U. S. NUCLEAR REGULATORY COMMISSION

REGION III

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License No:	SUB-526
Report No:	040-03392/98003(DNMS)
Licensee:	AlliedSignal, Inc.
Facility:	Metropolis Works
Location:	P.O. Box 430 Metropolis, IL 62960
Dates:	March 2 - 6, 1998
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EXECUTIVE SUMMARY

AlliedSignal, Inc., Metropolis Works
NRC Inspection Report 040-03392/98003(DNMS)

Augmented Inspection Team Followup

- Several procedural and policy requirements were not followed during the low boiler condenser work that was performed on January 27, 1998. As a result, three workers received hydrofluoric acid burns to their skin and a release of toxic uranium hexafluoride was spread to several levels of the Feed Materials Building. Two apparent violations were identified for failure to follow two separate sections of the Vessel Washing Procedure in the Distillation Manual. The root cause for these apparent violations appeared to be that management's expectations for procedural adherence was not clear in some cases and had been eroded through acceptance of site practices that contradicted procedural directions. (Section 1.1)

- The inspectors identified an apparent violation of the Radiological Contingency Plan and its implementing instruction which involved the failure to execute certain release response measures such as sounding the disaster siren, shutting down exhaust fans, and shutting down the mudball feed and water supply. The root cause of the apparent violation appeared to result from miscommunication and inattention to the response instructions on the part of plant staff responding to the event. (Section 1.2)

Facility Operations

- The inspectors identified an apparent violation in that the licensee continued operations in the fluorination and distillation plants without maintaining a standby generator for essential emergency electric utilities to safely shut down the plant upon loss of offsite power. The root cause for the apparent violation appeared to be the result of facility management not fully understanding the requirements that were specified in Chapter 5 of the license application. (Section 2.1)

- The inspectors identified an apparent violation for the licensee's failure to report the loss of the standby diesel generator to the NRC in a timely manner. The root cause for the apparent violation appeared to be the result of licensee management not fully understanding the requirements specified in the reporting procedure. (Section 2.2)

- Two apparent violations were identified as a result of the inspectors' review of the licensee's process for performing the chemical hazards assessment and developing an appropriate mechanical integrity program to maintain the safety equipment identified by that assessment. The root cause for the apparent violations appeared to be management and staff lack of familiarity with plant policy and license requirements for the processes involved. (Section 2.3)

Emergency Preparedness

- The licensee maintained an emergency response capability in accordance with the requirements in the license application and Radiological Contingency Plan. (Section 3.1)

Transportation

- Release of contaminated pigtail gaskets with total or removable beta-gamma radiation which exceeded the licensee's free-release criteria was identified as an apparent violation. The root cause of the apparent violation appeared to result from inattention to detail on the part of operators responsible for preparing cylinder shipments. (Section 4.1)

Radiation Protection

- The inspectors identified an apparent violation of the licensee's program for instrument calibration and monitoring detailed in Section 3.2.4 of the license application. The root cause for the apparent violation appeared to result from a lack of oversight on the part of Health Physics (HP) management and staff. Specifically, there was no tracking mechanism for calibrating a Victoreen 190 (Serial Number 2034) which the HP staff used routinely in preparing tank entry permits. (Section 5.1)

- The 1997 exposure monitoring results available at the time of the inspection indicated that, barring any abnormal external exposure results for the month of December 1997, the total effective dose equivalents and shallow dose equivalents for personnel working at the facility would be well below regulatory limits. (Section 5.2)

Maintenance and Surveillance Testing

- The licensee performed inspections and preventive maintenance tasks in accordance with the checklists and frequencies identified in the Maintenance Management System database, referenced in Section 13.4.8 of the license application. (Section 6.1)

Radioactive Waste Management

- The licensee had an active program for managing the radioactive wastes currently generated onsite and plans for continued reduction of radioactive wastes which have accumulated over years of operation. (Section 7.1)

Material Control and Accounting

- The licensee initiated corrective action to resume submitting annual inventory reports for foreign originated uranium source material to the NRC. The report for 1997 was to be manually submitted by April 3, 1998, and resubmitted in a computer-readable format by June 30, 1998. The Interim Plant Manager stated that all inventory statements thereafter would be in computer-readable form, as specified by NUREG-0007. (Section 8.1)

Report Details

I. Followup to Augmented Inspection Team Findings

1.1 Deviation from Vessel Washing Procedure Resulting in Uranium Hexafluoride Release

a. Inspection Scope (88020)

The inspectors reviewed the circumstances leading to the January 27, 1998, hazardous uranium hexafluoride (UF_6) release as documented in the Augmented Inspection Team (AIT) Report dated March 6, 1998. In addition, the inspectors reviewed the root cause identified by and the corrective actions taken by the licensee as of the date of this inspection.

b. Observations and Findings

Several operations at the facility involved high-risk interactions with highly hazardous chemicals. Based on information provided by senior plant management, one of the highest risk activities at the Metropolis Works facility was breaking lines that contain hazardous chemicals such as anhydrous hydrofluoric acid (HF) or uranium hexafluoride (UF_6). This information was based on the number of "sunburn" type HF burns that have occurred at the plant. These "sunburn" type burns were indicative of relatively small exposures of HF to the skin that cause reddening of the affected areas which were nevertheless considered significant due to the very nature of the hazards involved. Furthermore, line breaking was considered a higher risk activity because it involved breaking into a closed system. To further minimize the potential for exposures as a result of line breaking activities, the licensee imposed several levels of protection to help prevent a release or to mitigate the consequences of a release.

