



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION IV  
611 RYAN PLAZA DRIVE, SUITE 400  
ARLINGTON, TEXAS 76011-8064**

December 23, 1999

Mr. Michael J. Mocniak, Corporate Manager  
Fansteel Incorporated  
Number One Tantalum Place  
North Chicago, Illinois 60064

**SUBJECT: NRC INSPECTION REPORT 40-7580/99-02 AND NOTICE OF VIOLATION**

Dear Mr. Mocniak:

On November 5, 1999, the NRC completed the onsite portion of an inspection of Fansteel's rare earth recovery facility. The enclosed report presents the results of that inspection. Based on the results of the NRC's inspection and review of your health physics program, violations of NRC requirements were identified. These violations are cited in the enclosed Notice of Violation (Notice), and the circumstances surrounding them are described in the subject inspection report. The first violation involves the failure to report the damage from the June 1, 1999, tornado event to the NRC's Operations Center as required by 10 CFR 40.60. The second violation involved the failure to establish written and approved radiation protection and groundwater cleanup operations procedures as required by Sections 2.1, 2.4 and 4.1 of the license.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. For your consideration and convenience, an excerpt from NRC Information Notice 96-28, "SUGGESTED GUIDANCE RELATING TO DEVELOPMENT AND IMPLEMENTATION OF CORRECTIVE ACTION," is enclosed. The NRC will use your response, in part, to determine whether further enforcement action is necessary to ensure compliance with regulatory requirements.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be placed in the NRC Public Document Room.

Fansteel Incorporated

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Should you have any questions concerning this inspection, please contact Mr. Louis C Carson II at (817) 860-8221 or Dr. D. Blair Spitzberg at (817) 860-8191.

Sincerely,

/RA LLH Acting for/

Dwight D. Chamberlain, Director  
Division of Nuclear Materials Safety

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

Enclosure:

1. Notice of Violation
2. NRC Inspection Report 40-7580/99-02
3. NRC Information Notice 96-28

cc w/Enclosures 1 & 2:  
Mr. John J. Hunter, Corporate Manager  
Fansteel Incorporated  
Number Ten Tantalum Place  
Muskogee, Oklahoma 74403-9296

Mr. Hugh Terrell, Safety Compliance Inspector  
Occupational Safety and Health Administration  
Region 6, Oklahoma Field Office  
Oklahoma City, Oklahoma 73111

Mr. Walter Beckham, City Manager  
City of Muskogee  
229 West Okmulgee  
Muskogee, Oklahoma 74401

Mr. Allyn Davis  
U.S. Environmental Protection Agency  
Region VI  
1445 Ross Avenue  
Dallas, Texas 75202

Dr. Loren Mason  
District Environmental Manager  
Tulsa District  
U.S. Army Corps of Engineers  
P.O. Box 61  
Tulsa, Oklahoma 74121-0061

Fansteel Incorporated

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Mr. Mark Thomason  
State of Oklahoma Department  
of Environmental Quality (ODEQ)  
Division of Water Quality  
1000 N.E. 10th Street  
Oklahoma City, Oklahoma 73117-1212

Ms. Pamela L. Bishop  
State of Oklahoma Department  
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Waste Management Division  
Radiation Management Section  
1000 N.E. 10th Street  
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Mr. Mike Brodrick, Administrator  
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## ENCLOSURE 1

### NOTICE OF VIOLATION

Fansteel Incorporated  
Fansteel Metals Site

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

During an NRC inspection conducted on November 1-5, 1999, violations of NRC requirements were identified. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions," NUREG 1600, the violation is listed below:

- A. Licensee Condition 10 states, in part, that the licensee is authorized to use licensed material in accordance with statements, representations, and conditions contained in Part 1 (Chapters 1-5) of the application submitted by letter dated May 10 and supplemented by letters dated February 3, May 17, 1999, and July 7, 1999.

Chapter 4, Section 4.1 of the license states, in part, that plant operations shall be conducted in accordance with written procedures. Standard Operating Procedures shall be reviewed, revised, and approved by the Radiation Safety Committee.

Contrary to the above, from July to November 1999, the licensee implemented the radiation protection program and the groundwater cleanup operations without procedures that had been reviewed, signed, and approved by the Radiation Safety Committee.

This is a Severity Level IV violation (Supplement IV).

- B. 10 CFR 40.60(b)(1) requires, in part, that the licensee notify the NRC within 24 hours of discovering an unplanned contamination event that (i) requires access to the contaminated areas, by workers or the public, to be restricted for more than 24 hours by imposing additional radiological controls or by prohibiting entry into the area; (ii) involves a quantity of material greater than five times the lowest annual limit on intake specified in appendix B of 10 CFR 20.1001-20.2401; and (iii) has access to the area restricted for a reason other than to allow isotopes with a half-life of less than 24 hours to decay prior to decontamination. 10 CFR 40.60(c)(1) requires, in part, that licensees make reports required by 10 CFR 40.60(b) by telephone to the NRC Operations Center.

Contrary to the above, on June 1, 1999, the Fansteel Sodium Reduction Building was substantially damaged by a tornado which resulted in an unplanned contamination spill of at least 1000 pounds radioactive material on the ground. The spill released at least 68 microcuries of uranium 238 and 4.4 microcuries of thorium-232, amounts in excess of five times the lowest annual limit on intake specified in Appendix B of 10 CFR Part 20, and covered approximately 3000 square feet of property. This spill resulted in the licensee controlling access to the contaminated area from June 2-4, 1999, a period in excess of 24 hours. The license did not report the tornado damage to the NRC Operations Center within 24 hours of the event.

This is a Severity Level IV violation (Supplement VI).

