



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

MAR 07 1994

Docket No. 40-7580  
License No. SMB-911

Mr. John J. Hunter  
Corporate Manager  
Process Engineering & Facility Construction  
Fansteel Metals  
10 Tantalum Place  
Muskogee, OK 74401

Dear Mr. Hunter:

This letter is in response to Fansteel's request for a license amendment dated July 8, 1993, to release the Northwest Property Area for unrestricted use. To support this amendment, Fansteel submitted the report entitled "Radiation Survey and Remedial Assessment - Northwest Property Area" (the report) to the Nuclear Regulatory Commission. The NRC staff has completed its review of this report.

Based on its review, staff concludes that the report does not contain sufficient information to determine if the Northwest Property Area can be released for unrestricted use. The report was evaluated using the guidance contained in the draft "Manual for Conducting Radiological Surveys in Support of License Termination" (NUREG/CR-5849) dated June 1992, and Fansteel's Remedial Assessment Work Plan, as revised. As stated in Chapter 1.0 of the report, both of these documents were to have been used in the preparation of the report. However, it does not appear that NUREG/CR-5849 was followed, and portions of analyses, which Fansteel committed to performing in the work plan, were not included in the final report.

For example, it appears that survey areas were not classified into affected and unaffected areas, gamma survey results were reported in units which can not be used, and background determinations and sampling for removable contamination were not performed in accordance with methods outlined in NUREG/CR-5849. In addition, there were areas in the report which were not internally consistent. For example, the report states that no point which was surveyed for alpha activity exceeded the limit for removable contamination (200 dpm/100 cm<sup>2</sup>), even though the data tables contain several survey points with alpha activities above 200 dpm/100 cm<sup>2</sup>, the footnotes on the data tables stated that values above 1000 dpm/100 cm<sup>2</sup> would be highlighted, but there were many values well above this limit which were not highlighted, and information and activities which were stated in the introduction of the report as being performed were not included in the report.

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John J. Hunter

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Before NRC can approve Fansteel's request to release the Northwest Property Area for unrestricted use, Fansteel will be required to address the issues raised by the staff's review of the report. These issues are summarized, in detail, in Enclosure 1. Enclosure 2 is a copy of NUREG/CR-5849.

It should also be noted that the NRC will not authorize the removal of assets covered in the license until there is greater assurance that there are adequate funds available to decommission the entire site. This can be accomplished by increasing the current \$750,000 certificate of financial assurance to an amount of \$10,000,000. This would better ensure that Fansteel is capable of carrying out major decommissioning activities in the event such activities are necessary. If this arrangement is unacceptable, NRC requests that Fansteel submit a site specific Decommissioning Funding Plan (DFP). The DFP should cover the estimated full cost of decommissioning the Fansteel facility, including the Northwest Property Area.

If you have any questions concerning this review, or the additional information which is being requested, please contact me at 504-3466 or Dominick Orlando at 504-2566.

Sincerely,

[Original signed by]  
Heather Astwood  
Regulatory Issues Section  
Decommissioning and Regulatory  
Issues Branch  
Division of Low-Level Waste Management  
and Decommissioning  
Office of Nuclear Material Safety  
and Safeguards

Enclosures: As stated

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DATE	03/3/93		03/3/93	H	03/4/93	H	03/4/93		03/ /93	

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John J. Hunter

Before NRC can approve Fansteel's request to release the Northwest Property Area for unrestricted use, Fansteel will be required to address the issues raised by the staff's review of the report. These issues are summarized, in detail, in Enclosure 1. Enclosure 2 is a copy of NUREG/CR-5849

It should also be noted that the NRC will not authorize the removal of assets covered in the license until there is greater assurance that there are adequate funds available to decommission the entire site. We believe that sufficient information currently exists about the nature and extent of the contamination at the Muskogee facility, to allow Fansteel to develop a reasonable estimate of decommissioning costs. In addition, when this estimate is developed, Fansteel must be prepared to provide a financial assurance mechanism to meet these costs. This can be accomplished by increasing the current \$750,000 certificate of financial assurance to an amount equal to the estimate. This will better ensure that Fansteel is capable of carrying out major decommissioning activities in the event such activities are necessary. In order to demonstrate that Fansteel is capable of completing the decommissioning of the Muskogee facility, NRC is requesting that Fansteel submit a site specific Decommissioning Funding Plan that covers the estimated full cost of decommissioning the Fansteel facility, including the Northwest Property Area, within 120 days of the date of this letter.