Licensee management implemented a set of Metropolis Plant "Work Rules." These rules were put in place to provide a safe, well organized, and efficient operation. Within these instructions were the requirements to wear personnel protective equipment (PPE) as defined in the Employee Safety Handbook. Page 23 of the latest revision (1995) of the Employee Safety Handbook described the requirements for PPE during line-breaking activities. Specifically, a complete acid resistant suit and gauntlet-type gloves taped atop the jacket sleeves were required to prevent chemical releases from contacting a person's skin. No additional protection was specified for the head area other than requirements for wearing appropriate respiratory protection. As noted in the AIT Report, Section 10.4.2 of the Vessel Washing Procedure in the Distillation Manual, dated February 1997, did not require the protective gloves to be taped atop the sleeves of the acid resistant suit or any head and neck protection other than the respirator requirements. Although there were no specific regulatory requirements that the licensee comply with the Employee Safety Handbook, the lack of a requirement in the Vessel Washing Procedure to tape gloves over the suit, and the lack of any protection for the exposed area of the head during line-breaking evolutions, appeared to be a weakness in the licensee's safety program. In response to the issue raised by the NRC, the licensee revised the Vessel Washing Procedure to incorporate the safety measures in the Employee Safety Handbook and initiated an investigation to identify other methods for protecting the exposed area of the worker's head.

The Vessel Washing Procedure was used by operators to prepare the vessels in the distillation process for maintenance. This procedure was used to prepare the Number 2 Low Boiler Condenser for the washing operations that occurred in the week prior to the

release on January 27, 1998. After the condenser had been washed, this procedure was used to return the condenser to service. Part of this evolution required removal of a blank or skillet from a flange on the impurities pipe line (PP-5). The blank had been installed because the online condenser shared a common line with the offline condenser, and the blank provided further isolation of the process gasses (UF_6) from the offline condenser (vessel being washed).

During the blank removal process, operators were required to perform several valving steps and line evacuations to remove all remaining UF_6 from the PP-5 line prior to opening the pipe flange and removing the blank. Specifically, Section 10.4.9 of the Vessel Washing Procedure required operators to close the valve closest to the online condenser (Number 4) on the PP-5 line and evacuate UF_6 from this line for 15 to 20 minutes. Then, the operator was required to open both valves on the PP-5 line for the offline condenser (Number 2) and further evacuate UF_6 from the line for 10 to 15 minutes. If there were any deposits of UF_6 behind the blanked flange, these last 10 to 15 minutes of evacuation would remove the deposits. Finally, operators were required to close both isolation valves on the PP-5 line of the offline condenser. Maintenance mechanics could then open the flange by loosening the flange bolts and remove the blank. It was at this point of the procedure on January 27, 1998, when UF_6 was released from the flange joint. Two maintenance mechanics and one assistant operator were burned by HF in the head and neck areas, when the released UF_6 hydrolyzed with the moisture in the air and on the skin. In addition, one mechanic was burned on the forearm when the materials entered between the glove and sleeve of the chemical suit and contacted skin.

During conversations with the assistant operator involved with this evolution on January 27, 1998, and with several other operations personnel that had performed condenser washing work on other occasions, the inspectors identified that the general practice was to evacuate UF_6 from the PP-5 line for the online condenser for approximately five minutes and to evacuate UF_6 from the PP-5 line for the offline condenser for less than five minutes prior to removing the blank. Additionally, these interviews indicated that it was operators' general practice to leave the valves on the PP-5 line of the offline condenser partially open during the removal of the blank thereby causing a vacuum to preclude a UF_6 release.

Condition 10 of Materials License SUB-526 required that licensed material be used in accordance with statements, representations, and conditions in Chapters 1 through 7 of the application dated July 11, 1994, as amended. Section 2.6 of Chapter 2, "Operating Procedures," stated, in part, that "plant operations shall be conducted in accordance with written Standard Operating Procedure Manuals." Section 10.4.9(5) of the Distillation Manual required, in part, that "the inboard valve on the PP-5 line on the online condenser be closed and evacuated for approximately 15 to 20 minutes to assure UF_6 evacuation. Then, open the inboard and outboard valve on the PP-5 on the condenser to be hooked up and evacuate UF_6 for approximately 10 to 15 minutes, then close the inboard and outboard [valves] on the condenser to be hooked up." Failure to evacuate the PP-5 line for the required time (10 to 15 minutes) and the failure to fully close the isolation valves on the PP-5 line of the condenser prior to maintenance mechanics opening the flange to remove the blank on January 27, 1998, as required by Section 10.4.9(5) of Distillation Manual is **an apparent Violation (EEI 040-03392/98003-01)**.

The low boiler condensers were located of the sixth floor of the Feed Materials Building. This floor also housed the intake for the Distillations Hastings Heater. Section 10.4.2 of the Vessel Washing Procedure (Distillation Manual) required that the Distillations Hastings Heater be shut down during line openings on the UF_6 low boiler condensers. (In

the event of a release during the line opening, the heater could spread the release to other floors of the building.) During the January 27, 1998, line opening for the Number 2 Low Boiler Condenser, the assistant operator did not shut down the Distillations Hastings Heater. When maintenance mechanics subsequently opened the flange on the PP-5 line for this condenser, a UF_6 release occurred and the intake of the heater blower pulled in the material released and transferred the material to other floors of the FMB. Failure to shut down the Distillations Hastings Heater during line opening for the Number 2 Low Boiler Condenser on January 27, 1998, as required by Section 10.4.2 of the Distillation Manual is **an apparent Violation (EEI 040-03392/98003-02)**.

Licensee management indicated that the root cause of the January 27, 1998 release was a lack of procedural knowledge on behalf of the operator. The NRC AIT report (040-3392/98002(DNMS)), issued on March 6, 1993, indicated that the AIT concluded that the root cause appeared to be that management's expectations for procedural adherence was not clear in some cases and had been eroded through acceptance of site practices that contradicted procedural directions.

