Honeywell

Honeywell
P.O. Box 1053
Morristown, NJ 07962-1053

February 13, 2004

Mr. Jay L. Henson
U. S. Nuclear Regulatory Commission, Region II
Sam Nunn Atlanta Federal Center
61 Forsyth St. SW Suite 23T85
Atlanta, GA 30303-8931

Dear Mr. Henson:

Please find enclosed a copy of the affidavit from Honeywell supporting the confidentiality of the plant design diagrams submitted as an appendix to the Root Cause Report for the December 22, 2003 incident.

If you have any questions with regard to this matter, please do not hesitate to contact me at (973) 455.2151.

Regards,

Elizabeth A. Stairs
General Counsel
Honeywell Chemicals
Honeywell International Inc.

Enclosure

AFFIDAVIT

State of NEW JERSEY)
) ss.
County of MORRIS)

I, Elizabeth A. Stairs, swear and affirm as follows:

1. I am General Counsel of the Honeywell Chemicals business of Honeywell International Inc. ("Honeywell Chemicals"), and have the authority to execute this affidavit.
2. I have personal knowledge of the facts set forth in this affidavit.
3. Honeywell Chemicals believes that Appendix Z, Figures 1, 2 and 3 of Honeywell's Investigation Report dated February 6, 2004, ("Report"), may contain proprietary or safeguards protected materials concerning plant designs and processes.
4. The remainder of the Report may be disclosed to the public.
5. Further affiant sayeth not

Elizabeth A. Stairs

SUBSCRIBED and SWORN to before me

this 13th day of February, 2004.

JENNIFER M. MAPES
NOTARY PUBLIC OF NEW JERSEY
Commission Expires 3/25/2004

~~CONFIDENTIAL~~

Honeywell Metropolis Works

Honeywell

Investigation Report of Uranium Hexafluoride Release on December 22, 2003

Date of Report
February 6, 2004

Sponsor

Rory J. O'Kane, Plant Manager

Principal Investigators

Darren Mays
Manager of Health, Safety & Regulatory Affairs

Darrin Dodge
Environmental Supervisor

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Investigation Report of Uranium Hexafluoride Release on December 22, 2003

I. Executive Summary

The Honeywell Metropolis Works (the "Plant") converts natural uranium ore to uranium hexafluoride (UF_6) in order to create nuclear reactor fuel. The Plant is the only uranium conversion facility in the United States, and it is, therefore, critical to the national nuclear fuel cycle.

On December 22, 2003, the Plant was preparing to start up a second fluorination operating train within the UF_6 manufacturing area (the "Feeds Material Building" or the "Building"). Prior to this time, the Plant had been operating on a single fluorination train. To accommodate dual fluorination operating trains, the first train had to be removed from service to reconfigure the scrubbing system piping. It was during this activity that a UF_6 gas release occurred.

From approximately 0150 hours until approximately 0313 hours, a small quantity of UF_6 gas was released. The release occurred in two parts. The first part involved fugitive releases from fluorination system components that exited Building openings such as windows and vents. The second part involved a release through the ash dust collector system within the Building at an elevation of approximately 86 feet above ground level.

The fugitive releases were caused when the fluorination system was inadvertently pressurized with fluidizing air, nitrogen, and UF_6 gas. This gas mixture escaped from the piping system into the Building through system breaches. The second part of the release was caused when Plant personnel, responding to the observed internal leak, connected the fluorination system to the ash dust collector system, which exhausted the gas mixture to the atmosphere.

When the UF_6 gas was exposed to atmospheric moisture, it reacted to form uranyl fluoride (UO_2F_2) and hydrogen fluoride (HF). Any material released would have separated approximately into three parts UO_2F_2 and one part HF on a mass basis. The release was carried offsite by wind at five to ten miles per hour from the south-southeast (SSE) toward a sparsely populated area to the north-northwest (NNW) of the Plant.

The maximum amount of UF_6 gas available for release within the affected system did not exceed seven pounds.

Plant personnel promptly notified local authorities by telephone to the local sheriff's department when it was determined that the release would pass the fenceline. Plant personnel advised public emergency responders to evacuate potentially impacted residents. Evacuation and sheltering in-place of local area residents was conducted at the discretion of public emergency responders. The U.S. Nuclear Regulatory Commission ("NRC") was also notified.

Four local residents reported to the Massac County Hospital emergency room for precautionary observation or treatment. One resident remained overnight for observation. All have been discharged to normal activities.

Honeywell promptly monitored the residents' health, property and the environment. All available data establishes that there was no adverse impact to the residents' health, property or the environment arising from the release.

Five causal factors affecting the release, including its magnitude and duration, were identified:

1. The amount of UF_6 gas in the fluorination system.
2. The positive pressure in the fluorination system.
3. The fluorination system leakage under positive pressure.
4. The venting of the gas mixture (air, nitrogen, UF_6) through the ash dust collector.
5. The issues that extended the duration of the release.

By analyzing these five causal factors, the following root causes of the release were identified:

1. Over-reliance on the memory and knowledge of the operator to perform the evolution caused an error in reconfiguring the valves of the fluorination system.
2. There were insufficient planning and procedures for the performance of this particular evolution to anticipate and control hazards and abnormal conditions.
3. The Plant's Corrective Action Process was not effective to identify and correct deficiencies, and to insure that prior corrective actions are implemented and sustained.

The following corrective actions for these root causes have been identified:

1. Develop and implement a near-term Plant Restart Readiness Plan that defines all actions necessary for safe restart including improvements in management oversight, procedural review, training, planning processes, mechanical integrity, engineering solutions, corrective action program, auditing and emergency response.
2. Develop and implement a long-term Plant Performance Improvement Plan.
3. Implement an effective process to ensure that all necessary near and long term corrective actions and improvements are identified, accomplished and sustained.

(Detailed near and long-term corrective actions are set forth in Section VI *infra*.)

Existing procedures, training and supervisory oversight provide a strong foundation for safe operations. However, gaps, especially for non-routine operations, have been identified and will be rectified. Improvements to existing maintenance procedures will be implemented to address and improve mechanical integrity. Emergency response procedures for off-site releases will also be assessed and improved with input from local public emergency responders, consultants and the community.

Honeywell has or will implement near and long-term corrective actions to prevent future releases. The Plant will not restart until Honeywell is convinced that it can ensure and maintain safe operations.

II. Background

At the direction of the Plant Manager, this root cause analysis was initiated to review the December 22, 2003 UF_6 release. The results of the root cause analysis are provided below. (See Appendix 1 for a list of significant items reviewed.)

Prior to December 22, 2003, the Plant had been operating on a single fluorination train. The Plant production schedule, which is prepared by the Production Manager, called for operating two fluorination trains simultaneously. The switch from single to dual train fluorination is done infrequently, but had been successfully run twice in 2003. There was no established time or shift when this evolution was typically performed.

The evolution involved two employees, the Fluorination Operator ("FO") and the Assistant Fluorination Operator ("AFO"). Typically, the FO monitors operations in the control room, and the AFO manually operates the 21 valves necessary to reconfigure the fluorination system. In order to make the switch, the Plant had to shut down the operating fluorination train to reconfigure/lockout the scrubbing system piping. This involved removing a blank, removing a spool piece in the piping of the scrubbing system and installing two blind flanges, one on either side of the removed spool piece.

At the start of the lockout, fluorinators "A" and "C" were being fluidized by air and the distillation return was entering the fluorination system. (See Appendix 2, Figure 1 for valving configuration.) The fluidizing air will create a pressure within the fluorination system unless there is a vacuum source, such as the Nash vacuum pumps or ash dust collector. The UF_6 was coming from distillation and the fluorination system was in recycle mode. Depending on the supervisor and operator performing this evolution, the fluorination system may be in either recycle or total reflux mode. In the latter mode, no UF_6 is normally introduced into the fluorination system.

Locking out the Nash vacuum pumps removes a source of vacuum. If it is the only source of vacuum, its removal will permit pressurization when pressure sources such as fluidizing air or purge nitrogen are connected. Locking out the Nash vacuum pumps presents an opportunity for a leak to occur if one or more pressure sources are connected to the fluorination system.

In early December 2003, operations personnel identified a minor leak on the C-minus control valve in the fluorination system. The leak was stopped by tightening the packing on the control valve stem. This was a temporary repair until the valve components could be replaced. The replacement of these valve components had been deferred because the fluorination system was normally sub-atmospheric and the leak was only a minor operational issue. Following an informal assessment by the General Foreman, the leak was believed to represent no environmental and/or safety hazard. A work order to schedule this valve for future repair was not submitted as a result of inadvertence.