If you have any questions concerning this review, or the additional information which is being requested, please contact me at (301) 504-2566. or Heather Astwood at (301) 504-3466.

Sincerely,

[Original signed by]

Dominick A. Orlando, Project Manager  
Regulatory Issues Section  
Decommissioning and Regulatory  
Issues Branch  
Division of Low-Level Waste Management  
and Decommissioning  
Office of Nuclear Material Safety  
and Safeguards

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NAME	HAstwood		NOrlando		RNelson		JAustin	
DATE	03/03/93		03/03/93		03/04/93		03/7/93	H

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MAR 07 1994

Fansteel, Inc.  
Docket No.: 40-07580  
License No.: SMB-911

Letter dated \_\_\_\_\_

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Mr. David Berick  
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Subcommittee on Environment, Energy, and Natural Resources  
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U.S. NUCLEAR REGULATORY COMMISSION STAFF REVIEW OF  
FANSTEEL, INC.  
"RADIATION SURVEY AND REMEDIAL ASSESSMENT  
NORTHWEST PROPERTY AREA"

March 1994

In order to assist Fansteel in addressing the staff's comments, the staff's general concerns with a specific geographical area of the site are first presented, followed by a specific comments that identify the additional information that is being requested for that area.

I. LAND AREAS

A. General Concerns

The staff is concerned that Fansteel did not use the appropriate unrestricted release criteria when assessing the residual contamination of the land areas. Chapter 3.0 of Fansteel's report states that the guidelines contained in NRC's "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material" dated August 1987, were used by Fansteel to determine if "the buildings, land areas and equipment" met the criteria for unrestricted use. However, these guidelines are intended for surface contamination on buildings and equipment only. These criteria do not apply to land areas (soils). The criteria for the release of soils is contained in the 1981 Branch Technical Position (BTP) entitled "Disposal or Onsite Storage of Thorium or Uranium Wastes from Past Operations". This BTP outlines criteria for residual contamination in soils in picocuries per gram (pCi/g) for both uranium and thorium. The staff will use these criteria to determine if the soils can be released for unrestricted use.

NRC staff is also concerned that Fansteel did not classify the land areas according to the potential for contamination (i.e., as affected and unaffected areas) as specified in Section 4.2.1 of NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination." NUREG/CR-5849, Section 4.2.1, contain the definitions for affected and unaffected areas. These classifications are based on the probability that the area could be contaminated and are determined using knowledge of past operations and the results of preliminary surveys. Any area which could potentially be contaminated should be classified as an affected area. Any area which does not have a history of licensed material use and thus, has a limited probability of being contaminated should be classified as an unaffected area. The Northwest Property is divided (by a fence?) into a western section and an eastern section as seen on Figures C-2 and C-3 of the report. The eastern section includes all of the buildings on the Northwest Property and an area that was used to store ore prior to processing. The western section is an open area containing a pond and does not appear to have been involved in licensed material use or storage. Using the definitions contained in NUREG/CR-5849 the staff believes it is appropriate to classify the western section as an unaffected area and the eastern section as an affected area.

B. Comments: Western Section

There is no evidence presented in the report which indicated that the western section was ever involved in licensed radioactive material use. In addition, the report does not indicate that any contamination was discovered or removed during the survey of this area. As such, the staff believes it is appropriate to classify this area as an unaffected area. However, this is a preliminary assessment and the classification may change if the additional information requested below indicates that this area could be contaminated. In order to determine the classification of this area, the information outlined below should be provided.