As corrective actions, the licensee revised the Vessel Washing Procedure to permit cracking open the isolation valves on the condenser in order to ensure a vacuum on the line side of the PP-5 pipe flange when it was opened. In addition, the licensee provided retraining to all operators on the requirements in the Vessel Washing Procedure for shutting down the Distillations Hastings Heater and evacuating the PP-5 lines for the condenser impurities manifold.

c. Conclusions

Several procedural and policy requirements were not followed during the low boiler condenser work that was performed on January 27, 1998. As a result, three workers received HF burns to their skin and a release of uranium hexafluoride was spread to several levels of the Feed Materials Building. Two apparent violations were identified for failure to follow two separate sections of the Vessel Washing Procedure in the Distillation Manual. The root cause for these violations appeared to be that management's expectations for procedural adherence was not clear in some cases and had been eroded through acceptance of site practices that contradicted procedural directions.

1.2 Radiological Contingency Plan Implementation Deficiencies

a. Inspection Scope (88050)

The inspectors reviewed the licensee's event response for the January 27, 1998, UF_6 release as documented in the AIT Report dated March 6,1998. In addition, the inspectors reviewed root causes and corrective actions taken by the licensee as of the date of this inspection.

b. Observations and Findings

The AIT Report documented that the licensee's response was generally effective. However, deviations from the Radiological Contingency Plan (RCP) were identified by plant staff and by the NRC. In particular, the AIT noted a lack of effective communication of the classification of the event as an ALERT to personnel onsite during the event. In addition, an assistant operator involved in the release bypassed the decontamination control point and reported to the site dispensary while still contaminated.

As documented in the AIT Report, the event response did not include certain response measures required for a release classified as an ALERT. Specifically, there were some activities identified in the Radiological Contingency Plan (RCP) and its associated "Instructions for UF_6 Release Control," dated June 6, 1991, posted near the alarm panel in the control room, which were not completed. The Distillation Exhaust Fan (SW-28) and other FMB exhaust fans were not shut down. The failure to shut down the exhaust fans meant contaminated air and vapor from the sixth floor continued to be circulated to other floors of the FMB during the event. Finally, the mudball feed and water supply, located on the opposite side of the FMB, was not shut down.

Condition 11 of Materials License SUB-526 required that the licensee maintain and execute the response measures in the Radiological Contingency Plan (Emergency Plan) dated August 15,1993, or as provided by the licensee consistent with 10 CFR 40.35(f). Appendix A of the RCP, "UF_6 Release Control Procedure," Section entitled "Release Control," Step 3 required that "[t]he Control Room Officer will ensure all the items on the 'Instructions for UF_6 Release Control' have been completed." The "Instructions for UF_6 Release Control" dated June 6, 1991, required, in part, that the following measures be completed in response to a release: activate the fire and disaster alarm; shut down the Distillation Exhaust Fan (SW-28); shut down the building [FMB] exhaust fans; and, shut down the mudball feed and water supply. Failure to execute the identified response measures (not sounding the disaster alarm, not shutting down exhaust systems, and not shutting down the mudball feed and water supply) required by the RCP for an uranium hexafluoride release on January 27,1998, as required by "Instructions for UF_6 Release Control," is **an apparent Violation (EEI 040-03392/98003-03).**

The licensee developed corrective actions and an action plan in response to the deficiencies identified in the AIT Report. The corrective actions for the RCP implementation problems included: retraining all officers in RCP emergency classification process; revising and clarifying the "Instructions for UF_6 Release Control"; retraining health physics officers on when to upgrade a release to an ALERT or SITE AREA EMERGENCY; retraining all staff on decontamination procedures and reporting; and, evaluating the FMB sirens for audibility after installation of a new public address system had been completed at the facility. An action plan was developed that identified each item with a target date for its completion or implementation.

c. Conclusion

The licensee's response was effective in that no radiological or chemical consequence to members of the general public resulted from the January 27, 1998, UF_6 release event. The inspectors identified an apparent violation of the Radiological Contingency Plan and its implementing instruction which involved the failure to execute certain release response measures such as sounding the disaster siren, shutting down exhaust fans, and shutting down the mudball feed and water supply. The root cause of the apparent violation appeared to result from miscommunication and inattention to the response instructions on the part of plant staff responding to the event.

II. Operations

2.1 Standby Diesel Generator Failure

a. Inspection Scope (88020)

The inspectors reviewed the circumstances surrounding the February 28, 1998, loss of offsite power (a safety essential utility) event and a concurrent failure of the standby diesel generator.

b. Observations and Findings

The Metropolis Works facility received offsite electrical power through a 69-kilovolt substation within the restricted area fence. Since the chemical processes operating at the Metropolis Works facility contained hazardous materials at elevated temperatures and pressures, these processes relied on many electrically operated safety features. Additionally, some of the chemicals (including UF_6) were required to be heated to reduce the possibility of unsafe solidification in the process equipment. This heating process was primarily supported with steam from the licensee's three boilers, which required electricity to operate. Finally, several other safety functions required electricity to operate, including the emergency lights, the building evacuation sirens, the radiation warning lights, the FMB public address system, and one fluorination scrubbing train.