On December 21, 2003, the Plant made initial preparations to put the second fluorination train in service. By early morning on December 22, 2003, the valves had been reconfigured by the AFO in accordance with a computer-generated lockout sheet prepared and reviewed by the shift supervisor earlier that shift. The lockout sheet shows only those valves for which the position needed to be changed to ensure that the scrubbing system was locked-out in a zero-energy state. Although there are detailed written fluorination operation procedures, there was no written procedure to cover the specific operation of switching from single to dual train fluorination.

Plant personnel had previously performed this non-routine task successfully on two occasions in 2003. The FO and the AFO had 41 and 7 years experience, respectively, in fluorination operations. Each had been fully trained, and their re-certifications were current. The lack of a written procedure, however, required the AFO to rely on his knowledge and memory to correctly perform the evolution.

If the evolution had gone as anticipated, the fluorination system would have stayed at sub-atmospheric pressure and there would have been no leakage or release. The AFO intended to close the fluorination system valves and open the ash dust collector valves before locking out the Nash vacuum pumps. The precise sequencing of the valve changes is important. In order to maintain adequate sub-atmospheric pressure, the ash dust collector system valves need to be opened immediately following the closing of the fluorination system valves and before the Nash vacuum pumps are locked out.

This sequence was not followed. Instead, the ash dust collector system valves were closed and the fluorination system valves were open when the Nash vacuum pumps were locked out. (See Appendix 2, Figure 2 for valving configuration.) This error by the AFO caused the normally sub-atmospheric system to become pressurized with air, nitrogen and UF_6 gas. This rise in pressure began at approximately 0140 hours. The system is not designed to accommodate positive pressurization. The system became pressurized at approximately 0150 hours. There was no alarm function to alert personnel in the control room of rising pressure. The FO did not detect the rise in pressure from the control room instrumentation.

At approximately 0212 hours, a fence line monitor alarmed in the security guard station, indicating a potential fluorine release. At approximately 0215 hours, while verifying the Nash vacuum pump's lockout, the Area Shift Foreman noticed a UF_6 release on the 4th Floor. The extent of the release was verified using the control room video monitors. It was later determined that the C-minus control valve had leaked UF_6 into the Building. This valve is located on the 5th floor. (See Appendix 2, Figure 3 for valving configuration.) It is suspected that system breaches may have occurred at various locations in the Building, given the rise in pressure. The leaking valve and other system breaches initiated the fugitive release pathway.

At approximately 0216 hours, the Area Shift Foreman notified other shift personnel and the Emergency Response Team ("ERT") of the release. Immediate action was taken to reduce the pressure on the fluorination system. The FO shut off the fluidizing air from the control room. The HAZMAT trained fluorination system operators ("HAZMAT Response Team") were mobilized. At approximately 0228 hours, the Hazmat Response Team was directed to open the ash dust collector valves and to close the fluorination system valves in order to reverse the incorrect valving that caused the rising pressure. The HAZMAT Response Team utilized its HAZMAT response training; however, no specific procedure was available to respond to the abnormal condition presented by the over-pressurization of the fluorination system.

The actions taken by the HAZMAT Response Team at 0228 hours had the effect of venting the gas mixture to the ash dust collector system's horizontal exhaust stack, hence to the environment. (See Appendix 2, Figure 4.) This initiated the second release pathway. At 0231 hours, a remote security camera showed a release from the ash dust collector system. At 0234 hours, the ERT leader advised security personnel to notify the sheriff's office of the offsite release. This notification was promptly made. NRC was notified at approximately 0300 hours.

Shutting off the air and nitrogen and opening the valves to the ash dust collection system were not fully effective in stopping the release. The HAZMAT Response Team then attempted to restore sub-atmospheric pressure by starting the Nash vacuum pumps, which had been locked out during the evolution. Returning the Nash vacuum pumps from the lockout condition to the service condition required manually operating the 21 valves (which were previously locked-out) located at various locations in the Building. The presence of UF_6 caused poor visibility and required the HAZMAT Response Team to don personal protective equipment. Both events increased the time needed to terminate the release.

After unlocking the Nash vacuum pumps, the HAZMAT Response Team attempted to open the high water valves that were necessary to connect the fluorination system to the vacuum source. Opening the valves would restore sub-atmospheric pressure; however, they would not open because the Nash vacuum pumps did not have seal liquors (potassium hydroxide) running to them. The high water valves could not be opened because a recirculating pump had a broken coupling at attempted startup. This, in turn, caused a safety interlock to prevent the high water valves from opening.

The seal liquor is necessary for the pumps to operate. The lack of potassium hydroxide seal liquor eventually was solved by supplying water as a seal liquor.

The Nash vacuum pumps had passed routine inspections in December 2003. It was later found that the pump providing seal liquor to the Nash vacuum pump had sheared its coupling upon attempted startup. The shearing of the coupling was consistent with its design and intended function if the pump impeller will not turn. The exact cause of the shearing has not been determined; however, defective equipment and insufficient maintenance have been ruled out. (It is suspected that solid potassium hydroxide in the system may have collected during downtime, causing the impeller not to turn.) The condition of the Nash vacuum pumps further increased the time necessary to restore the normal source of sub-atmospheric pressure to the fluorination system.

At 0305 hours, the Nash vacuum pump was restarted and sub-atmospheric pressure was established at 0313 hours. The time to restore sub-atmospheric pressure and thereby terminate the release was extended by the complexity of the lockout, the high level of personal protection necessary for the HAZMAT Response Team, and by the unexpected equipment failure in the Nash vacuum pumps. (See Appendix 2, Figure 5 for valving configuration.)

At 0320 hours, the Foreman reported that no smoke was leaving the building. The all-clear was issued at 0415 hours.

III. Evaluation of Impacts to the Environment or Personnel

At approximately 0234 hours, the Plant notified outside emergency services of the release. The release tracked in a north-northwest (NNW) direction at 5 to 10 miles per hour. Shortly after the notification, City of Metropolis and Massac County emergency response personnel began contacting area residents downwind of the release. Approximately 25 individuals were evacuated from their home and approximately 75 residents were asked to shelter in place. Four individuals reported to the local hospital. Three individuals were evaluated and released that night. One resident was kept overnight for precautionary observation. All residents have since resumed normal activities. Honeywell had no onsite personnel over-exposure or injuries associated with the release.

Honeywell promptly began assessing any potential impacts to residents' health, property and the environment. Among other activities, Honeywell technicians tested the pH of surface water on structures immediately downwind of the release point. The lowest pH (or most acidic) observed was a pH of six (6). This is reflective of a normal pH. At the start of the release, Honeywell's fenceline monitor (sensor AT-183) alarmed indicating the presence of fluorine greater than 1 part per million. Honeywell's fluorine fenceline monitoring system records monitoring data every 20 seconds. Analysis of the stored data indicated that only one sensor (AT-183) detected concentrations above background levels for approximately two minutes.

Pursuant to Honeywell's NRC license (License No. SUB-526), the Plant's offsite air monitors provide data needed to assess potential radiological dose to nearby residents. Air monitor NR-7 was located in the path of the release. Analysis from this monitor reflected levels of uranium

100 times above normal levels; however, these elevated levels were still below NRC regulatory monthly average effluent concentration limits. Other offsite monitor results were well below NRC regulatory limits. Similarly, the State of Illinois air monitor data was consistent with Honeywell's monitors, as reported to Honeywell by the NRC.

Honeywell contracted with Duratek, Inc., a third-party contractor, to take samples downwind of the release to assess the impact, if any, on human health and the environment. (See Appendix 4). The data showed that soil and water samples were at a minimum of 10 times below the applicable regulatory limit, establishing that this release had no adverse impact on the environment.

Honeywell also contacted local residents who were potentially impacted by this release and offered to test their potential exposure by way of uranium bioassay analysis. This data indicates that potential exposures associated with this release, if any, were below applicable regulatory limits. Based on all the personnel and environmental testing conducted, the release did not have an adverse impact on residents' health, property or the environment.

The results of this investigation revealed opportunities for improvements to the Plant's Emergency Response Plan, including improved coordination with local emergency responders and the community. The recommended improvements identified to date are discussed in Section VI(A)(5) *infra*.

IV. Causal Analysis

A. Causal Factors For the Release

Five causal factors affecting the release, including its magnitude and duration, were identified:

1. The amount of UF_6 gas in the fluorination system.
2. The positive pressure in the fluorination system.
3. The fluorination system leakage at positive pressure.
4. The venting of the gas mixture (air, nitrogen, UF_6) through the ash dust collector.
5. The issues that extended the duration of the release.