Pursuant to the provisions of 10 CFR 2.201, Fansteel, Inc. is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555, with a copy to the Regional Administrator, U.S. Nuclear Regulatory Commission, Region IV, 611 Ryan Plaza Drive, Suite 400, Arlington, Texas 76011, within 30 days of the date of the letter transmitting this Notice of Violation (Notice). This reply should be clearly marked as a "Reply to a Notice of Violation" and should include for each violation: (1) the reason for the violation, or, if contested, the basis for disputing the violation or severity level, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken to avoid further violations, and (4) the date when full compliance will be achieved. Your response may reference or include previous docketed correspondence, if the correspondence adequately addresses the required response. If an adequate reply is not received within the time specified in this Notice, an order or a Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other action as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

If you contest this enforcement action, you should also provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

Because your response will be placed in the NRC Public Document Room (PDR), to the extent possible, it should not include any personal privacy, proprietary, or safeguards information so that it can be placed in the PDR without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.790(b) to support a request for withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21.

In accordance with 10 CFR 19.11, you may be required to post this Notice within two working days.

Dated this 23<sup>rd</sup> day of December 1999

**ENCLOSURE 2**

U. S. NUCLEAR REGULATORY COMMISSION  
REGION IV

Docket No.: 40-7580

License No.: SMB-911

Report No.: 40-7580/99-02

Licensee: Fansteel Incorporated

Facility: Muskogee Plant

Location: Muskogee, Oklahoma

Inspection Dates: November 1 - 5, 1999

Inspectors: Louis C. Carson II, Health Physicist  
Fuel Cycle & Decommissioning Branch  
Division of Nuclear Material Safety

Michael Adjodha, Nuclear Process Engineer  
Fuel Cycle Operations Branch  
Division of Fuel Cycle Safety

Accompanied By: Pam Bishop, Environmental Specialist  
Oklahoma Department of Environmental  
Quality Radiation Section

Binesh Tharakan, Health Physicist  
Division of Industrial and Medical Nuclear Safety  
Materials Safety Inspection Branch

Approved By: D. Blair Spitzberg, Ph.D., Chief  
Fuel Cycle & Decommissioning Branch  
Division of Nuclear Material Safety

Attachments: Supplemental Inspection Information

## EXECUTIVE SUMMARY

### Fansteel Incorporated Muskogee Plant NRC Inspection Report 40-7580/99-02

The Fansteel facility had been shutdown since 1989. It was redesigned and reconstructed from 1996 through 1998, and facility operations were authorized to restart on March 15, 1999. During the period from 1996 to present, the licensee had committed to numerous regulatory requirements that would allow the Fansteel project to conduct the following operations: source material recovery, rare metals recovery, radioactive byproduct volume reduction, groundwater remediation, and site remediation.

This inspection included a review of the status of the licensee's long-term decommissioning strategy known as the work-in-progress material processing project. Areas inspected included management organization and controls, operations, site radiation safety, radioactive waste management, and environmental protection programs.

#### Site Status, Decommissioning and Work-In-Progress Processing Facility Construction

- The Fansteel site was found to be operational following the June 1999 tornado that significantly damaged the facility. The groundwater corrective action (French drain) system was operational (Section 1).
- The licensee's decommissioning activities, construction, and facility operations were in accordance with applicable license conditions and NRC regulations (Section 1).

#### Management Organization and Controls and Standard Operating Procedures

- Changes had been made to the organization structure that had not been incorporated into the license. This was considered a minor violation of NRC requirements. It appeared that adequate oversight was being provided for the current level of site activities. An Inspection Followup Item was opened concerning the need for an organization license amendment request (Section 2).
- Approved procedures were not in use for the radiation protection or groundwater cleanup and monitoring work being conducted. A violation was identified for the licensee's failure to implement these programs using approved procedures (Section 2).

#### Radiation Protection

- The licensee's radiation protection program met requirements established in 10 CFR Part 20 (Section 3).
- All radioactive material storage areas were secure and being controlled within the site boundary in accordance with the requirements of 10 CFR Part 20.1801. All storage areas displayed proper radiological posting/labeling as required by 10 CFR 20.1902.



Site fences were secure and in good condition, and perimeter postings were appropriate (Section 3).

#### Radioactive Waste Management and Environmental Protection

- A review of the licensee's environmental monitoring and radioactive waste management programs indicated that the licensee was conducting appropriate surface water effluent monitoring in compliance with the license requirements (Section 4).
- The licensee's failure to establish an approved procedure for the groundwater cleanup system with written alarm response instructions (Section 4).

#### Inspection Followup

- An Inspection Followup Item on the licensee's recovery efforts from the June 1, 1999, tornado event was successful. This matter was closed (Section 5).
- An Unresolved Item concerning the licensee's 10 CFR 40.60 reporting requirements to NRC following the June 1999 tornado event resulted in a violation. This matter is closed (Section 5)
- An Unresolved Item concerning the licensee's failure to label large bags of radioactive material pursuant to 10 CFR 20.1904 was closed (Section 5).

## Report Details

### **1 Site Status, Decommissioning of Fuel Cycle Facilities (88104), and Construction Review (88001)**

#### **1.1 Site History**

Fansteel's Muskogee plant had been in the rare metals extraction business from 1958 to 1989 when operations ceased. Fansteel produced tantalum and columbium metals that were extracted from uranium ore, thorium ore, and tin slag feedstock using an acid digestion process. The extracted metals were made into ingots, bars, powder, alloys and compounds to be used as feed material for other Fansteel operations throughout the United States. Since 1967, this rare metals extraction facility had operated with either an Atomic Energy Commission or NRC license because of the amounts of radioactive waste (naturally occurring and technically enhanced uranium and thorium ore residues) generated from the process. There is approximately 4.7 million cubic feet of radioactive waste residue in ponds and 0.6 million cubic feet of contaminated soil at the site. Most of the remaining tantalum and columbium feedstock material that contained valuable metals and reconcentrated radioactivity (uranium and thorium) was stored in Ponds 2 and 3. The Ponds 2 and 3 residues represent 10,250 metric tons of radioactive material to be reprocessed. Additionally, 500 metric tons of radioactive material from former Ponds 1, 4, and 5 and contaminated soil were contained in barrels and bags that were stored in the sodium reduction building. The concentrated uranium and thorium radioactive waste and byproduct material at the site continues to require licensing by the NRC as "source material," per 10 CFR Part 40.