At approximately 11:40 p.m. (Central Standard Time) on Saturday, February 28, 1998, a lightning arrestor failed and portions of the AlliedSignal Metropolis Works site, including the distillation plant and the boilers, lost offsite electrical power. As designed, the standby (backup) generator (G-126) automatically started and powerhouse operators began electrically connecting the standby generator to required site safety equipment as defined in the powerhouse operating procedure. In the FMB, when the offsite power was lost, distillation operators used the vacuum generated by the cold traps to evacuate the fill lines and the fill pigtail of the cylinder being filled. At approximately 12:10 a.m., on March 1, 1998 (30 minutes after safety essential electric power was lost), the standby generator failed and the plant was without backup power until approximately 6:00 p.m. on Monday, March 2, 1998. At 1:30 a.m. on Sunday, March 1, 1998, the electrical supervisor restored primary offsite power (but not backup power) to the affected onsite locations, and the licensee continued operations in the fluorination and distillation areas of the FMB.

The licensee continued to operate the distillation and fluorination plants (producing UF_6) until the morning of March 2, when the Interim Plant Manager terminated UF_6 production because he was concerned about the availability and reliability of safety essential electric utilities. The Interim Plant Manager stated that he was not familiar with the discussion of the safety essential standby diesel generator in Section 5.5 of the license, but was familiar with the Radiological Contingency Plan requirements for safety essential standby power.

Condition 10 of Materials License SUB-526 required that licensed material be used in accordance with statements, representations, and conditions in Chapters 1 through 7 of the application dated July 11, 1994, as amended. Section 5.5 of Chapter 5, "Standby Utilities," stated, in part: "Standby utilities are maintained in order to facilitate a safe and orderly shutdown of the process units during a complete power failure. . .Standby electrical power is provided from an electrical generator located in the powerhouse building. . .In the event that electrical power is interrupted, the standby generator

automatically starts and comes to a 'standby' mode..Standby power is provided [from the electrical generator] to critical instrumentation in the fluorination and distillation areas of the UF_6 process and to one fluorination scrubbing train. This gives operating personnel the capability to monitor the in-process UF_6 and to evacuate piping or vessels as needed to maintain the process in a safe condition." The continuation of operations in the distillation and fluorination areas of the plant from approximately 12:10 a.m. on March 1 to approximately 8:00 a.m. on March 2, 1998, without maintaining the safety essential standby electrical generator available and reliable to provide standby electric power during an offsite electric power failure is **an apparent Violation (EEI 040-03392/98003-04)**.

On Monday, March 2, 1998, a backup generator was acquired and electrically connected by approximately 5:00 p.m. to substitute for the failed G-126 generator. The licensee evaluated the specifications of the replacement generator and determined it would provide the same load capability as the existing G-126 generator. Training was also provided to all powerhouse operators on how to operate the new replacement generator. The inspectors noted that the replacement generator had not been connected for automatic start-up upon loss of offsite power and that this feature was identified in Section 5.5 of the license application. At the end of the inspection, the licensee had established the electrical connections to provide the automatic start function. In addition, the licensee shipped the failed diesel generator back to the manufacturer to determine the root cause of the failure. This root cause and the appropriate corrective actions will be transmitted to the NRC within 30 days of the event as part of the written report required per 10 CFR 40.60.

c. Conclusions

The inspectors identified an apparent violation in that the licensee continued operations in the fluorination and distillation plants without maintaining a standby generator for safety essential emergency electric utilities to safely shut down the plant upon loss of power. The root cause for the apparent violation appeared to be the result of facility management not fully understanding the requirements that were specified in Chapter 5 of the license application.

2.2 Failure to Report a Loss of Standby Diesel Generator

a. Inspection Scope (88020)

The inspectors reviewed the reportability of the failure of the safety essential standby diesel generator on March 1, 1998, by reviewing the licensee's reporting procedure and 10 CFR 40.60.

b. Observations and Findings

Condition 10 of Materials License SUB-526 required that license material be used in accordance with statements, representations, and conditions in Chapter 1 through 7 of the application dated July 11, 1994, as amended. Section 2.8 of Chapter 2 of the license application required, in part, that the Plant Manager report incidents which are reportable to the NRC in accordance with the Health Physics Procedure, "Procedure for Reporting Radioactive Materials Incidents to the Nuclear Regulatory Commission." Section 3.2.2 of this procedure required that a failure of the plant emergency generator be reported to NRC via telephone within 24 hours of discovery of such an event. Contrary to this requirement, the licensee did not report the diesel generator failure to the NRC until

4:17 p.m. (Central Standard Time) on March 3, 1998, a period of approximately 40 hours after the emergency generator had failed at 12:10 a.m. on March 1, 1998. The Safety Supervisor indicated that plant staff were not aware of the reporting requirement in the procedure prior to the inspectors' questions. As a result, the issue had not been reviewed for reporting to the NRC. Failure to report the loss of the standby diesel generator to the NRC within 24 hours, as required by the Health Physics Procedure, is **an apparent Violation (EEI 40-3392/98003-05)**.

c. Conclusion

The inspectors identified an apparent violation for the licensee's failure to report the loss of the standby diesel generator to the NRC. The root cause for the apparent violation appeared to be the result of licensee management not fully understanding the requirements specified in the reporting procedure.

2.3 Review of Deconversion of Uranium Hexafluoride Pilot Plant

a. Inspection Scope (88020)

The inspectors reviewed the status of the Deconversion of Uranium Hexafluoride (DUF_6) Pilot Plant. The review included evaluation of the high-risk elements of the pilot plant and the dominant controls for those risks. Specifically, the inspectors reviewed the Chemical Hazard Assessment (or Process Hazard Assessment) and the development and implementation of the Mechanical Integrity (MI) Program.

b. Observations and Findings

b.1 Chemical Hazard Assessment

The DUF_6 pilot plant began operations on February 27, 1998. The plant was designed to convert UF_6 to uranium oxide. A byproduct of this conversion was hydrofluoric acid (HF), which was removed as an offgas, filtered to remove entrained solids, and then distilled to produce anhydrous HF. The chemical safety risks associated with this operation included: UF_6 gas, oxide reactor high-temperature HF offgasses, high-temperature steam, and anhydrous and aqueous HF.