The causal factors for the release are more fully explained in a graphic format in the "Why Staircase" contained in Appendix 5.

Cause 1: The amount of UF_6 gas in the Fluorination System

At the time of the release, the distillation system was configured for recycle rather than total reflux. The system could have been reconfigured to a total reflux, which is a configuration where no UF_6 is normally introduced into the fluorination system.

Findings:

- There was no uniform written procedure for this non-routine evolution that requires distillation to be in total reflux instead of recycle when locking-out/tagging-out the scrubbing system.
- There was no uniform policy requiring that systems be placed in a minimum risk condition prior to conducting evolutions that could involve hazards.

Cause 2: The positive pressure in the Fluorination System

The AFO's erroneous configuration of the fluorination system caused the system to pressurize. He reported that he knew how to perform this evolution correctly, but he forgot to change the configuration of certain valves. The evolution had been successfully performed twice in 2003. In the absence of some method to remind the AFO of the necessary actions, the reliance is on knowledge-based behavior, which can be unreliable and lead to operator error. The AFO was using a lockout/tagout template that outlined steps to de-energize the Nash vacuum pumps. This template did not include the ash dust collector valves or the fluorination valves. There was likewise no procedure to transition from single to dual fluorination operating trains.

Findings:

- The AFO erred in reconfiguring the valves of the fluorination system.
- There is no procedure that outlines the prerequisites, distinct steps, and action sign-off for this evolution, thus relying on operator memory for certain key steps.
- Although the Plant has adequate operation and maintenance procedures generally, similar critical evolutions may exist that lack defined prerequisites, distinct steps, and action sign-off.

This evolution was not treated as an infrequent or unusual operation. The personnel involved in the system lockout had a discussion that covered the general scope of work. However, there was no formal pre-job planning or brief that included: work scope, hazards involved, barriers to protect against hazards, modes of recognizing barrier insufficiency, and operational contingency actions.

Findings:

- There is no uniform policy to establish the practice of formalized and documented pre-job planning involving highly hazardous chemicals.
- There is no procedure that defines the requirements for pre-job briefs, including necessary supervisory oversight.

There is no alarm for rising pressure in the fluorination system. This vulnerability was not noted in the last process hazard analysis. The rising pressure was not noticed until it had caused a leak. If monitored and interpreted correctly, the instrumentation in the control room will give timely warning of rising pressure in the fluorination system. However, the control room operator had not been instructed to monitor the applicable instrumentation during the evolution and did not do so.

Findings:

- There is no alarm for rising pressure on the fluorination system.
- Systems whose overpressure could cause the release of highly hazardous chemicals may not have adequate alarms.
- No pre-job planning brief had been performed for this evolution.

Cause 3: The Fluorination System leakage at positive pressure

Pre-release leaks in the fluorination system were considered acceptable because the system normally operates at sub-atmospheric pressure. As a result, the repair of the C-minus control valve had been deferred because the fluorination system was normally sub-atmospheric. Following an informal assessment, it was believed this condition represented no environmental or safety hazard. Interim action consisted of tightening the packing, however, no work order was issued to repair the valve in the future because of inadvertence.

Findings:

- No uniform procedure exists requiring written notification and documentation when equipment is not in proper working order.

Cause 4: The venting of the gas mixture (air, nitrogen, UF_6) through the ash dust collector

In response to directions from the Incident Commander, the HAZMAT Response Team opened the ash dust collector valves, which released the pressurized gas from the fluorination system to the ash dust collection system. The mindset of the Incident Commander was to reverse the valving error. Opening these valves contributed to the majority of the release. Operating procedures do not currently include measures to respond to abnormal conditions.

Findings:

- There is no uniform policy to establish the practice of formalized and documented pre-job planning involving highly hazardous chemicals.
- While emergency procedures do exist in each of the UF_6 operating manuals, procedures covering normal unit operations do not include specific measures to respond to certain abnormal conditions.

Cause 5: The issues that extended the duration of the release

The time to restore sub-atmospheric pressure and thereby terminate the release was extended by the large scope of the lockout, the level of personal protection required to respond to the release, and by an unexpected equipment problem in the Nash vacuum pumps. The lock-out/tag-out process was a normal condition for this evolution. The high water valves could not be opened because a recirculating pump had a broken coupling at startup. This caused a safety interlock to prevent the high water valves from opening. The pump was operating reliably prior to shutdown. The pump coupling failed when it was restarted.

Findings:

- No measures exist to ensure that the system remains at sub-atmospheric pressure while performing certain tasks, such as the switch from single to dual train fluorination.

B. Root Causes

The following root causes of the release were identified:

1. Over-reliance on the memory and knowledge of the operator to perform the evolution caused an error in reconfiguring the valves of the fluorination system.
2. There were insufficient planning and procedures for the performance of this particular evolution to anticipate and control hazards and abnormal conditions.
3. The Plant's Corrective Action Process was not effective to identify and correct deficiencies, and to ensure that prior corrective actions are implemented and sustained.

V. Extent of Condition

Honeywell has numerous and detailed procedures to operate and maintain the Plant, as well as to train its operations and supervisory personnel. Those procedures were reviewed in response to the September 2003 events. At that time, procedures were validated and operators retrained in revised procedures. That review did not evaluate potential procedural and training gaps. Gap analyses are now being performed that will identify detailed improvements for the near and long term. Honeywell is assuming that the deficiencies in the fluorination process that were identified in this report are potentially applicable to some of the other processes in the UF_6 Building. Honeywell has looked far beyond the root cause of this release in order to determine areas of improvement for restart. The corrective actions identified below will be focused on addressing the broader implications of the following:

- Establishing a uniform policy requiring that systems be placed in minimum risk condition prior to conducting evolutions that could involve hazards.
- Ensuring procedures that outline the prerequisites, distinct steps, and action sign-off for critical Plant evolutions involving hazardous chemicals, especially non-routine operations.
- Ensuring procedures that define the requirements for pre-job planning and briefings, including necessary supervisory oversight and training.
- Include measures to respond to abnormal conditions as a part of procedures.
- Evaluating the extent of conditions and ensuring uniform procedures exist requiring written notification and documentation for equipment that is not in proper working order.
- Ensuring that systems that could cause the release of highly hazardous chemicals have adequate alarms.
- Implementing an effective corrective action program to ensure that all necessary near and long term corrective actions and improvements are identified, accomplished and sustained.

The remaining deficiencies identified in the root cause analysis relate specifically to the UF_6 fluorination system.

VI. Corrective Actions

A. Plant Restart Readiness Plan

Honeywell intends to develop and implement a Plant Restart Readiness Plan as a result of its ongoing review of this release. The following corrective actions have been identified as necessary prior to restart. These corrective actions address issues for restart, and are not limited to the root causes identified in this report. They are subject to modifications based upon the results of Honeywell's ongoing investigations.

1. Perform and Implement Findings of an In-depth Corporate Review of Plant Processes and Operations

A team of corporate and outside advisors have completed an in-depth review that considered the following elements:

- A review of the fluorination, distillation and HF processes for safety and environmental improvement opportunities through one or more of the following: engineered solutions, alarm systems, administrative controls, process design/engineering controls and/or mechanical integrity.
- standard operating procedures.
- training.
- management of change.
- emergency response.

Items identified as a result of the review will be evaluated and those identified as restart items will be completed prior to restart

2. Management Process Review/Gap Analysis

In addition to the in-depth review outlined above, the Plant is performing a review of various management processes to gaps, which will include:

- Procedural review to identify any new procedures needed for the fluorination, distillation and HF systems.
- Training review for the fluorination, distillation and HF system operators for status and completeness.
- Preventative maintenance and inspection review of fluorination, distillation and HF systems for status and completeness.

- A walk-down of the fluorination system's mechanical integrity.
- Corrective action program review

Items identified as a result of the reviews will be evaluated and those identified as restart items will be completed prior to restart

3. Specific Corrective Actions Related to the Release

The Plant has identified the following specific corrective actions in connection with the release:

- Create and implement procedures to define minimum requirements for certain pre-job planning processes, which will include risk assessment and procedural requirement reviews.
- The adequacy of communications to ensure that plant personnel understand management expectations.
- The adequacy of management and supervisory oversight.
- Create pre-job briefing checklists that will review all steps, including work scope, potential hazards and contingency plans. This will include supervisory review to determine job impact on total plant operations and abnormal conditions.
- Modify all permit system procedures to include the need for a pre-job briefing to involve system conditions.
- Improve and revise regular and formal management assurance reviews.
- Develop and implement a policy to evaluate placing systems in a minimum risk condition prior to performing work.
- Develop and implement written notification and documentation procedures for equipment that is not in proper working order. This will include the development of computerized procedures to flag equipment with high recurrent failures.
- Assess plant designs to maintain sub-atmospheric pressure in the fluorination system.