1. Fansteel should indicate whether it believes the area is an affected or unaffected area and provide the rationale for the classification.
2. The uranium and thorium concentrations in the soil in 30 randomly located soil samples should be provided (NUREG/CR-5849 Section 4.2.3). Since 20 soil samples have already been taken in this area, 10 additional samples should be taken. However, Fansteel must provide the rationale for the location of the original 20 samples as seen on Figure C-3 as the locations of these samples do not appear to have been selected in a random manner. All 30 soil samples should be analyzed for both uranium and thorium and the results should be reported in picocuries of uranium or thorium per gram of soil.
3. All gamma survey measurements taken in this area should be presented in uR/hr (NUREG/CR-5849 Section 2.2).
4. A physical description of the pond and any past uses in the area which could have introduced uranium or thorium into the pond should be included in the report. If prior use did not introduce uranium or thorium into the pond this should be stated in the report.
5. The pond water should be sampled and analyzed (3 samples minimum). The results should be reported in picocuries (pCi) of uranium and thorium per liter of pond water.
6. The results of background soil analyses should be presented in pCi of uranium per gram of soil.
7. All gamma survey measurements that were used to develop the background measurements should be included in the report and should be reported in uR/hr.
8. Page 5-2 states that radioactive material concentrations in well MW-151D were high following installation, while current sampling indicates low levels of radioactive material. An explanation for the difference in the radioactive material concentrations in well MW-151D should be provided.
9. The location of any roads or paved areas should be included on a map of this area.

C. Comments: Eastern Section

NUREG/CR-5849 defines an affected area as an area in which there could be contamination or in which contamination is found. The report states that the eastern section contains areas in which licensed material was stored. In addition, Fansteel removed radioactive material contamination that was discovered during the survey. Therefore, the NRC staff believes it is appropriate to classify the eastern section of the facility as an affected area. In order to determine the classification of this area, the information outlined below should be provided.

1. Fansteel should indicate whether it believes the area is an affected or unaffected area and provide the rationale for the classification.
2. The concentration of uranium and thorium in the soil should be determined. Figure C-3 indicates that soil sampling was not performed in this area. Soil samples should be collected and analyzed in accordance with NUREG-5849 Section 4.2.3.
3. Areas where contaminated soil was excavated should be identified on diagrams of the area.
4. Additional soil sampling should be performed in and around the area that was excavated. This should ensure that all residual radioactive material above the unrestricted use limits was removed. The locations of the additional sampling, and the results of the analysis, reported as picocuries of uranium or thorium per gram of soil, should be included in the report.
5. The need for subsurface sampling should be evaluated in accordance with NUREG/CR-5849
6. The results of all well water sampling should be included in the report.
7. All gamma survey measurements taken in this area should be presented in  $\mu\text{R/hr}$  (NUREG/CR-5849 Section 2.2).
8. Site photographs show two roads which cross the boundary between the Northwest Property and the remainder of the Fansteel site. The roads near the property boundary, and the soils adjacent to the roads, should be sampled to ensure that contamination was not carried onto the Northwest Property by vehicles coming from other areas of the site.
9. The location of all roads and paved areas should be included on a map of this area.
10. Soil borings which were taken in this area were scanned for radioactivity. Some of the results are reported in Appendix G in  $\mu\text{R/hr}$  while other results are reported in cpm. The results of these scans, and the background exposure rate, both reported in  $\mu\text{R/hr}$ , should be included in the report.
11. Appendix F of the report states that drums of waste were buried in an area near Building 1, bordering but not on, the Northwest Property Area of the facility. Fansteel should determine if any radioactive waste, either uncontained or in drums, was buried on the Northwest Property

area.

12. Figure 12 of the Remedial Assessment Workplan indicates that piping connects the Northwest Property with the remainder of the Fansteel site. Please indicate if this piping was involved in licensed material use and if so what remedial activities Fansteel intends for the piping and adjacent soil.

