid block would be evaluated for comparison with release criteria. However, UCC is willing to accept the larger survey unit size suggested for comparison with release criteria.

There is no criteria established in NUREG/CR-5849 for evaluating the "activity of each individual measurement" to "ensure that the averaging criteria in NUREG/CR-5849 are satisfied". There is criteria for evaluating survey units or groups of measurements to assure that the averaging criteria are met.

The procedure for demonstrating that averaging criteria are met is presented in NUREG/CR-5849, Section 8.5.4 Calculating Average Levels, and in Section 8.5.5 Comparisons. As stated in the NUREG, the mean (average) of the measurements in each survey unit is calculated. The averages are then compared with the guideline values and conditions. If the averages are less than the guideline values, the results are further evaluated to assure the 95% confidence level of the true mean activity is also below the guideline criteria. Areas for which the 95% confidence level are equal to or below the guideline criteria are considered acceptable and no further surveys or remedial actions are required.

8.0 Page 15, Section 4.6 through 4.8: Will surface scans be conducted of the affected and unaffected outdoor areas and of the quonset buildings? Affected outdoor areas should receive 100% surface scans and unaffected areas should receive a minimum of 10% surface scans.

Yes. UCC has committed to conducting the surveys as per NUREG/CR-5849 and as such, the specific declaration of conducting surveys and scans was implied both in the plan and during telephone conversations. Surface gamma scans will be conducted on both affected and unaffected areas of open land using a NaI scintillation detector. As discussed above in response to comment 6.0, affected areas will receive a 100% gamma scan. Unaffected areas will receive a 10% gamma scan. The quonsets will receive a total of 30 measurements for surface alpha and beta radiation as stated on Page 18, Section 4.8, 'Quonset Building Sampling'. Sections 4.7 and 4.8 will be revised to read as follows:

"4.7 Unaffected Outdoor Areas

Sampling, scans and surveys of unaffected areas within the project boundary will be conducted at 30 random locations throughout the project area. These locations are not illustrated in Figure 6, but will be conducted on 10% of the unaffected areas. The unaffected sampling and survey will be conducted in the same manner as for the affected sampling, with a gamma scan of 10% of the area, followed by a surface and 1 meter instrument reading collected prior to sampling of each location.

4.8 Quonset Building Sampling

Two quonsets have previously been surveyed for gamma radiation by Chemical Waste Management and Norris Environmental with no anomalous areas discovered. To further characterize these two buildings, a total of 30 surface contamination (alpha and beta) scans and measurements will be made in the buildings. These measurements will be randomly conducted on concrete floors and wood construction materials inside the buildings such that 10% of the floors and lower 2 meters of the walls of the two buildings will be surveyed. The characterization data will be evaluated to determine if any additional efforts are required in the quonsets."

The characterization data and evaluation for the quonsets will be submitted to NRC under a separate cover along with the characterization data for the concrete ore pad discussed below.

9.0 Page 18, Section 4.9, "Concrete Pad": It is our understanding of the Closure Plan that initial surveys efforts to be conducted on the concrete pad constitute characterization data and that results of the concrete pad characterization will be submitted to NRC for review under a separate cover along with a final survey plan for the release of the concrete pad.

The Closure Plan calls for characterization of the concrete ore pad for surface alpha and beta contamination as an unaffected area with 10% surface scans and a minimum of 30 survey measurements. The characterization data will be evaluated to determine if the pad is affected and what further actions would be required. The characterization survey of the pad and review of the data will be submitted to NRC under a separate cover. If the data indicates the pad is unaffected, no final survey plan for release of the pad will be necessary.

Additional Comments on the Final Status Report

10.0 Page 2-5, Section 2.2.1.3, "Building 78 Floor and Concrete Structures": Was the potential for migration of contamination to subfloors investigated?

Several expansion joints on the floor of Building 78 exhibited elevated beta radiation levels during the course of remediation efforts. These areas were chipped out and surveyed to assure no contamination remained. The verification surveys of the floor were subsequently conducted and the data presented in the final report. No core holes were drilled into the floor to assess subfloor contamination, as chipping of joints was successful, and the fact that the building was constructed prior to initiation of the licensed activities eliminating the chance for materials to have been deposited prior to floor construction..

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