4. Emergency Response and Community Communication

As a result of the release, Honeywell has identified improvements to its Emergency Response/Radiological Contingency Plans. Honeywell, in conjunction with local and state authorities, is considering improvements to these plans and improvements for continued community communication. Those improvements are as follows:

- Review and revise the Emergency Response/Radiological Contingency Plans.
- Conduct a tabletop drill of the final revised Plans that includes offsite response and participation, subject to the cooperation of local emergency responders.
- Develop and implement plans to install alarms/controls for critical systems in the Building. (This will include conducting an alarm failure mode effects analysis ("FMEA") or equivalent on all fluorination and distillation systems with potential for releases.)
- Develop and implement improved operating procedures to respond to abnormal conditions.
- Review, and if necessary revise, the Risk Management Plan.
- Establish an improved public notification system.
- Investigate a direct telephone line to local authorities.
- Establish "shelter-in-place" protocols.
- Assess and identify other ways to improve community awareness and communication, including potential improvements to the existing Community Awareness Committee.

B. Plant Performance Improvement Plan

Honeywell also intends to develop a long-term Plant Performance Improvement Plan to achieve excellence in safe operations. The elements of this plan will be finalized and implemented after start-up. It is anticipated that the plan will contain the following elements:

- Improve the corrective action program to ensure a more comprehensive identification of root causes. This will include improvements to ensure that corrective actions are sustained.
- Develop and implement uniform control room conduct of operations.
- Systematically improve the Plant Procedures Program, taking into consideration uniformity and human factors analysis.
- Implement an improved Training Program, taking into consideration standardized methods of training, trainer qualifications and verification.

- Implement an improved Mechanical Reliability Program, taking into consideration data collection, tracking, adequacy and effective planning and scheduling.
- Implement an improved Commitment Tracking Process for NRC and other regulatory agencies.
- Implement an improved Document Management System, taking into consideration document revision, distribution and generation control.

VII. Conclusion

The release did not result in an adverse impact on residents' health, property or the environment.

Honeywell has fully analyzed and identified the root causes of the release. During its investigation, it identified corrective actions for the near and long term to assess and improve emergency response, operations, processes, procedures, the corrective action process, mechanical integrity, training and supervisory oversight. These corrective actions are intended to prevent releases to the full extent practicable.

Honeywell is committed to achieving excellence in safe operations, and will not restart operations until it is convinced that safety issues are resolved, and that the Plant can maintain reliably safe operations.

Appendices

1. List of Significant Items Reviewed
2. Figures and Tables
3. Time Sequence of Changes
4. Environmental Monitoring Data Results
5. Why Staircase Tree for Release

Appendix 1: List of Significant Items Reviewed

1. Copies of Log Sheets from Fluorination log books, Dec. 22, 2003
2. Engineering Findings (PowerPoint Slides)-source of system figures
3. Time Lines for UF_6 Release on December 22, 2003
4. NRC Exit (PowerPoint Slides), January 6, 2004
5. TOP Incident Investigation Report # 03-123
6. Complete Lockout Template #F2N-01095, Issue date Dec. 21, 2003
7. Security camera footage and stills for UF_6 release on Dec. 22, 2003
8. Fluorination System Manual Dated October, 2003
9. NRC Confirmatory Action Letter CAL No. 2-2003-003, Dec. 22, 2003
10. Engineering Calculation of Uranium and HF Released, Dec. 22, 2003
11. Town Meeting Handout (following NRC SIT Exit): "2003 Metropolis Works Review of Root Causes, Corrective Actions & Common Cause Analysis for Incidents on 9/9/03, 9/12/03, 9/30/03"
12. Wackenhut Security Officer Info. Report Dated January 8, 2004
13. NRC License No. SUB-526
14. Duratek Data
15. Honeywell Sampling Results (Dec. 22, 2003)

Figure 4 Ash Dust Collector Exhaust (Horizontal Stack)