From 1989 through August 1996 Fansteel conducted limited site remediation and decommissioning of selected site areas and completed the site radiological characterization. In August 1996, the NRC released for unrestricted use approximately 40 acres (Northwest property) and removed the property from the license by amendment.

#### **1.2 Licensee's Decommissioning Strategy**

This inspection included assessing the status of the licensee's proposed long-term decommissioning strategy to operate the facility for at least 10 years. This strategy known as the work-in-progress (WIP) material reprocessing project will include uranium and thorium recovery, rare metals recovery processing, radioactive waste volume reduction, and site remediation operations.

Fansteel has been placed under the NRC's Site Decommissioning Management Plan (SDMP). As a SDMP site, Fansteel's decommissioning strategy is to reprocess onsite source material for at least 10 years to reduce the volume of radioactive waste on site. On July 6, 1998, the licensee submitted to the NRC for approval the Fansteel Decommissioning Plan pursuant to 10 CFR 20.1401(b)(3), 10 CFR 40.42(g)(4), and License Condition 25. By license application dated January 25, 1995, Fansteel

requested a license amendment authorizing processing of onsite residues for recovery of precious metals. The application described the construction and operation of a facility designed to reprocess onsite licensed material. This material contains moderate concentrations of natural uranium and thorium (source material) and is designated as WIP material. The additional processing will recover rare metals, uranium and thorium, and will reduce the total volume of waste associated with the WIP material reprocessing. The application also discussed radioactive groundwater collection and remediation. Fansteel also requested approval to recover calcium fluoride ( $\text{CaF}_2$ ) from existing onsite waste treatment Ponds 6-9 and onsite disposal of contaminated soils. On March 25, 1997, the NRC authorized Fansteel to proceed with the WIP project and install a French drain groundwater remediation system. On December 18, 1997, the NRC issued License Amendment No. 1 which authorized the licensee to reprocess wastewater treatment residues that are located in Ponds 6-9.

On March 15, 1999, the NRC issued License Amendment No. 4 which removed several license conditions that restricted Fansteel from starting residue recovery operations. The license restarted facility operations on April 1, 1999. On August 20, 1999, the issued License Amendment No. 6 which approved the licensee's decommissioning plan for Muskogee, Oklahoma, processing site that is under the NRC's Site Decommissioning Management Plan.

### 1.3 Site Activities

Since the previous inspection in June 1999, licensee activities have included the following:

- Preoperational startup testing of the WIP system which restarted in late July 1999 following the June 1, 1999, tornado that substantially damaged the site.
- Fansteel resumed processing  $\text{CaF}_2$  sludge for the production of cryolite. The  $\text{CaF}_2$  material contained uranium and thorium residues with an estimated gross alpha and gross beta radioactivity concentration of 100 picocuries/gram (pCi/g) to 690 pCi/g. The license has produced less than 2000 pounds of cryolite that they returned to the  $\text{CaF}_2$  ponds for reprocessing.
- French drain groundwater system operations have been continuous since July 1999.

Routine site activities by plant personnel included personnel training, maintenance of the sample stations, radiological surveys, groundwater sampling, small equipment/material decontamination, laboratory work with WIP material, building and grounds maintenance, testing and construction of the WIP/ $\text{CaF}_2$  reprocessing plant, and the initial operation of the reprocessing plant using  $\text{CaF}_2$  material.

## **2 Management Organization and Controls (88005) and Standard Operating Procedures (88058)**

## 2.1 Inspection Scope

Fansteel's organization structure and management controls were reviewed to ensure that the licensee had established a staff and programs with defined responsibilities and functions, as required by the General License and 10 CFR Parts 19, 20, and 40.

## 2.2 Observations and Findings

### a. Fansteel Site Organization

The organization had changed since the previous inspection because of an NRC license amendment dated September 2, 1999. Fansteel's site organization as described in the General License, Section 2.1, "Organizational Responsibilities and Authority," and Figure 3 describes that Fansteel's site organization and Radiation Safety Committee is comprised of five key positions. However, Figure 3 of the General License indicates that the Radiation Safety Committee and site organization consists of six key positions whereby the plant radiation safety officer (PRSO), a single person, may simultaneously hold the plant safety director position. According to Figure 3, the permanent site staff consisted of the site general manager, operations process manager, operations maintenance manager, PRSO/plant safety director, process crew leader and mining crew leader. However, the inspectors noted that Section 2.1 of the General License does not describe the duties of the operations maintenance manager and does not distinguish between the duties of the two operations groups at Fansteel. Fansteel management stated that they would submit a license amendment request to update Section 2.1 of the position descriptions in the General License to be consistent with Figure 3. The licensee's submittal of the licensee amendment request for updating the site organization will be reviewed during a future inspection (40-7580/9902-01).

### b. Management Controls

#### (1) Staff Radiation Safety Training

The licensee's radiation protection training program was reviewed to determine compliance 10 CFR 19.12 for radiation safety instructions to workers and Section 2.3 of the General License, "Training." Section 2.3 of the General License requires that all new employees receive radiation safety training including temporary and contract employees. A review of 1999 training documents such as lesson plans and student test results indicated that all personnel had been trained and tested in accordance with the licensee's General License and the requirements of 10 CFR 19.12. Random interviews with several workers confirmed the adequacy of the licensee's training program.

#### (2) Procedures

Regarding the establishment of written and approved procedures at the Fansteel site, the General License requires the following:

- Chapter 2, Section 2.1.2 requires, in part, that the Radiation Safety Committee must sign all approved procedures prior to its distribution and use.