To evaluate the hazard that may be present as a result of this type of operation, the license application required that a chemical hazard assessment be performed. Condition 10 of Materials License SUB-526 required that license material be used in accordance with statements, representations, and conditions in Chapter 1 through 7 of the application dated July 11, 1994, as amended. Section 5.4 of Chapter 5, "Chemical Safety Plan (CSP)," stated, in part, that the plant shall comply with the specific elements of the CSP as described in Chapter 13.4. Section 13.4.2, "Chemical Hazard Assessment," stated, in part, that "AlliedSignal employs the "What If" method [or other methodologies] as a formal technique for identifying the potential hazards of a facility, evaluating the significance of the hazards, evaluating the adequacy of existing safeguards, and identifying preliminary recommendations for reducing the likelihood or severity of potential hazards. The plant hazard assessment team [that performs these assessments] is composed of an engineer (usually the team leader) from the Technical area who is trained in and has experience in the "What If" methodology [performing chemical hazard assessments]. Additionally, the results of the [chemical hazard] assessment are reviewed by the Process Safety Management Steering Committee to

assure that plant policy was followed in the completion of the document. Next, the assessment with action plan is reviewed and approved by the Plant Manager."

The inspectors reviewed the preliminary DUF_6 Pilot Plant Process Hazard Assessment, dated February 7, 1997. This Process Hazard Assessment (PHA) was a preliminary attempt to identify the hazards associated with the DUF_6 process. The licensee noted in the cover letter of the PHA that the emphasis of the PHA was on the design of the system and additional sessions were necessary to cover potential mishaps [i.e., operational upsets and risk significant operating issues] during the operations of the facility. The inspectors noted that the team that performed the Deconversion Pilot Plant PHA did not have any team member trained in or experienced in performing chemical hazard assessments. The inspectors also noted that the results of this preliminary chemical hazard assessment were not reviewed by the Process Safety Management Steering Committee to assure that plant policy was followed, and the assessment and the associated action plan was not reviewed and approved by the Interim Plant Manager prior to startup. The inspectors concluded that the licensee did not comply with the Chemical Safety Plan requirement for performing a chemical hazard assessment for the DUF_6 Pilot Plant. Failure to comply with the requirements for performing a chemical hazard assessment as detailed in Section 13.4 of the license application for the DUF_6 pilot plant is **an apparent Violation (EEI 040-03392/98003-06)**.

b.2 Mechanical Integrity Program

The main purpose of a PHA is to define the highest-risk aspects of the process evaluated. Once these high-risk areas have been defined, the PHA should further evaluate the process to determine the dominant controls for those risks and ensure that those controls maintain risk to an acceptable level. The engineering controls documented in the PHA are risk-ranked and the highest risk controls would be maintained available and reliable in normal, off-normal, and emergency conditions. (This maintenance program is called a Mechanical Integrity (MI) program.)

Condition 15 of Materials License SUB-526 required, in part, that an MI program be in place prior to the DUF_6 process starting. Occupation Safety and Health Administration regulations stated that an MI program applies to pressure vessels and storage tanks; piping systems (including valves); relief and vent systems and devices; emergency shutdown systems; controls (including monitoring devices and sensors, alarms, and interlocks); and pumps and that the MI program should also have the following:

1. Implemented written procedures to maintain the ongoing integrity of the process equipment (as listed above);
2. Training for process maintenance activities;
3. Inspection and testing that includes implemented procedures, defined frequencies, and documentation of the test;
4. Method to fix equipment deficiencies that fall outside of the PSI; and,
5. Quality assurance program.

The inspectors noted that the MI program for the DUF_6 process had not been fully implemented in that: certain pieces of equipment were not included in the list of covered equipment (e.g., anhydrous hydrofluoric acid pump); a comprehensive list of the covered process equipment had not been developed; and, no procedures were in place to perform inspections or tests in the future as required by the licensee's policy manual for an MI program. Upon learning of the inspectors' findings, the Interim Plant Manager shut down operations on March 4, 1998, pending a formal evaluation of the MI program.

Subsequently, the Interim Plant Manager notified the NRC that the MI program was not fully in place when UF_6 was first introduced into the process on February 27, 1998. Failure to have an MI program in place before the Deconversion of Uranium Hexafluoride Pilot Plant began operation as required by Condition 15 of the license is **an apparent Violation (EEI 040-03392/98003-07)**.

c. Conclusion

Two apparent violations were identified as a result of the inspectors' review of the licensee's process for performing the chemical hazards assessment and developing an appropriate mechanical integrity program to maintain the safety equipment identified by that assessment. The root cause for the apparent violations appeared to be management and staff lack of familiarity with plant policy and license requirements for the processes involved.

III. Emergency Preparedness

3.1 Maintenance of Emergency Response Capability

a. Inspection Scope (88050)

The inspectors reviewed selected aspects of the licensee's emergency response program, including emergency responder training, emergency equipment inventory, and interactions with offsite response organizations.

b. Observations and Findings

The licensee maintained emergency response and fire brigade teams for each shift. Emergency responders received 24 hours of training during 1997, including 8 hours of scenario maintenance training, 8 hours of fire, rescue, and confined space entry training, and 8 hours of first aid training. Fire brigade members received hands-on training on pallet fires, confined space entry, and search and rescue at a training facility in Calvert City, Kentucky. The training performed met the requirements in Section 2.5 the license application for maintaining a qualified emergency response organization at the facility.

The inspectors performed a selected inventory of emergency equipment cabinets onsite. All the supplies identified in the RCP were available in the cabinets. Cabinets were maintained on all floors of the FMB as well as locations outside. In addition, the licensee purchased and stocked a mobile van which could be driven to any location onsite to support the emergency response team.