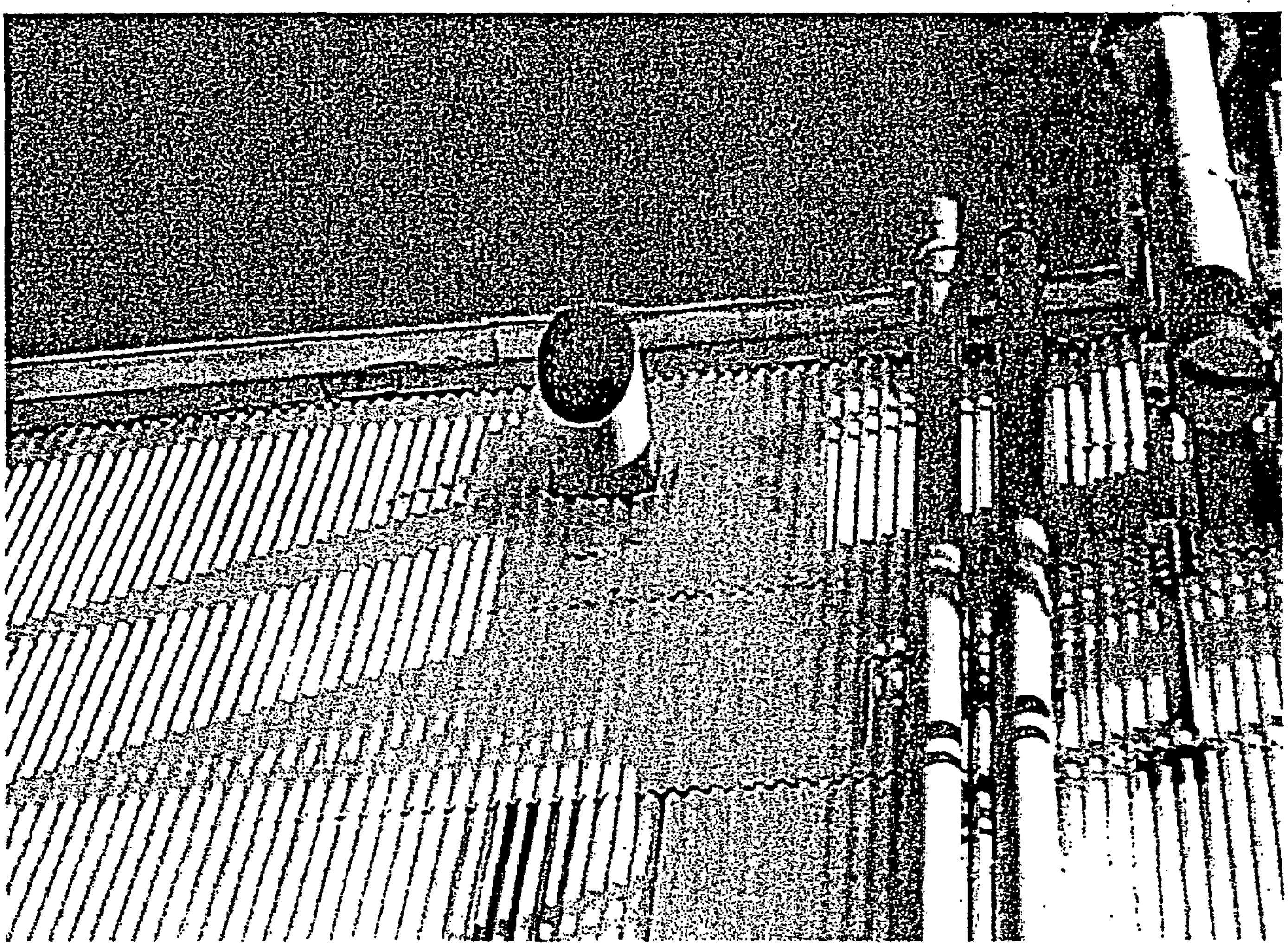

Figure 5 Process When Release Terminated

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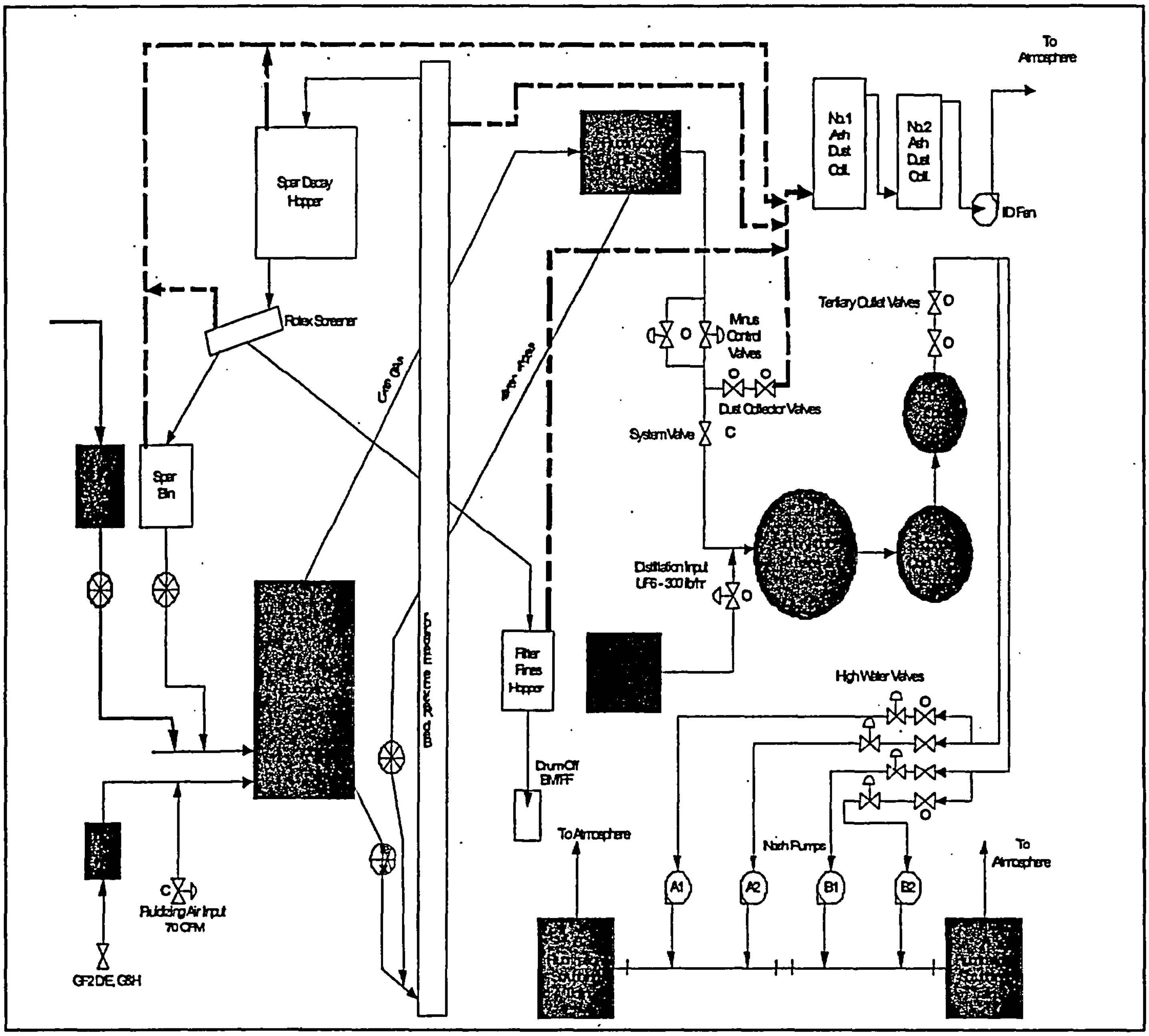


Appendix 3: Time Sequence of Events

Time	Event
12/21/03 23:15	Shut off UF_4 feed valve to A Fluorinator
12/21/03 23:15	Reduced F_2 flow (call to F_2) to A Fluorinator
12/21/03 23:15	Fluorinator shut down activities
12/21/03 23:25	Shut off F_2 to A Fluorinator
12/21/03 23:35	Started purge of the F_2 supply line
12/22/03 0:00	Shut the purge off to the F_2 supply line
12/22/03 0:35	Blank switching of mist pots completed. Lockout/tagout card cleared.
12/22/03 1:30	Lockout/tagout started for Nash pump evolution
12/22/03 1:40	Started loosing system negative pressure
12/22/03 1:50	System under positive pressure
12/23/03 2:01	Security camera automatically identifies movement in parking lot for reason unknown
12/23/03 2:12	Fence line HF monitor (AT-183) alarms indicating low level fluoride release
12/23/03 2:15	Foreman notices release on 4th floor
12/23/03 2:16	ERP/RCP initiated
12/23/03 2:16	Fluidizing air was isolated from the Fluorinators
12/23/03 2:28	Dust collector valves opened
12/23/03 2:31	Camera 2 moves off the parking lot view towards possible Ash Dust Collector Loss
12/23/03 2:34	ERT leader notifies security to call sheriff's office for public notification; sheriff's office is notified
12/23/03 2:35	Plant Manger notified by security
12/23/03 2:40	Started unlocking Nash pumps
12/23/03 3:00	NRC Response Center notified
12/23/03 3:05	A1 Nash pump started
12/23/03 3:13	System returned to negative pressure
12/23/03 3:20	Foreman reports no visible smoke leaving building
12/23/03 3:45	B1 Nash pump put into service
12/23/03 3:47	Distillation system on total reflux.
12/23/03 4:05	ERT.inspects each floor FMB
12/23/03 4:15	All clear issued

Appendix 4: Environmental Monitoring Data Results

Plant Personnel Exposure:

Uranium bioassays (analytical results) reflect exposure below regulatory requirements.

Public Exposure:

Based on current data, radiation exposure dose associated with this release was not above applicable regulatory limits.

Plant Effluent Results:

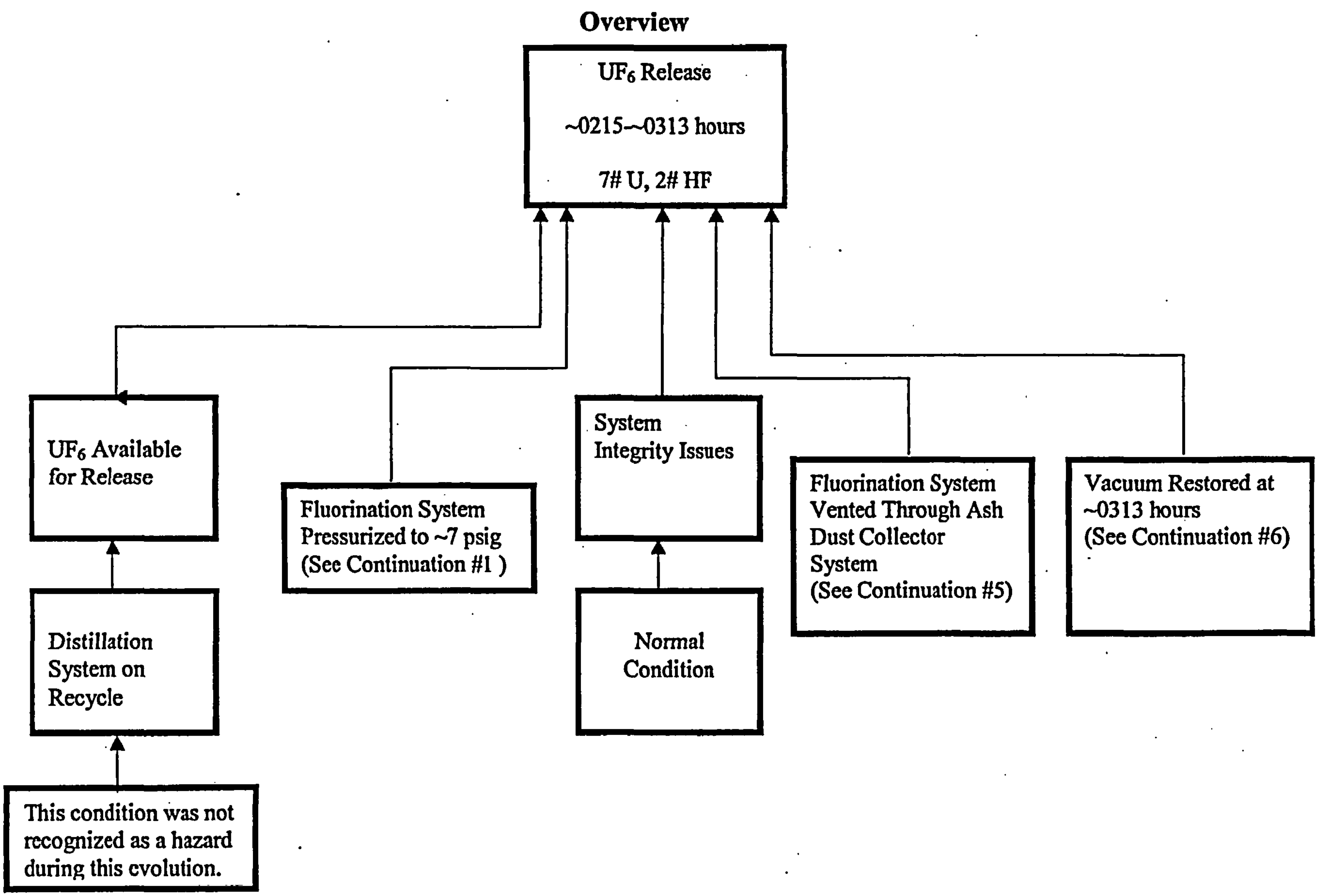
Highest fixed area boundary air sample results 1.4E-12 uCi/ml. NRC effluent monthly average limit 3E-12 uCi/ml. This air sample location was directly down wind.