- Chapter 2, Section 2.4 states, in part, that plant procedures shall be reviewed, revised, and approved by the Radiation Safety Committee, then implemented in the plant.
- Chapter 4, Section 4.1 states, in part, that plant operations shall be conducted in accordance with written procedures. Standard Operating Procedures shall be reviewed, revised, and approved by the Radiation Safety Committee.

During the April 1999 inspection, the inspectors noted that the licensee had not developed an SOP manual for radiation protection or effluent monitoring in support of plant operations. Inspectors determined that licensee's procedures were not sufficient for the scope of work that was being conducted at Fansteel. The PRSO acknowledged the inspectors findings and stated that they were developing SOPs. During the May 1999 followup inspection, the inspectors found the licensee developing a comprehensive set of radiation protection, industrial safety, environmental monitoring, and process sampling SOPs that included 42 procedures.

During this inspection, the inspectors found that neither the PRSO or the health physics technician were using any of the procedures that had been developed in May 1999. Additionally, the inspectors found that none of the proposed procedures had been reviewed and approved by the PRSO or the Radiation Safety Committee. Although, the inspectors found that the license had been conducting most of the radiation protection activities such as: bioassays, air sampling, instrument calibration, product sampling, and environmental monitoring. Written and approved procedures were not being used by the PRSO and the health physics technician. Section 3 of this report details the extent to which routine radiation protection activities were being conducted by the license.

The inspectors determined, however, that from July to November 1999, the licensee implemented radiation protection program without procedures that had been reviewed, signed, and approved by the Radiation Safety Committee. This was an example of a violation of the General License (40-7580/9901-02).

### (3) Radiation Safety Committee

The Fansteel Radiation Safety Committee is responsible for safety oversight. Section 2.1.2 of the General License details the requirements of the Radiation Safety Committee and requires that the Radiation Safety Committee meeting minutes be distributed to the members. Since the last inspection in June 1999, the Radiation Safety Committee had met at least six times. The inspectors noted that the Radiation Safety Committee meeting minutes were adequate and were being distributed to the committee members. Additionally, the license requires the Radiation Safety Committee to review and evaluate at 12-month intervals, data from the previous 18 months in the following areas: personnel exposures, unusual occurrences, airborne radioactivity levels, radiological and chemical effluent releases, environmental monitoring, and compliance with the National Pollutants Discharge Elimination System (NPDES). The licensee was required to evaluate upward trends, assess the as low as is reasonably achievable (ALARA) implementation at Fansteel, and determine if equipment for effluent exposure control was being used, maintained and inspected properly. The inspectors noted that

the Radiation Safety Committee meeting minutes indicated that the committee had been reviewing most of the subjects identified in the license.

(4) Audits and Inspections

Section 2.5, "Audits and Inspections," requires the PRSO to audit the radiation safety program and inspect facility operations annually. The inspectors noted that the licensee's annual audit requirements could satisfy the annual radiation program review required by 10 CFR 20.1101(c) if fully implemented. The inspectors reviewed the licensee's annual radiation protection program audit report for 1998 records that was used to demonstrate compliance with all the above requirements. The audit had been conducted in January 1999. The audit report was not detailed and consisted of less than a third of a page of documentation. The audit listed radiation area topics reviewed and briefly indicated the following: personnel exposures (internal and external) were low; unusual occurrences, none; radiological and chemical effluent releases, no exceedances. The inspectors determined that the licensee had briefly addressed some of the areas of the radiation protection program. The inspectors concluded that the licensee was in compliance with requirements 10 CFR 20.1101(c).

2.3 Conclusions

Changes had been made to the organization structure that had not been incorporated into the General License. It appeared that adequate oversight was being provided for the current level of site activities, but an Inspection Followup Item was opened concerning the need for an organization change through a license amendment request. Existing procedures were insufficient for the scope of radiation protection work being conducted since the last inspection. A violation was identified for the licensee's failure to implement the radiation protection program with approved procedures.

**3 Radiation Protection (83822)**

3.1 Inspection Scope

The licensee's radiation protection program, including procedure compliance, internal and external exposure control, records maintenance, security of radioactive material, and radiological surveys, were inspected to determine the licensee's compliance with requirements established in the license and NRC regulations. Part I, Section 3, of the General License describes the licensee's radiation protection program.

3.2 Observations and Findings

a. Radiation Work Activities and Special Work Permits

Radiological work activities included operators unloading CaF<sub>2</sub> material in Chem-A building feed tanks. Discussions with operators indicated they possessed sufficient knowledge of radiation hazards for their assignments. Adequate protective clothing and contamination control practices were evident.

On June 3, 1999, the noted that the licensee had implemented a special work permit (SWP) on how to complete the SWP form. The licensee had developed an SWP form but not an accompanying procedure. During this inspection, the inspectors identified that the licensee had written 30 SWPs since June of 1999. However, the licensee had not written a procedure for the implementation of the SWP process. A review of the activities being conducted and the potential hazards involved revealed that the work included: handling large bags of radioactive material with the potential for inhaling dust and potential contact with sulfuric acid, hydrofluoric acid, and caustic solutions. Although the work was conducted without a significant incident, the SWP process was not covered by an approved procedure or detailed instructions covering the work activity.

b. Health Physics Technician Activities

In July 1999 Fansteel management had hired a full-time health physics technician to assist the PRSO in performance of the radiation safety program. The inspectors observed the technician perform routine radiation surveys, collect environmental air samples, and perform radiation survey instrument functional checks with little direction from the PRSO. Discussions with the health physics technician and PRSO revealed that the licensee provided the technician on-the-job training and training required under 10 CFR 19.12. The inspectors noted that the licensee had not provided the technician with any formal radiation protection training. Additionally, the technician had not been trained on any of the licensee's radiation protection procedures and was not using written procedures during routine health physics activities. The inspectors did not identify any radiation protection duties that had been performed inadequately by the technician.

c. Occupational Exposures

Occupational radiation exposures at the Fansteel site during 1999 were essentially zero. Currently, the licensee monitors selected workers for internal exposures. During recovery process operations, the licensee implemented personnel external monitoring program for all radiation workers. Inspectors noted that all workers were wearing thermoluminescent dosimeters (TLD). The inspectors reviewed TLD records and interviewed workers to determine if they had been instructed on the use of TLD badges. The inspectors found that Fansteel workers had been trained on wearing TLDs.