The inspectors also reviewed the letters of agreement signed by the licensee and local hospitals for emergency medical treatment. The licensee had three current letters of agreement, signed in 1997, with local hospitals in Metropolis, Illinois and Paducah, Kentucky. The licensee updated the letters annually and offered to provide specific training on the radiological and chemical hazards present at its facility for responsible medical personnel. The Supervisor of Safety indicated that the local volunteer fire department had been approached in the past to develop a similar arrangement; however, the fire department had not responded to the licensee's request. The supervisor stated that the licensee's fire brigade was trained in the types of fires that potentially could occur onsite, with at least four qualified fire fighters onsite at all times.

c. Conclusions

The licensee maintained an emergency response capability in accordance with the requirements in the license and Radiological Contingency Plan.

IV. Transportation

4.1 Release of Contaminated Gaskets with Cylinder Shipments

a. Inspection Scope (86740)

The inspectors reviewed the circumstances surrounding a notification by Paducah Gaseous Diffusion Plant (PGDP) under 10 CFR 20.1906 that contaminated gaskets exceeding the Department of Transportation (DOT) limits had been shipped to Paducah on two separate cylinder shipments.

b. Observations and Findings

On February 18, 1998, the NRC was notified that on two separate shipments originating at the licensee's facility on that date, pigtail gaskets with total or removable contamination levels above the levels specified in the DOT regulations were found on cylinders upon arrival at PGDP. One gasket had total (fixed plus removable) contamination of 35,000 disintegrations per minute per 100 square centimeters or less (dpm/100 cm^2) of beta-gamma radiation; another gasket had removable contamination of 10,500 dpm/100 cm^2 of beta-gamma radiation; and, another gasket had removable contamination of 8,400 dpm/100 cm^2 of beta-gamma radiation. No unacceptable levels of contamination were identified on the associated cylinders.

The pigtail gaskets were discarded as waste when the cylinders were disconnected from the filling manifold at Metropolis Works. The gaskets landed on the skirts of two cylinders in an area where operators could not readily observe them. However, the licensee's cylinder yard operators had a checklist which required them to specifically check for discarded pigtail gaskets because of past incidents where contaminated gaskets had been improperly released with cylinder shipments. The inspectors review indicated that the checklists had been used, but the operators had not identified the gaskets because of an oversight or inattention to detail. The inspectors noted that although two operators were typically assigned to prepare a cylinder shipment, the licensee's process did not incorporate any independent verification of the items on the checklist. As corrective actions for the incident, the licensee revised the checklist to clarify and reemphasize the importance of checking for contaminated pigtail gaskets on cylinders to be shipped and retrained responsible operators.

Condition 10 of Materials License SUB-526 required, in part, that licensed material be used in accordance with the statements, representations, and conditions in Chapters 1 through 7 of the application dated July 11, 1994, as amended. Section 1.6.3 of Chapter 1 required that release of equipment or packages from the plant site be in accordance with "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 April 1993. Table 1 of the "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material," specified that the acceptable surface contamination levels for equipment contaminated with natural uranium and associated decay products were: (a) a maximum of 15,000 dpm/100 cm^2 for total alpha or beta-

gamma contamination; and (b) a maximum of 1,000 dpm/100 cm^2 for removable alpha or beta-gamma contamination. The release of three contaminated pigtail gaskets from the plant site on February 18, 1998, with total or removable beta-gamma contamination levels exceeding the acceptable limits detailed in Table 1 of the "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material," is **an apparent Violation (EEI 040-03392/98003-08).**

c. Conclusions

Release of contaminated pigtail gaskets with total or removable beta-gamma radiation which exceeded the licensee's free-release criteria was identified as an apparent violation. The root cause for the apparent violation appeared to result from inattention to detail on the part of operators responsible for preparing cylinder shipments.

V. Radiation Protection

5.1 Instrument Calibrations

a. Inspection Scope (83822)

The inspectors reviewed the status of the licensee's program for calibrating instruments used to perform radiation and contamination surveys by examining instruments in use, reviewing selected surveys, and reviewing selected calibration reports.

b. Observations and Findings

The licensee's program for calibrating and using radiation and contamination detection instruments was described in Section 3.2.4 of the license application. The selected review indicated that the instruments used to perform surveys for surface contamination at the facility had been appropriately calibrated on a quarterly frequency, as required. However, the health physics (HP) staff could not locate any calibration records and could not recall calibrating a Victoreen 190 (Serial Number 2034) routinely used to perform exposure rate surveys of process vessels in preparing tank entry permits since July 31, 1996. The HP staff indicated the missed calibration for the Victoreen 190 was due to an oversight. The inspectors noted that the licensee did not have a tracking system for instruments at the facility which specifically indicated which instruments were in calibration and which were not. The licensee relied upon technicians to round up instruments to be calibrated when a calibration procedure was to be performed. Upon identification by the NRC that the instrument was out of calibration, the licensee immediately calibrated the instrument.

The inspectors reviewed the exposure rate calibration performed on March 5 and noted that the instrument readings on the "x10" scale were off by up to 50 percent, although in the conservative direction. In reviewing the calibration procedure, "Procedure for Calibration of Geiger-Mueller Portable Radiation Survey Instruments," the inspectors noted that there were no acceptance criteria in the procedure for when an instrument was considered to be out of tolerance. As a result, the HP technicians performing the calibration did not have any guidance for correcting as-found instrument deficiencies. The procedure did, however, require a calibration curve be generated which could be referenced to correct readings if necessary.