## II. STRUCTURES

### A. General Concerns

The surveys performed to assess the residual contamination on building surfaces were not adequate to determine the levels of residual contamination on the buildings. Although the site contains both uranium and thorium contamination, Fansteel assumed all contamination identified onsite was thorium, since the unrestricted use criteria for thorium is more restrictive than the criteria for uranium. The limits for thorium contamination (200 dpm/100 cm<sup>2</sup> removable and 1000 dpm/100 cm<sup>2</sup> fixed) were used throughout the report. In the report it was implied that survey measurements made using an alpha radiation detector measured removable activity while beta-gamma radiation detectors measured fixed activity. For example, statements on page 5-3 of the report indicate that the unrestricted use criteria for removable thorium (200 dpm/100 cm<sup>2</sup>) are met if survey results indicate that less than 200 dpm/100 cm<sup>2</sup> are present when evaluated for alpha radiation only. A majority of the survey measurements which exhibited alpha radiation below 200 dpm/100 cm<sup>2</sup> exhibited beta-gamma radiations well above 200 dpm/100 cm<sup>2</sup>. However, Fansteel stated that these measurements met the criteria as long as the beta-gamma radiation measurements were below 1000 dpm/100 cm<sup>2</sup> (the limit for fixed thorium contamination). Removable contamination cannot be distinguished from total contamination (i.e., removable contamination + fixed contamination) using a portable survey instrument. Removable activity is the activity that can be removed from the surface of a contaminated object and is determined using a technique that physically removes the contamination from the surface, such as swipes.

In addition, when measuring thorium contamination, the ratio of alpha activity and beta activity (alpha/beta) is generally close to or equal to one. Since alpha radiation measurements are usually not as reliable as beta radiation measurements and the two activities are generally equivalent (for thorium), the staff will use the beta-gamma measurements to evaluate the residual contamination on surfaces, unless Fansteel can justify using a different ratio for alpha/beta activity.

Fansteel did not provide a clear explanation of the method used to determine the background exposure rate for the building surveys. The interior background exposure rate should consist of both the instrument background and the background of the building interiors themselves. NUREG/CR-5849 Section 2.3.1 states that interior background measurements should be taken in onsite buildings of similar construction that do not have a history of licensed operations. Several measurements should be made and the average value of these measurements should be used as the average background exposure rate. The background exposure rate indicated by the radiation detection instruments should be checked frequently and compared to the average value. If the background varies more than 2-3 standard deviations from the average background value, the instrument should not be used. This method does not



appear to have been used by Fansteel. For example, Table D-4 page 4 lists beta-gamma measurements on the order of 70 cpm and a background of 191 cpm. When using an average background as stated above, it is expected that there will be areas that exhibit negative activity, after subtracting background. This is the case with the Fansteel report. However, it is difficult to have confidence in the measurements when there is such a large difference between the measured values and the average background. In addition, since the background is an average, a survey of any area would be expected to have both positive and negative values after subtracting background, if the background is appropriate for that area. The majority of measurements reported by Fansteel were negative values (after subtracting background). This indicates that the background values which were used may have been too high for the area.

B. Comments: Buildings 5 & 6

All buildings located onsite should be classified as affected or unaffected areas using a method similar to the one discussed previously for classifying the land areas. Buildings 5 & 6 do not appear to have been involved in activities using licensed material and Fansteel did not report any areas of contamination in excess of unrestricted release limits. However, the background exposure rates in many of these areas appear to be determined incorrectly. The staff believes it is appropriate to classify these buildings as unaffected. However, this classification may change if, after the background exposure rates are redetermined, the report indicates the presence of contamination above acceptable unrestricted use criteria. In order to determine the classification of this area the information outlined below should be provided.

1. Fansteel should indicate whether it believes the buildings are affected or unaffected areas and provide the rationale for the classification.
2. The acceptability of the background measurements should be evaluated using Equation 8.22 in NUREG/CR-5849.
3. Fansteel should include a detailed explanation of the method used to determine background (similar to the method discussed in NUREG/CR-5849) and adjust the background used in the report accordingly.
4. All gamma survey measurements taken in this area should be presented in  $\mu\text{R/hr}$  as stated in NUREG/CR-5849 Section 2.2.
5. Sampling for removable activity should be performed using a method similar to that contained in NUREG/CR-5849 Section 6.4.4. Results of sampling for removable activity should be reported in  $\text{dpm}/100 \text{ cm}^2$ .
6. Any areas in these buildings where residual radioactivity is greater than 25% of the unrestricted use criteria should be investigated and the need for additional surveys evaluated (NUREG/CR-5849 Section 4.2.3).
7. Any areas in excess of the unrestricted use criteria should also be shown on the diagrams.