The inspectors reviewed the licensee's radiation protection program for controlling internal exposures and detecting internally deposited exposures and assuring compliance with 10 CFR 20.1204 and Section 3.5.1 of the license. The inspectors determined that Fansteel had evaluated potential airborne radioactivity hazards associated with operating the reprocessing plant without approved procedures. Section 3.5.1 of the license requires the PRSO to conduct the following:

- During the first 3 weeks of operation, perform continuous, representative sampling of individual's airborne intake of RAM as necessary to demonstrate compliance with 10 CFR Part 20.

- After the first 3 weeks of baseline air samples are collected, collect representative samples on a weekly basis in areas with a significant potential for airborne contamination in accordance with NRC Regulatory Guide 8.25, "Air Sampling in the Work Place."

The inspectors determined that in order to comply with the above, the licensee had to collect air samples and determine if radiological conditions were significant during process operations and when CaF<sub>2</sub> material was being loaded for reprocessing. The PRSO indicated their intent to comply with the above.

The licensee's bioassay program was reviewed for compliance with 10 CFR 20.1703(a)(ii) and (iii). Section 6.4 of the licensee's Radiation Safety Manual requires the licensee to have a bioassay program capable of detecting thorium and uranium deposition. The licensee had conducted urine and fecal bioassays on the workers. The PRSO stated that no worker had been exposed to any significant concentrations of radioactive material. Bioassay records and reports were reviewed for 1999 with no anomalous results noted. The licensee had all samples analyzed by an offsite laboratory and no uranium or thorium was detected in workers. The inspectors noted that bioassays were normally collected from workers on a quarterly basis, but several workers had not been sampled during current quarter. Based on the bioassay results, the bioassay program was found to be acceptable. However, the bioassay program was being implemented without an approved procedure.

c. Radioactive Material Postings

Site tours and observations disclosed that radiological storage areas (Ponds 2 and 3, French drain contaminated, Chem A and sodium reduction buildings) were being properly maintained and posted with "Caution, Radioactive Material" signs. The licensee's restricted area boundary was defined as that area encompassed by fencing east of and contiguous with the third (innermost) gate on the main access road (Ten Tantalum Place) to the facility. Site security was provided during regular business hours by a security guard and by site personnel. Access to the site was limited by locked gates during non-business hours to prevent unauthorized access to the facility. The site perimeter fence was noted to be in good condition and properly posted. All radioactive material storage areas were secure and being controlled within the site boundary in accordance with the requirements of 10 CFR Part 20.1801. All storage areas displayed proper radiological posting/labeling as required by 10 CFR 20.1902.

d. Site Contamination Surveys

Adequate protective clothing and contamination control practices were evident. The inspectors observed workers conduct personal contamination and equipment release surveys on vehicles or other material leaving the restricted area. Records indicated that nothing had been released from the site with contamination levels above the release limits set by the licensee. The inspectors noted that the licensee had implemented a program for sorting performing contamination surveys on anti-contamination coveralls before shipping them to an offsite laundry processor. The radiation protection technician revealed that they conducted surveys on one out of every six coveralls prior



to release to an offsite laundry facility. Records indicated that no coveralls had been released from the site with contamination levels above the licensee's release limits. However, Section 3.5.3 of the General License states, in part, that uniforms are surveyed for alpha contamination prior to pickup by a laundry service. The inspectors further noted that this activity was being conducted without an approved procedure.

Both fixed and loose radioactivity, as well as ambient gamma radiation exposure rates had been measured throughout the site. Smears for loose radioactivity were counted by both portable and laboratory instrumentation. No significant radiation or loose surface contamination levels were encountered within the restricted area. Loose surface contamination surveys did not detect any contamination levels above 200 disintegrations per minute per 100 square centimeters (dpm/100 cm<sup>2</sup>). The licensee was noted to have a low threshold (less than 100 dpm/swipe) for performing decontamination of areas exhibiting removable radioactivity. The licensee had found some fixed contamination in excess of 5000 dpm/100 cm<sup>2</sup> in the Chem C building. The contamination stemmed from processing CaF<sub>2</sub> material that splatter on the wall and floor during processing. The inspectors noted that the licensee had installed splash guards around some of the affected CaF<sub>2</sub> processing equipment as a contamination prevention method.

The inspectors reviewed 1999 radiological surveys for surface activity and release surveys were in compliance with the General License. The inspectors determined that the licensee's contamination control program was adequate. However, the licensee conducted the contamination surveys and release survey without approved procedures.

e. Instrument Calibrations and Operations

Calibration of the licensee's instrumentation was found to be current. Calibration records, frequency of calibrations, and methodologies were found to be in agreement with industry recommendations. The inspectors discussed with the PRSO the analysis techniques used in the assessment of airborne radioactivity at the site. The licensee's air sampling equipment and calibration methodologies were reviewed and found acceptable. A review of the licensee's calibration procedures and calibration sources was conducted. The inspectors found that none of the licensee's air sampling and instrument calibration procedures had been approved by the Radiation Safety Committee.

3.3 Conclusions

The licensee had implemented a radiation protection program that met requirements established in 10 CFR Part 20 and was adequate for current site activities. All radioactive material storage areas were secure and being controlled within the site boundary in accordance with the requirements of 10 CFR Part 20.1801. All storage areas displayed proper radiological posting/labeling as required by 10 CFR 20.1902.