The inspectors identified an Eberline 600 instrument (Serial Number 891) used to perform contamination and exposure rate surveys for ore concentrates shipments (including trucks and trailers) to the facility that did not have a check source for ensuring continued reliable operation. The HP staff indicated the instrument had been in routine use since it was last calibrated in November 1997. The HP staff were not specifically aware that the license application required check sources for instruments. The instruments which had been in use for a number of years had check sources; however, the Eberline 600 instrument which was purchased within the last year did not have a check source. The HP technicians indicated they did not routinely check the instrument for stable response. The HP staff immediately located a check source for the Eberline 600 instrument.

Condition 10 of Materials License SUB-526 required, in part, that licensed material be used in accordance with the statements, representations, and conditions in Chapters 1 through 7 of the application dated July 11, 1994, as amended. Section 3.2.4, "Radioactivity Measurement Instrumentation," of Chapter 3 required, in part, that Geiger-Counter instruments routinely used in radiation surveys be calibrated on a quarterly frequency or immediately before use. In addition, Section 3.2.4 stated: "Appropriate check sources are also available to monitor instrument response during use." Failure to calibrate a Victoreen 190 routinely used to perform radiation surveys for tank entries since July 31, 1996, and failure to have a check source available to monitor the response of an Eberline 600 instrument routinely used to perform radiation and contamination surveys is **an apparent Violation (EEI 040-03392/98003-09).**

c. Conclusions

The inspectors identified an apparent violation of the licensee's program for instrument calibration and monitoring detailed in Section 3.2.4 of the license application. The root cause for the apparent violation appeared to result from a lack of oversight on the part of HP management and staff. Specifically, there was no tracking mechanism for calibrating a Victoreen 190 (Serial Number 2034) which the HP staff used routinely in preparing tank entry permits.

5.2 Exposures for 1997 Monitoring Year

a. Inspection Scope (83822)

The inspectors reviewed the radiological exposure data for the time period of January through December 1997 for internal exposures and January through November 1997 for external exposures. As of the date of the inspection, the licensee had not completed the calculations for the total effective dose equivalents (TEDE) for the 1997 monitoring year (required by April 30, 1998, for 1997 per 10 CFR 20).

b. Observations and Findings

The inspectors reviewed the bioassay (urinalysis) data available for 1997 internal exposures. The licensee performed both routine bioassays and special bioassays in response to incidents or events. The bioassay records indicated that the licensee performed routine and followup sampling in accordance with license requirements. The maximum sample result for soluble uranium was approximately 270 micrograms per liter which was well below the equivalent action level for consideration of work restriction of 10 milligrams. Although the licensee had not calculated the effective dose equivalent yet, the internal dose from an intake of soluble natural uranium of this magnitude would be on the order of a few millirem.

The inspectors also reviewed the thermoluminescent dosimeter (TLD) results for the monitoring year through November 1997. The maximum deep dose equivalent was 820 millirem and the maximum shallow dose equivalent was 2,200 millirem. The inspectors concluded that based upon the available data the annual total effective dose equivalents (internal plus external) would be well below the applicable 10 CFR 20 limit of 5,000 millirem and the shallow dose equivalent would be below the limit of 50,000millirem, barring an abnormally high TLD results for the month of December 1997.

c. Conclusions

The 1997 exposure monitoring results available at the time of the inspection indicated that, barring any abnormal TLD results for the month of December, the total effective dose equivalents and shallow dose equivalents for personnel working at the facility would be well below regulatory limits.

VI. Maintenance and Surveillance

6.1 Preventive Maintenance and Inspections for Safety Equipment

a. Inspection Scope (88025)

The inspectors reviewed selected 1997 inspection and preventive maintenance records for safety equipment on the licensee's Critical Equipment Inspection List and Maintenance Management System.

b. Observations and Findings

The Critical Equipment Inspection List and the Maintenance Management System (MMS) identified the frequencies and types of inspections and preventive maintenance tasks for equipment relied upon for safety. The equipment included fired and unfired pressure vessels, the fire water pump, weight and flow instrumentation for the distillation process, the liquid-UF_6 handling crane, the accountability scale, cylinder haulers and other safety equipment at the site. All inspections and tasks reviewed were performed in accordance with MMS inspection checklists at the frequency identified in the MMS database, including an annual inspection of the UF_6 cylinder crane by an outside vendor.

c. Conclusions

The licensee performed inspections and preventive maintenance tasks in accordance with the checklists and frequencies identified in the MMS database, referenced in Section 13.4.8 of the license application.

VII. Radioactive Waste Management

7.1 Radioactive Waste Management Activities

a. Inspection Scope (88035)

The inspectors reviewed the status of the licensee's radioactive waste management program.

b. Observations and Findings

The licensee had recently completed a new Waste Minimization Manual and planned to complete training of plant staff by the end of May 1998. The manual provided guidance to plant staff on methods for reducing contaminated wastes by minimizing the sources of such wastes. The licensee had also targeted three waste streams for shipment to offsite waste treatment facilities or low-level radioactive disposal sites during 1998, including contaminated wood pallets, contaminated asbestos, and uranium tetrafluoride contaminated with trace amounts of plutonium.

The licensee continued a program to ship contaminated, empty drums to a licensed facility with a mill tailings pond for disposal and to repackage and dispose of corroded drums containing radioactive materials. The licensee had a large number of corroded drums filled with uranium-bearing materials on the pad outside the Bed Materials/Filter Fines Building. Plant staff continued a program to relocate, repackage, and dispose of these drums which have been exposed to the weather for a number of years.

c. Conclusions

The licensee had an acceptable program for managing the radioactive wastes currently generated onsite and plans for continued reduction of radioactive wastes which have accumulated over years of operation.

