WHC-MR-0519

WHC Significant Lessons Learned 1993-1995

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Date Published
February 1996

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

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Management and Operations Contractor for the
U.S. Department of Energy under Contract DE-AC06-87RL10930

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Printed in the United States of America

DISCLM-1.CHP (8-95)

FOREWORD

A **lesson learned** as defined in DOE-STD-7501-95, DEVELOPMENT OF DOE LESSONS LEARNED PROGRAMS, is:

- A "good work practice" or innovative approach that is captured and *shared* to promote repeat applications

- An adverse work practice or experience that is captured and *shared* to avoid a recurrence.

The key word in both parts of this definition is "shared". This document was published to share a wide variety of recent Hanford experiences with other DOE sites. It also provides a valuable tool to be used in new employee and continuing training programs at Hanford facilities and at other DOE locations.

This manual is divided into sections to facilitate extracting appropriate subject material when developing training modules. Many of the bulletins could be categorized into more than one section, however, so examination of other related sections is encouraged.

Readers are encouraged to provide feedback on the appropriateness and utility of the bulletins included. Any suggestions for improvement can be provided to the Hanford Lessons Learned Coordinator, telephone (509)373-7664, FAX (509)372-0270, or e-mail: John_C_Bickford@rl.gov.

PERSONNEL CONTAMINATION

One of the basic precepts of our safety programs is to keep radioactive materials contained to prevent contamination of our workers and the environment. Many of the bulletins in this section reflect a casual attitude towards preventing the spread of radioactive contamination. Radiological control procedures are generally adequate to prevent such spread IF THEY ARE FOLLOWED. In most of these incidents some procedural requirement was ignored or overlooked, hence these bulletins could also be listed in the Procedural Violation section of this document.

LESSONS LEARNED BULLETIN - 93I046.BU
August 31, 1993

INHALATION AND CONTAMINATION OF PERSONNEL

The following information is supplied by the PFP for dissemination to other facilities describing two incidences in which contamination of personnel occurred. Facilities are requested to examine this information and apply it to their operations.

ACCIDENTAL INHALATION OF RADIOACTIVE CONTAMINATION AND ACCIDENTAL RADIOACTIVE CONTAMINATION OF PERSONNEL

An investigation was conducted to examine two accidents at the Plutonium Finishing Plant (PFP): one that resulted in three employees receiving nasal contamination while troubleshooting a flow-control instrument (rotameter) at the Plutonium Reclamation Facility (PRF), on March 22, 1993, and the other resulting in eight employees who were subjected to the internal deposition of plutonium during normal routine operations while replacing a high efficiency particulate air (HEPA) filters in filter box 9A (FB-9A), on March 17, 1993.

On March 17, 1993, the work package for replacement of the filter box (FB) 9A HEPA filters was released for work. The major portion of this task involves work inside a containment greenhouse where access to the interior of the filter box can be gained for the changeout of a pair of filters. A preparatory step for changeout of the filters is the release of eight filter holddown clamps (four clamps per filter) by means of an external release mechanism. Experience had shown that these clamping mechanisms could be subject to binding.

A decision was made during the pre-job meeting to "test" the filter clamps before starting work for the package to verify that the clamps would be operable for this task. This testing was undertaken without respiratory protection or monitoring by health physics technicians (HPT). At approximately 10:05 a.m., while the workers were loosening the clamping mechanisms, the handle on one of the clamping mechanisms came loose, allowing it to withdrawn part way from the filter box and release contamination to the workers and immediate surroundings. The release resulted in the internal deposition of plutonium to workers. Workers immediately acted to minimize the spread of contamination and to care for the contaminated workers. Actions were taken to characterize the extent of the contamination inhalation and to begin appropriate medical care for the workers.

On March 22, 1993, at approximately 5:10 a.m., three operators at the Plutonium Reclamation Facility (PRF) on the Hanford site received possible internal contamination. Facility personnel were preparing to line up a tank to remove liquid from the floor of some glove boxes. During this preparation, control room operators noted an abnormal reading on the tank level, and dispatched an operator to investigate the problem. Two operators in the area responded and commenced troubleshooting the instrumentation system. During their investigation, the operators noted that an instrument air rotameter for the system appeared to have a stuck float. When attempts to free the float by adjusting the inlet air flow to the rotameter were unsuccessful, the operators removed a protective cover over the glass metering tube in the rotameter. When this was performed, the operators reported hearing a short duration hissing sound from the vicinity of the rotameter.