#### **4 Radioactive Waste Management (88035) and Environmental Protection (88045)**

##### **4.1 Inspection Scope**

The licensee's site environmental monitoring program was reviewed to determine compliance with license conditions involving liquid and gaseous effluent releases (radiological and nonradiological) and groundwater monitoring. The environmental program requirements are identified in Chapters 3.5 of the General License and the licensee's NPDES Permit No. OK0001643 which is regulated by the U.S. Environmental Protection Agency (EPA) and administered by the State of Oklahoma Department of Environmental Quality (ODEQ). The environmental program consisted of groundwater sampling, ambient airborne radon and particulate sampling, and liquid effluent sampling of site discharges to the Arkansas River.

##### **4.2. Observations and Findings**

###### **a. Gaseous Effluent Monitoring**

There had been intermittent site operations being conducted that produced gaseous/particulate effluent releases. The inspectors determined that the licensee was conducting environmental sampling in all required areas. The license requires process stack and fence line monitoring for gaseous effluents during facility operations. Air particulate samples were being collected at various locations throughout the site and had been analyzed for both gross alpha and beta activity after an adequate period for radon progeny to decay. Air sample results for 1999 showed no anomalies. Sample results reviewed were fractions of the gaseous effluent concentration limits established in 10 CFR Part 20, Appendix B and the license. No significant trends were identified by the licensee.

###### **b. Liquid Effluents**

Liquid effluent collection and discharge systems were inspected. Discharge systems reviewed included the Pond 3 collection cistern, transfer system, plate filter system, Ponds 6, 7, 8, and 9, and Outfall 001 effluent discharge station. All ponds and equipment were in a good state of maintenance.

Records of 1999 Outfall 001 discharges were reviewed for flow, pH, fluorides, ammonia, total suspended solids, chemical oxygen demand, sulfate, tantalum, columbium, lead and zinc. No anomalous readings were identified. Samples were composited and analyzed for alpha and beta radiation emission content. No discharges above the 10 CFR Part 20, Appendix B effluent limits or the NPDES permit were noted.

c. Groundwater Monitoring

(1) Regulatory Requirements

The inspectors reviewed the licensee's groundwater monitoring program to determine compliance Section 3.5 of the General License and License Condition 27. Section 3.5, "Groundwater Monitoring" of the General License requires the licensee to analyze groundwater samples for gross alpha and beta radiation and non-radiological chemical parameters on a quarterly basis. Section 3.5 of the General License requires the following depending on the groundwater and effluent results:

1. If the gross alpha concentration exceeds 15 picocuries/liter (pCi/l) or gross beta-gamma concentration of 50 pCi/l, isotopic analyses will be made to identify major radionuclides such as U-234, U-238, Th-228, and Th-232.
2. If the concentration of any radionuclide in groundwater or liquid effluents exceeds 25 percent of the effluent concentration limits listed in 10 CFR Part 20, Appendix B, Table II, an investigation will be made to determine the cause and corrective action.
3. If the concentration of any radionuclide in groundwater or liquid effluents exceeds effluent concentration limits listed in 10 CFR Part 20, Appendix B, Table II, Fansteel will submit a report to the NRC RIV Regional Administrator within 30 days.

(2) Groundwater Monitoring Data

Records indicated that the licensee collected and analyzed groundwater samples at monitoring wells and sumps during 1999. The licensee collected and analyzed groundwater samples on a quarterly as required by the license. The inspectors considered the operating status of the Fansteel site and the fact that the licensee had begun operation of the French drain groundwater monitoring system that was designed to mitigate the affects of groundwater contamination. The inspectors assessed the capability of the licensee to monitor and examine potential trends in the monitoring well data.

The inspectors reviewed the results of several groundwater monitoring wells that were analyzed during 1999. Several monitoring wells and sumps had gross alpha radioactivity in excess of 15 pCi/l and had gross beta radioactivity in excess of 50 pCi/l. The inspectors reviewed three groundwater gross alpha and beta radioactivity isotopic analyses reports from May, September, and October 1999. The maximum gross alpha radioactivity measured were in monitoring Wells 56, 67, and 74 were 51.5 pCi/l, 1083 pCi/l and 155 pCi/l. The maximum gross beta radioactivity in monitoring Wells 62, 65, and 67 were 204 pCi/l, 429 pCi/l and 785 pCi/l. Groundwater sump results indicated that gross alpha radioactivity in Sumps 2 and 3 were 238 pCi/l and 763 pCi/l. The gross beta radioactivity in Sumps 2 and 3 were 229 pCi/l and 3550 pCi/l. The inspectors asked to review the isotopic analyses used to identify major radionuclides pursuant to license. The licensee records reflected that isotopic analyses were performed on the

groundwater on October 29, 1999. The isotopic analysis report that identified major radionuclides in the groundwater at Sump 2 containing U-234, U-235, and U-238 at 3930 pCi/l, 881 pCi/l, and 5580 pCi/l, respectively.

The inspectors asked licensee representatives if they had conducted an investigation to determine the cause of the problem pursuant to the license. The licensee was having the contract laboratory reanalyze the groundwater samples. Additionally, the licensee had split samples with the contract laboratory and stored the sample for future analysis. However, the inspectors noted that the licensee did not have any written procedures for conducting investigations of groundwater samples, splitting samples, and storing samples. The inspectors further noted that 5580 pCi/l analysis was in excess of any contamination previously reported in Fansteel groundwater. Additionally, the inspectors noted that the concentration of U-238 radioactivity in the Sump 2 groundwater was more than 18 times in excess of the 10 CFR 20, Appendix B, effluent concentration level for U-238.