Environmental Results:

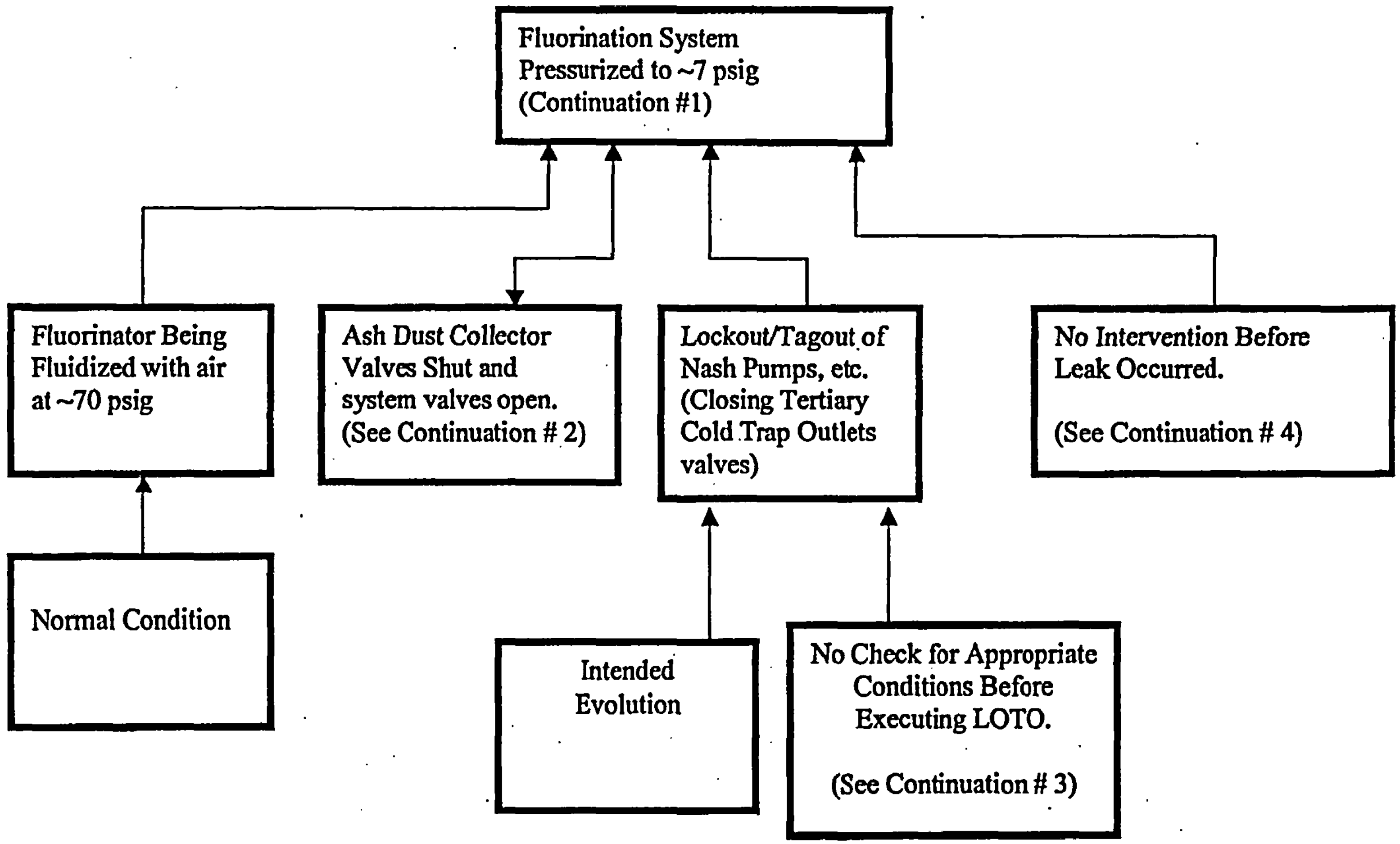
Environmental sample results are comparable to pre-release results. Samples were independently obtained and analyzed with similar results. Samples were obtained from potential down wind sectors. Sample results are as follows:

Location	Sample	Type	Release Results Result ppm U	Pre Release Result ppm U
Special Sample down wind	SPV1	Vegetation	0.31	
Reiniking Property	V5	Vegetation	0.16	1.14
Metropolis Airport	V6	Vegetation	1.54	0.61
Maple Grove School	V7	Vegetation	0.83	1.08
Nearest Residence	V-NR7	Vegetation	4.05	1.61
Lindsay Lake	M6	Mud	0.626	0.819
Oak Glenn Lake	M7	Mud	0.599	2.30
Special Sample down wind	SPV1	Soil	0.750	
Reiniking Property	S5	Soil	1.223	0.787
Metropolis Airport	S6	Soil	1.200	0.823
Maple Grove School	S7	Soil	0.783	0.385
Nearest Residence	S-NR7	Soil	4.002	5.538
Lindsay Lake	W6	Water	0.002	0.0006
Oak Glenn Lake	W7	Water	0.000058	0.0003

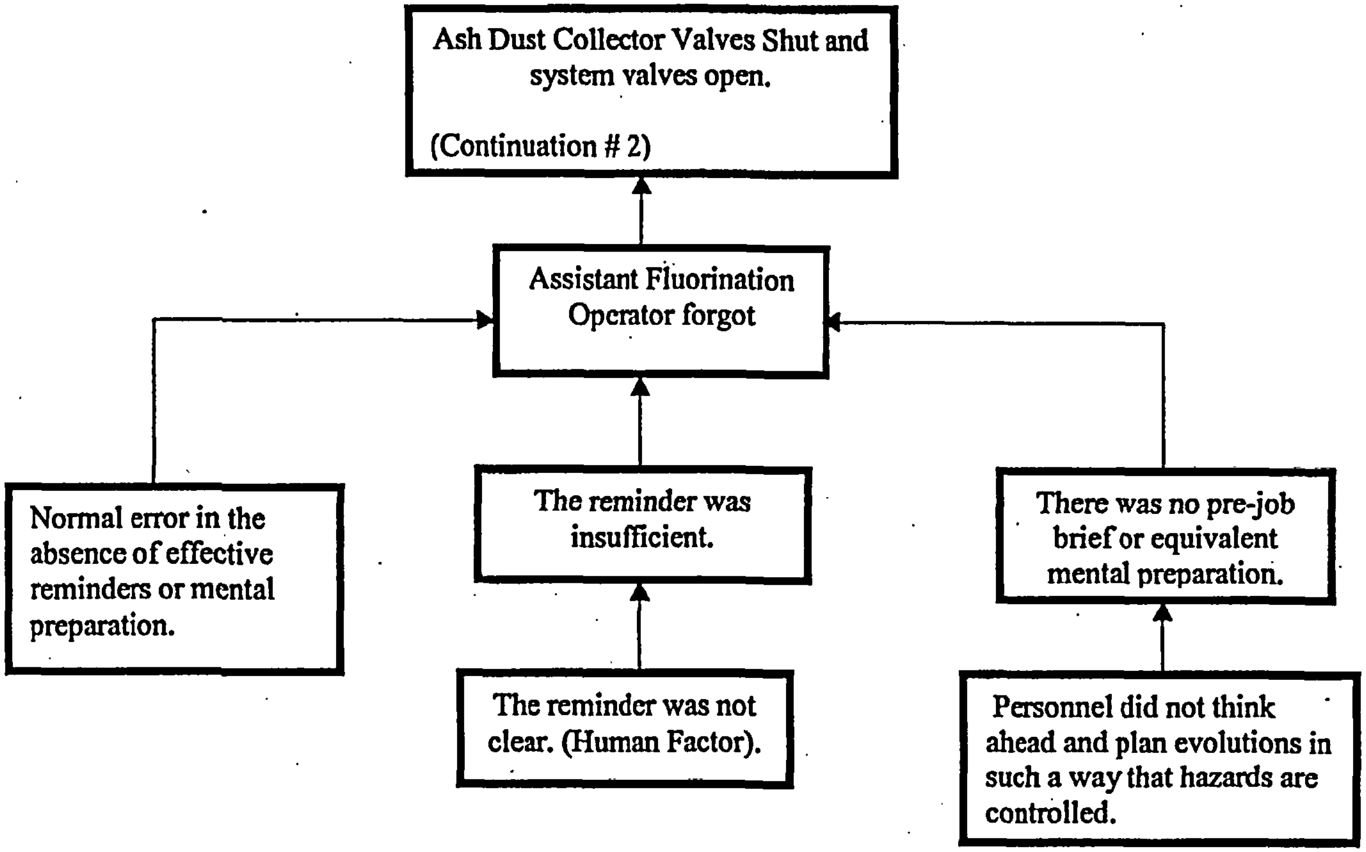
Appendix 5: Why Staircase Tree for Release