C. Comments: Buildings 1 - 4

Fansteel reported that licensed material was used in Building 1 and areas of contamination, in excess of the unrestricted release limits, were found in all buildings. Using the definitions contained in NUREG/CR-5849, the staff believes it is appropriate to classify Buildings 1 - 4 as affected areas. In order to determine the classification of these areas, the information outlined below should be provided.

1. Fansteel should indicate whether it believes the buildings are affected or unaffected areas and provide the rationale for the classification.
2. The acceptability of the background measurements should be evaluated using Equation 8.22 in NUREG/CR-5849.
3. Fansteel should include a detailed explanation of the method used to determine background (similar to the method discussed in NUREG/CR-5849) and adjust the background used in the report accordingly.
4. All gamma survey measurements taken in this area should be presented in  $\mu\text{R/hr}$  as stated in NUREG/CR-5849 Section 2.2.
5. Sampling for removable activity should be performed in accordance with methods similar to those contained in NUREG/CR-5849 Section 6.4.4. Results should be reported in  $\text{dpm}/100 \text{ cm}^2$ .
6. Any areas in these buildings where residual radioactivity is greater than 25% of the unrestricted use criteria should be investigated and the need for additional surveys evaluated (NUREG/CR-5849 Section 4.2.3).
7. The report states in Section 2.0 that Buildings 2 & 3 did not contain radioactive material, while the data tables indicate that contamination in excess of unrestricted use criteria were found in these buildings. Fansteel should include an explanation for the cause of this contamination.
8. The report indicates high levels of radioactive material contamination were found in a bathroom in Building 3. The location of the bathroom should be indicated on a diagram of the building.
9. A sink in Building 1 was found to exhibit some contamination. The drains and pipes associated with this sink, and any other sink which was found to be contaminated, should be surveyed and sampled for activity in excess of the unrestricted release limits.
10. NUREG/CR-5849 Section 4.2.3 states that scans of affected areas should be performed in order to locate hot spots. Fansteel should perform these scans in accordance with NUREG/CR-5849 Section 4.2.3 or provide an explanation why the scans are not necessary.

III. DATA TABLES AND FIGURES

A. General Concern

NUREG/CR-5849 does not indicate an acceptable format for data used to support decommissioning activities. However, it is assumed that the data will be

presented in a clear and logical manner. The data tables presented by Fansteel contained a great deal of information (over 60,000 survey points) but were difficult to read and interpret.

#### B. Comments

1. The unrestricted use criteria for both uranium and thorium appear to have been used in the tables in Appendix D, while Fansteel committed to using the unrestricted use criteria for thorium only. For example, even though the footnotes indicated that measurements above 1000 dpm/100 cm<sup>2</sup> would be highlighted, there are many points in the table which were above 1000 dpm/100 cm<sup>2</sup> but were not highlighted. In addition, the footnotes on other tables indicated that only measurements over 5000 dpm/100 cm<sup>2</sup> (the limit for uranium) would be highlighted. The report implied that Fansteel was using the highlighted measurements as indicators of contaminated areas. The footnotes should caveat data in a manner that is consistent with the information presented in the report. Fansteel should present an explanation for using the higher uranium activity limit in the tables when the report states they used the lower thorium limit.
2. Many tables contain two measurements for the same survey point. It appears that these samples were taken on two different days. An explanation for the different results should be provided.
3. Tables D-54 and D-65 are the only tables which include spaces to report removable radioactive material contamination. However, only a few of the spaces contain data. An explanation should be provided for variations in data presented as well as for any gaps in the data.
4. The gross alpha and gross beta analysis results for the sampling that occurred on 5/3/93 appear to be missing from Table 3. Fansteel should provide this analysis or an explanation for its absence.
5. All figures should contain legends which explain all symbols used in the figures. For example, Figure C-2 should explain the use of the symbols bordering the site area diagram and Figure C-45 should explain what is meant by the shaded area on wall 1.
6. Figures C-2 and C-3 only show the locations of four of the buildings. Fansteel should include a diagram clearly indicating all building locations and label the buildings with both the name of the building and the building number (i.e., Metal Storage Building - Building 5).
7. Because of the quantity of information contained in the data tables, Fansteel should provide a summary table which lists all areas that were surveyed and exhibited radioactive material contamination in excess of the unrestricted use criteria.

ENCLOSURE 2