(3) French Drain System Operations

In June 1999, the licensee had expressed their intent to develop and implement a French drain procedure for the groundwater corrective action system when initial testing was completed. Inspectors toured the groundwater cleanup system (French drain system) during this inspection. However, at the time of this inspection, the licensee had not written an SOP for the French drain system. The licensee was using a temporary procedure for the operating the groundwater system. The inspectors determined that the temporary groundwater procedure had not been reviewed and approved by the Radiation Safety Committee and the PRSO. During the inspection, on November 3, 1999, the inspectors noticed that a red light was flashing at the groundwater evaporation building; however, operations personnel were not responding. The inspectors found that the groundwater sump collection Tank T-10, had overflowed and spilled onto the floor. The red flashing light was the T-10 tank visual high level alarm that operations personnel was suppose to respond to within a reasonable time. However, the temporary groundwater system procedure did not address that Tank T-10 had an alarm and that operations had to take corrective action upon noticing the red flashing light. The licensee indicated that they were aware of the spill problem. The licensee had found that the T-10 tank high switch was broke. One of the operations manager wrote a handwritten instruction for operations to check the T-10 tank every hour. The inspectors determined that the licensee accepted that T-10 tank alarm light continued to flash and that sump water would continue to spill until the procedure and high level alarm switch were fixed. The inspectors noted that the licensee did not think that it was necessary to minimize groundwater sump operations in order to preclude more spills. The inspectors determined that the licensee's decision not to reduce the likelihood of more spills was unreasonable because:

- Groundwater that had spilled from the T-10 tank to the floor had radioactivity that was well in excess of 10 CFR Part 20, Appendix B, Effluent Concentration Level.

- Section 3.5.2 of the General License states, in part, that in the event of any spill in excess of normal end-of-shift cleanup or any spill that requires stoppage of normal activities or duties, the spill must be cleaned to within acceptable limits.

The inspectors found that licensee was satisfied to let the groundwater eventually drain into the floors. Other than to restrict work activities in the groundwater evaporator building, the licensee did not cleanup the spill.

The inspectors concluded that the licensee's failure to have the groundwater sump procedure reviewed by the Radiation Safety Committee and incorporate adequate alarm responses into the procedure to preclude groundwater spills was an example of a violation of the General License which requires the following:

- Chapter 2, Section 2.1.2 of the General License requires, in part, that the Radiation Safety Committee must sign all approved procedure prior to its distribution and use.
- Chapter 2, Section 2.4 of the General License states, in part, that plant procedures shall be reviewed, revised, and approved by the Radiation Safety Committee, then implemented in the plant.
- Chapter 4, Section 4.1 of the General License states, in part, that plant operations shall be conducted in accordance with written procedures. Standard Operating Procedures shall be reviewed, revised, and approved by the Radiation Safety Committee.

From July to November 1999, the licensee implemented the groundwater system and monitoring program without procedures that had been reviewed, signed, and approved by the Radiation Safety Committee (40-7580/9902-02).

#### 4.3 Conclusions

A review of the licensee's environmental monitoring and radioactive waste management programs indicated that the licensee was conducting appropriate surface water effluent monitoring in compliance with the license requirements. The licensee was found to be in violation because they failed to have groundwater cleanup procedures with alarm response instructions that had been reviewed and approved by the Radiation Safety Committee prior to implementation.

### **5 Followup (92701)**

#### 5.1 (Closed) IFI 40-7580/9901-03:Tornado Incident Damage, Response, and Recovery

At approximately 7:00 p.m. on June 1, 1999, the Fansteel facility received substantial tornado damage. The NRC contacted the licensee the next morning to receive a facility damage assessment. According to the licensee, the following was damaged by the tornado:

- The sodium reduction building which contained at least 500 metric tons of radioactive material had been damaged substantially.
- The worker change station, lunch building, and the security station had been destroyed.
- Two groundwater pumping stations and the plant effluent discharge station had been destroyed.
- The facility administration office, warehouse, Chem Buildings A and C, and the groundwater evaporation building had received minor damage.
- All four site air sampling stations were inoperable due to a loss of electrical power.

Licensee management had estimated that it would be at least 4-6 weeks before Fansteel could resume operations. Overall, the inspectors determined that the licensee's tornado recovery efforts were adequate. The NRC determined that the licensee's tornado recovery efforts would be reviewed during a future inspection and would be tracked as an Inspection Followup Item.

During this inspection, the inspectors found that the licensee had recovered from the tornado. The licensee was able to restart some facility operations at the end of July 1999. The worker change station/lunch building and a maintenance shop were still in the reconstruction phase. The inspectors determined that the licensee had adequately addressed facility repairs, and this matter was is closed.

## 5.2 (Closed) URI 40-7580/9901-04: 10 CFR 40.60 Tornado Damage Reportability Determination

On June 1, 1999, the Fansteel facility had received substantial tornado damage. The licensee reported that several 1-ton bags of radioactive material had fallen out of the sodium reduction building. However, the licensee did not report that any of the bags of radioactive material had been breached. The licensee reported that the bags of radioactive material were intact, and no radioactive material or chemical releases had occurred. However, the inspectors found that the sodium reduction building had been 30-40 percent destroyed. At least five or six 1-ton bags of radioactive material had fallen out of the southwest section of the building, and three or four of those bags had been breached. The inspectors observed a crew of workers cleaning up the radioactive material spill. At least 1000 pounds of radioactive material had been recovered and placed in a new bag. However, there appeared to be more than 1000 pounds of radioactive material remaining to be cleaned up.

The NRC determined that the question of whether NRC reporting requirements of 10 CFR 40.60 or 10 CFR 20.2202 were met, as a result of the tornado damage, would be tracked as an Unresolved Item. To resolve this item, more information was needed from the licensee on the amount of material spilled and the amount of time that was required to cleanup the spill and remove the additional radiological controls.