Overview
UF6 Release
~0215-~0313 hours
7# U, 2# HF
UF6 Available for Release
Distillation System on Recycle
This condition was not recognized as a hazard during this evolution.
Fluorination System Pressurized to ~7 psig (See Continuation #1)
System Integrity Issues
Normal Condition
Fluorination System Vented Through Ash Dust Collector System (See Continuation #5)
Vacuum Restored at ~0313 hours (See Continuation #6)

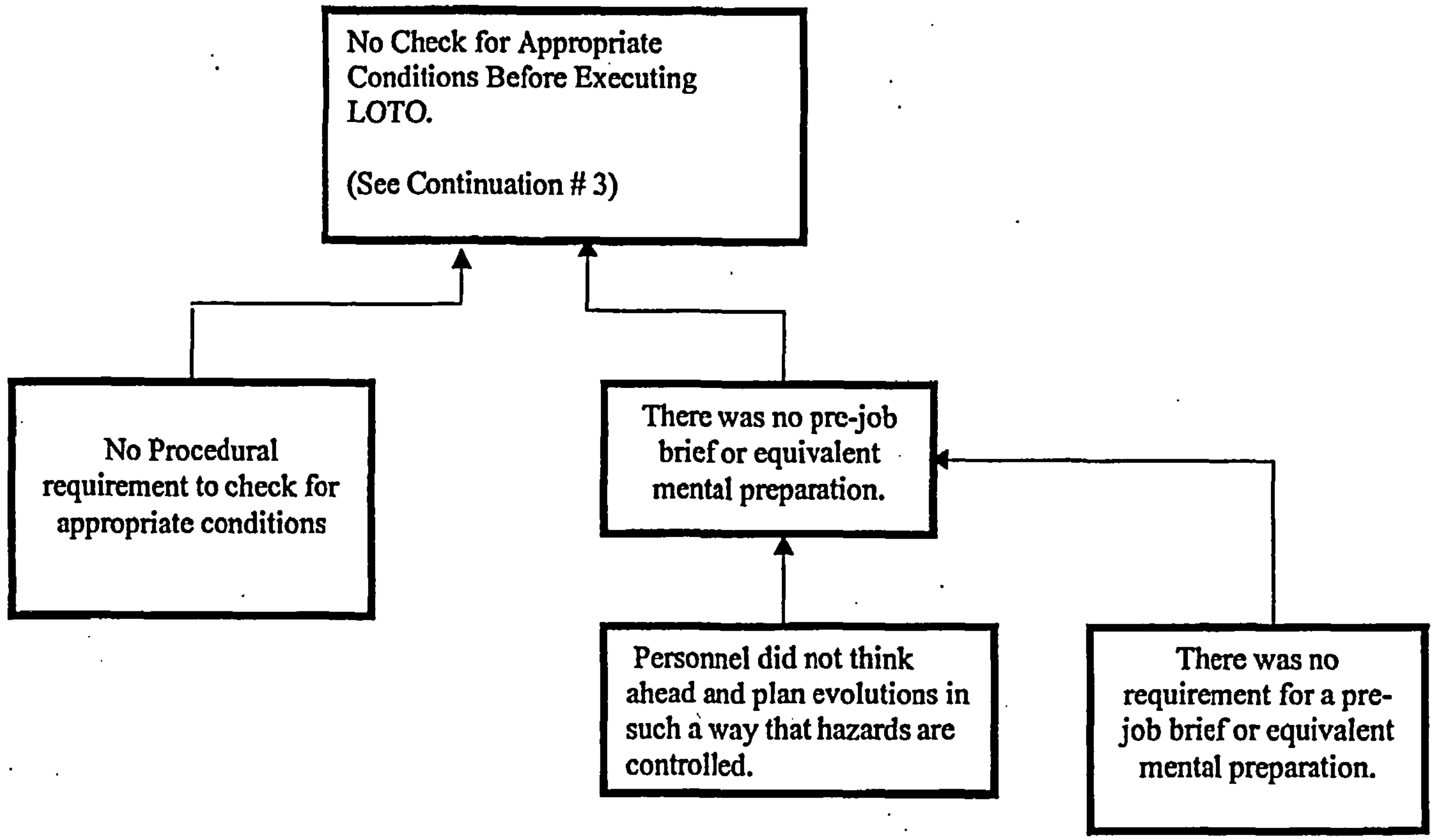
Continuation # 1



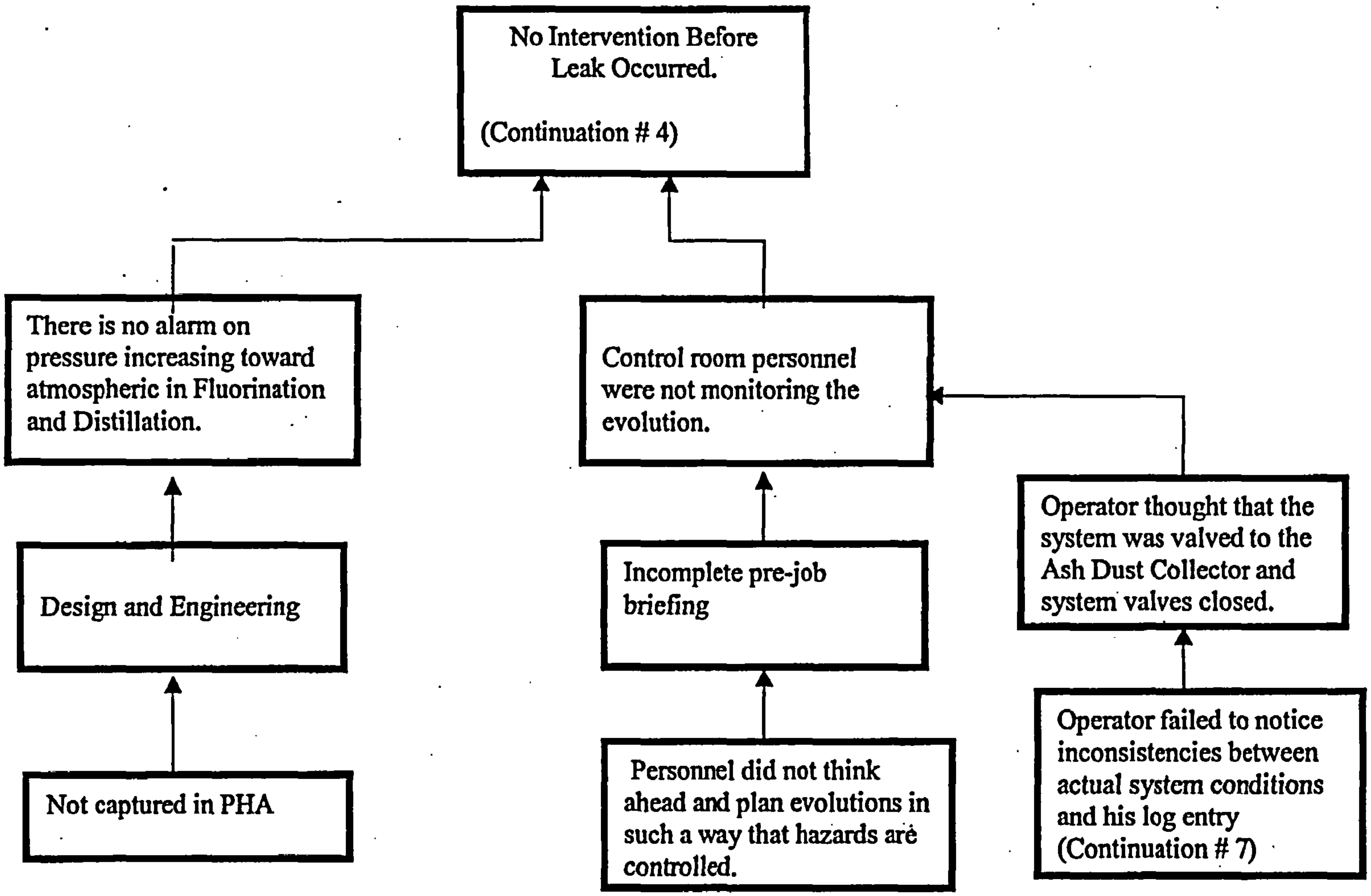
Continuation # 2



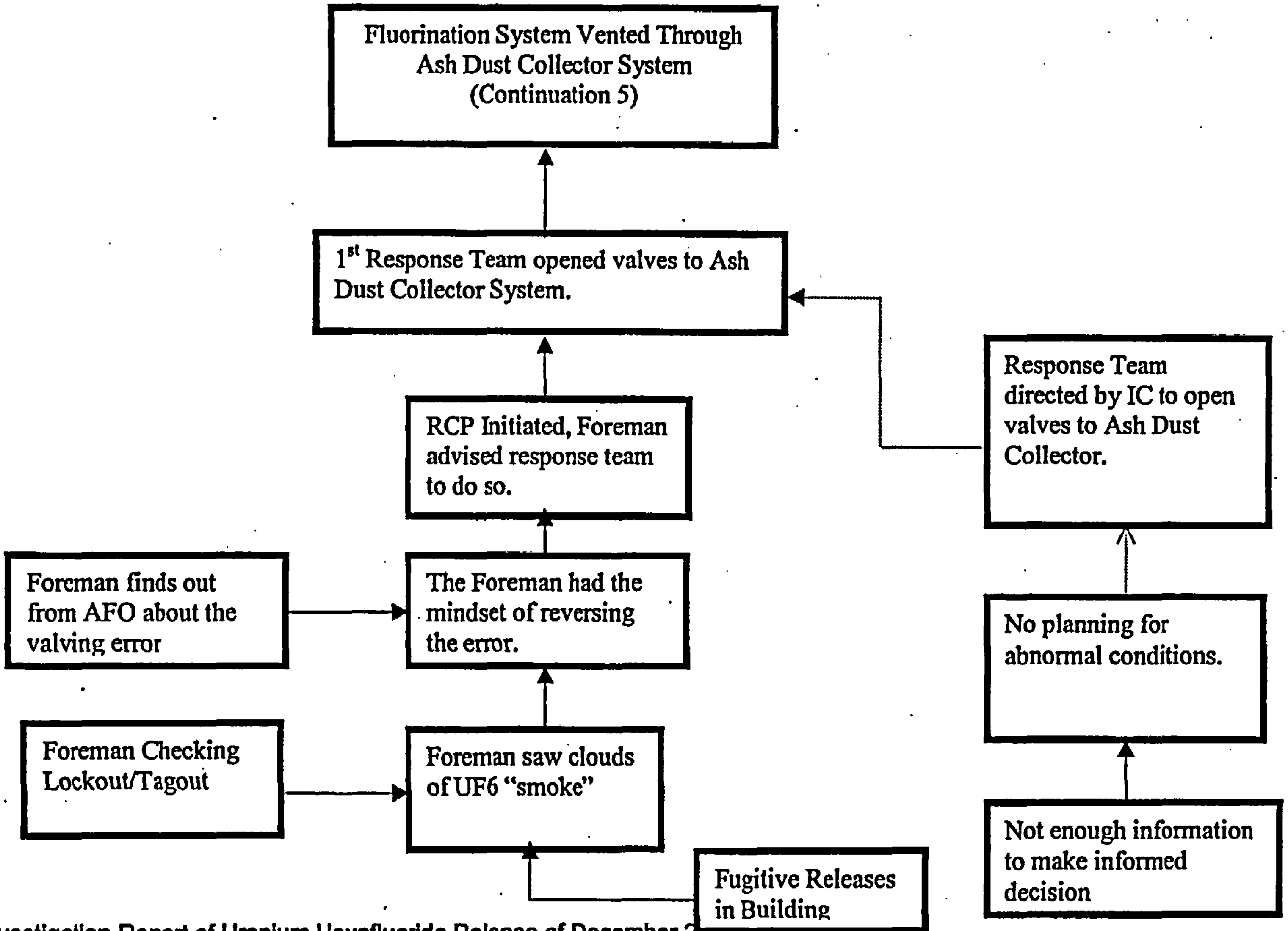
Continuation #3



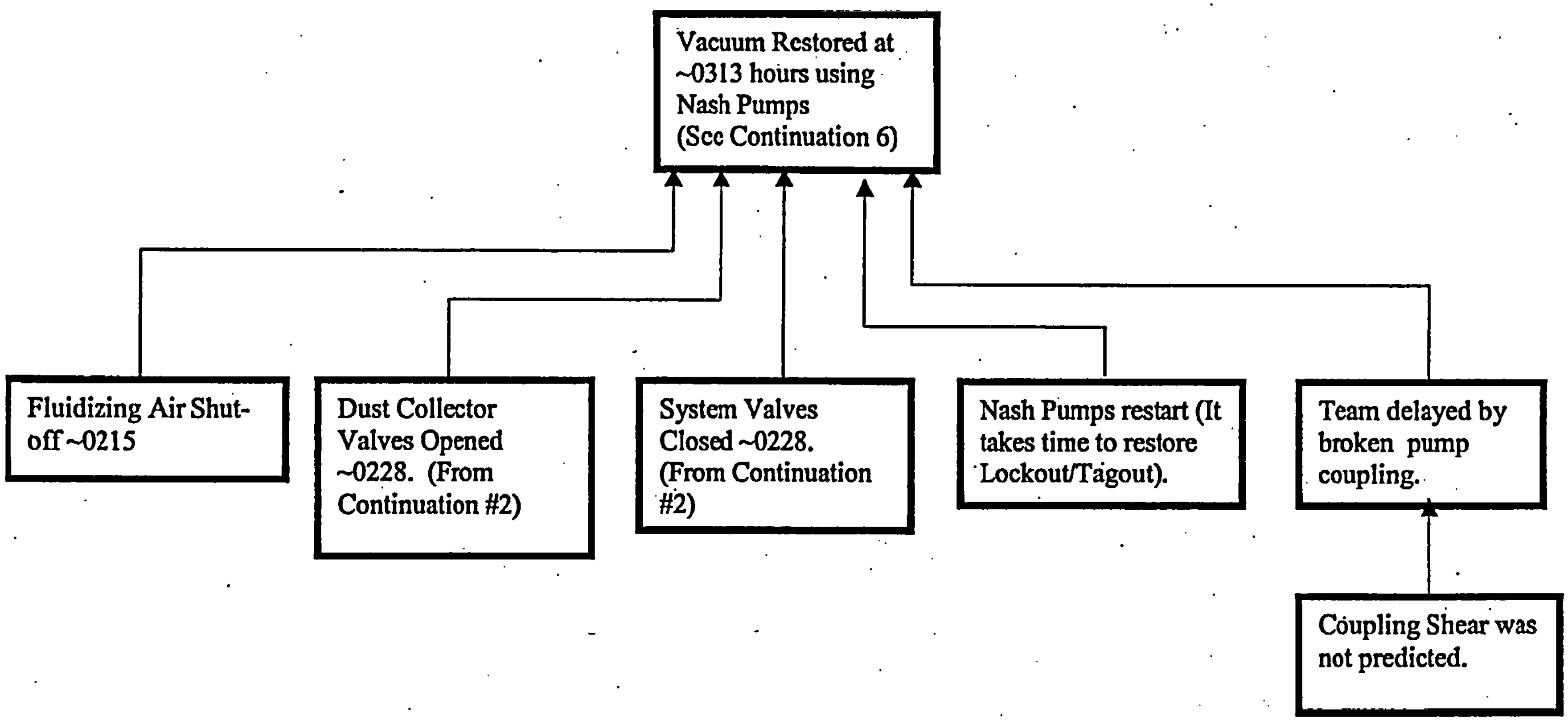
Continuation # 4



Continuation # 5



Continuation # 6



Continuation # 7