VIII. Material Control and Accounting

8.1 Inventory Reports for Natural Uranium Transactions

a. Inspection Scope

The inspectors reviewed the licensee's compliance with reporting requirements stipulated by 10 CFR 40.64(a) and (b). This regulation required that transfers of one kilogram or more of uranium source material of foreign origin, as well as one kilogram imports or exports of any origin, must be reported to the Nuclear Material Management and Safeguards System (NMMSS) following the instructions of NUREG/BR-0006. Moreover, each licensee authorized to possess at any one time and location more than 1,000 kilograms of uranium had to submit to the Commission within 30 days after September 30th of each year a statement of its foreign-origin source material inventory, following the instructions of NUREG-0007.

b. Observations and Findings

The inspectors' examination disclosed that transfer transactions were being adequately reported for uranium ore receipts and UF_6 shipments for source material of foreign origin. (These reports were of considerable importance for material control and accounting programs at the gaseous diffusion plants.) The inspectors noted that the licensee reported UF_6 shipments of one kilogram or more to the Paducah and Portsmouth facilities, including source material of domestic origin, for inclusion into the NMMSS database.

The inspectors identified that no annual inventory reports (DOE/NRC Form 742) were submitted by the licensee since 1992. The root cause appeared to be licensee management not understanding the reporting requirements stipulated by 10 CFR 40.64(a) and (b) following a merger between AlliedSignal and Converdyn. Licensee staff

acknowledged the finding and readily agreed to update the NMMSS database by manually submitting an annual inventory within 30 days of March 4, 1998. An appropriate inventory statement was due 30 days after September 30, 1997, using DOE/NRC Form 742. The Interim Plant Manger committed that a computer-readable report would be submitted to NRC by June 30, 1998, after trial runs with the Nuclear Assurance Corporation, the contractor for NMMSS, starting on June 2, 1998. Failure to submit DOE/NRC Form 742 for annual source material inventories constitutes a violation of minor significance and is being treated as **a Non-Cited Violation, consistent with Section IV of the NRC Enforcement Policy (NCV 040-03392/98003-10).**

c. Conclusion

The licensee initiated corrective action to resume submitting mandatory annual inventory reports for uranium source material of foreign origin to the NRC. The report for 1997 is to be manually submitted by April 3, 1998, and resubmitted in a computer-readable format by June 30, 1998. The Interim Plant Manager committed that all inventory statements thereafter would be in computer-readable form, as required by NUREG-0007.

IX. Management Meetings

9.1 Exit Meeting Summary

The inspectors presented the inspection results to the Interim Plant Manger, members of plant management and others at the conclusion of the inspection on March 6, 1997. The facility staff acknowledged the findings presented.

The licensee did not identify any of the information discussed at the meeting as proprietary.

PARTIAL LIST OF PERSONS CONTACTED

AlliedSignal, Inc.

C. Blanden, Uranium Hexafluoride Operations Team Leader
A. Del Priore, Manager of Process Technology
P. Gasperini, Interim Plant Manager
D. Huffman, Wet Process/Tank Farm Operations Team Leader
W. Murrell, President, AlliedSignal Energy Services
J. Pratte, Manager of Maintenance and Plant Engineering
H. Roberts, Supervisor of Health Physics and Safety
M. Shepherd, Manger of Environmental and Regulatory Affairs
S. Stewart, Supervisor of Health Physics

Other members of the licensees' staff were also contacted during the inspection period.

INSPECTION PROCEDURES USED

IP 83822:	Radiation Protection
IP 86740:	Transportation of Radioactive Materials
IP 88020:	Operations Review
IP 88025:	Maintenance/Surveillance Testing
IP 88035:	Radioactive Waste Management
IP 88050:	Emergency Preparedness

ITEMS OPENED, CLOSED AND DISCUSSED

Opened

040-03392/98003-01	EEI	failure to evacuate PP-5 lines for required times and close isolation valves for condenser in accordance with Vessel Washing Procedure in Distillation Manual
040-03392/98003-02	EEI	failure to shut off Distillations Hasting Heater in accordance with Vessel Washing Procedure in Distillation Manual
040-03392/98003-03	EEI	failure to perform certain response measures required by the Radiological Contingency Plan and its implementing instructions
040-03392/98003-04	EEI	failure to maintain standby electric utilities while operating the fluorination and distillation areas of the plant
040-03392/98003-05	EEI	failure to report the loss of the standby diesel generator to the NRC within 24 hours as required by event reporting procedure
040-03392/98003-06	EEI	failure to comply with the license requirements for performing a chemical hazard assessment for the Deconversion of Uranium Hexafluoride Pilot Plant
040-03392/98003-07	EEI	failure to implement a Mechanical Integrity Program for the Deconversion of Uranium Hexafluoride Pilot Plant

040-03392/98003-08	EEI	release of contaminated pigtail gaskets which exceeded the total or removable contamination limits for free release
040-03392/98003-09	EEI	failure to calibrate and monitor radiation detection instruments in accordance with license requirements

Closed

040-03392/98003-10	NCV	failure to submit annual inventory form for source material of foreign origin to NRC

LIST OF ACRONYMS USED

ANS	American National Standard
CFR	Code of Federal Regulations
CSP	Chemical Safety Plan
DNMS	Division of Nuclear Material Safety
EEI	Escalated enforcement item
FMB	Feed Materials Building
MI	Mechanical Integrity
MMM	Maintenance Management System
MOC	Management of Change
MTW	Metropolis Works
NCV	Non-cited violation
NMMSS	Nuclear Materials Management and Safeguards System
NOV	Notice of Violation
NRC	Nuclear Regulatory Commission
OJT	On-the-job training
PDR	Public Document Room
PHA	Process Hazards Assessment
TEDE	Total effective dose equivalent
UF_6	Uranium hexafluoride
VIO	Violation