10 CFR 40.60(c)(2) requires, in part, that each licensee that makes a report required by 10 CFR 40.60(b) submit a written followup report within 30 days of the initial report. On June 29, 1999, the licensee sent a written report to the NRC documenting the tornado damage pursuant to 10 CFR 40.60. On October 1, 1999, the licensee sent a followup report. The licensee's reports met the written report requirement of 10 CFR 40.60(c)(2). The licensee concluded that based on the amount of radioactive material that spilled and the time that radiological access controls had to be in-place in order to cleanup the spill, that the tornado event was reportable to the NRC pursuant to 10 CFR 40.60(b)(1). The licensee determined that they did not report the tornado event to the NRC Operations Center via telephone within 24 hours of the event as required by 10 CFR 40.60(c)(1). Based on the information that the licensee provided to the NRC, the inspectors determined that the spill released at least 68 microcuries of uranium-238 and 4.4 microcuries of thorium-232, amounts in excess of five times the lowest annual limit on intake specified in appendix B of 10 CFR Part 20, and covered approximately 2000 square feet of property. This spill resulted in the licensee controlling access to the contaminated area from June 2 through June 4, 1999, a period in excess of 24 hours.

The licensee's failure to report the tornado event to the NRC pursuant to 10 CFR 40.60(b)(1) and 10 CFR 40.60(c)(1) was a violation of NRC requirements (40-7580/9902-03).

### 5.3 (Closed) IFI 40-7580/9901-05 Radioactive Material Container Labeling

At least 500 metric tons of radioactive material from former Ponds 1, 4, and 5 and contaminated soil were contained in hundreds of barrels and bags that have been stored in the sodium reduction building since November 1997. Generally, the sodium reduction building was posted as a radioactive material storage area consistent with 10 CFR 20.1902(e). However, the inspectors noted that the licensee did not have the following knowledge or records concerning the radioactive material stored in the sodium reduction building:

- how many containers (bags and barrels) of radioactive material were in storage;
- the quantity of radionuclides, specific activity, or kinds of material in each container of radioactive material;
- specific labeling that clearly identified the nature of radioactivity in the container such that the worker could avoid or minimize personal exposure;
- the quantity of radioactivity or radiation in each container.

Because the licensee had not quantified the amount of radioactivity in each bag of radioactive material, the licensee could not determine whether the bags required labeling in accordance with 10 CFR 20.1904. The NRC determined that this matter concerning labeling containers of radioactive material would be tracked as an Unresolved Item, pending additional information from the licensee concerning the quantity of radioactive material stored in the sodium reduction building.

During this inspection, the inspectors were able to quantify the amount of radioactivity in each bag. Based on the licensee data, the concentration of radioactivity in each bag was 282 pCi/g uranium and 352 pCi/g thorium. Essentially, a metric ton bag of the radioactive material would contain 281  $\mu$ Ci of uranium and 351  $\mu$ Ci of thorium. Based on the amount of radioactive material in each bag, labeling pursuant to 10 CFR 20.1904 would be required. However, in licensee correspondence dated October 1, 1999, Fansteel explained why they thought that 10 CFR 20.1905(e) exempted them from labeling the bags of radioactive material. The exemption applied if the containers were accessible only to authorized workers, and the contents of the containers had to be identified to workers by readily written records. The inspectors determined that the licensee did not have adequate records or access controls in-place until October 1999. The PRSO agreed to submit a license amendment request for a labeling exemption for radioactive material stored in the sodium reduction building. Based on the licensee's current access controls and radioactive material information posted at the entrance to the sodium reduction building, the inspectors determined that this matter was closed.

## **6 Exit Meeting Summary**

The inspectors presented the inspection results to licensee representatives at the conclusion of the onsite inspection. The licensee representatives acknowledged the findings as presented. During this inspection, Fansteel did not provide any proprietary documents to the inspectors for review.



**ATTACHMENT**

**SUPPLEMENTAL INFORMATION**

**PARTIAL LIST OF PERSONS CONTACTED**

Licensee

- \*J. Burgess, Operations Manager, Maintenance and Utilities
- \*J. Hunter, General Manager and Assistant Radiation Safety Officer
- \*M. Mocniak, Vice President and General Counsel
- \*M. Mooring, Plant Radiation Safety Officer and Plant Safety Director
- \*C. Petit, Operations Manager, Process Plant
- \*G. Richards, Process Engineering Manager

State of Oklahoma Department of Environmental Quality (ODEQ)

P. Bishop, ODEQ, Radiation Section

**INSPECTION PROCEDURES USED**

IP 88005	Management Organization and Controls
IP 83822	Radiation Protection
IP 88035	Radioactive Waste Management
IP 88045	Environmental Monitoring
IP 88058	Standard Operating Procedures
IP 88001	Construction Review
IP 88104	Decommissioning of Fuel Cycle Facilities
IP 92701	Followup
IP 93001	OSHA Interface Activities

**ITEMS OPENED, CLOSED AND DISCUSSED**

Opened

40-7580/9901-01	IFI	Followup of Fansteel's license amendment for an organization change.
40-7580/9902-02	NOV	Failure to implement the radiation protection program and groundwater cleanup operation without Radiation Safety Committee reviewed and approved procedures.
40-7580/9902-03	NOV	Tornado damage and event reporting requirements pursuant to 10 CFR 40.60 and 10 CFR 20.2202.

Closed

40-7580/9901-03	IFI	Followup of Fansteel's tornado recovery efforts.
40-7580/9901-04	URI	Tornado damage and event reporting requirements pursuant to 10 CFR 40.60 and 10 CFR 20.2202.
40-7580/9901-05	URI	Radioactive material container labeling requirements pursuant to 10 CFR 20.1904.

Discussed

None

## LIST OF ACRONYMS USED

CaF <sub>2</sub>	calcium fluoride
CFR	Code of Federal Regulations
Chem	chemical
dpm	disintegrations per minute
IFI	inspection followup item
IP	Inspection Procedure
NMSS	Nuclear Material Safety and Safeguards
NRC	Nuclear Regulatory Commission
ODEQ	Oklahoma Department of Environmental Quality
pCi	picocurie (2.22 dpm)
pCi/l	picocurie per liter
pCi/g	picocurie per gram
PRSO	plant radiation safety officer
SDMP	Site Decommissioning Management Plan
SWP	special work permit
TLD	thermoluminescent dosimeter
URI	unresolved item
WIP	work-in-progress