Approximately two minutes after the hissing noise was heard, a continuous air monitor (CAM) in the area alarmed, indicating a release of airborne contamination. The two operators who were troubleshooting the rotameter and two additional operators who were on the same floor of PRF evacuated the area.

Immediately following the contamination release, Health Physics Technicians responded to the area and surveyed the personnel who had been in the vicinity. Three operators had indications of positive nasal contamination. A follow up survey of the area where the operators had been working revealed the presence of loose surface contamination. This contamination is believed to have been released during the work by the operators.

The investigation revealed that there were many factors involved in the events occurring.

CAUSES

The key causal factor for the Plutonium Finishing Plant events reviewed was less than optimum work practices.

KEY CAUSES IDENTIFIED ON THE ACCIDENTAL INHALATION OF RADIOACTIVE CONTAMINATION INCIDENT

1. Design inadequacies or inadequate acceptance inspection criteria in 1965 let to the loss of the retaining ring function.

2. A lack of clarity in both the work package and the RWP, and the failure to integrate the two, allowed the filter clamp loosening operation to be performed without HPT coverage and without respiratory protection.

3. Management has not enforced the philosophy that detailed work instructions must be provided for all packages commensurate with both the complexity and potential hazard of the operation.

ROOT CAUSES IDENTIFIED ON THE ACCIDENTAL RADIOACTIVE CONTAMINATION OF PERSONNEL INCIDENT

1. Facility personnel did not understand the extent of contamination in the tank level instrumentation system.

2. The hazards associated with potentially contaminated pressurized systems have not been adequately addressed at the facility.

3. The operators went beyond the perceived normal limits for troubleshooting efforts by removing the protective cover on the rotameter and tapping on the glass rotameter tube.

REFERENCES

1) WHC-MR-0411, Investigation of Accidental Radioactive Contamination of Personnel, March 22, 1993: Tank 49 Rotameter, Plutonium Reclamation Facility, PREPARED APRIL 30, 1993.

2) WHC-MR-0408, Investigation of Accidental Inhalation of Radioactive Contamination, March 17, 1993: Filter box FB-9A, Plutonium Finishing Plant, PREPARED APRIL, 1993.

3) RL-WHC-PFP-1993-0018, "During a Filter Changeout, a Filter Holddown Bolt Broke Loose, Causing a Contamination Spread and Internal Contamination of a Worker", 10-Day dated March 31, 1993.

4) RL-WHC-PFP-1993-0020, "Four Operators Received a Potential Intake of Radioactive Material Following an Attempt to Clear a Clogged Rotameter Tube" 10-Day dated April 5, 1993.

Westinghouse Hanford Company
Site Wide Lessons Learned
Safety Bulletin

Date: May 10, 1994

Number: 941017

LESSONS LEARNED

TREAT ALL ITEMS AND ACTIONS AS POTENTIALLY CONTAMINATING WHEN WORKING AROUND OR WITH RADIOLOGICAL MATERIAL

PERSONNEL CONTAMINATION RESULT OF IMPROPER MANIPULATION OF PROTECTIVE CLOTHING - 2/17/94

Three operators (under continuous coverage from a Health Physics Technician [HPT]) were performing a task in a radiologically controlled area (RCA) of Hanford. During the exiting survey one operator alarmed the Personnel Contamination Monitor (PCM) indicating contamination in the head area. An HPT surveyed the operator and detected 10,000 dpm/probe area beta/gamma and less than (<) detectable alpha contamination on the underside of the operator's chin. The first set of nasal smears indicated 1,000 dpm/probe area beta/gamma and < detectable alpha on the right nostril, 500 dpm/probe area beta/gamma and < detectable alpha on the left nostril by portable instruments. The second set of nasal smears showed < detectable results by portable instruments.

All other workers in the area cleared the PCM and the HPT personnel survey without incident.

All decontamination materials, nose blows and nasal smears were sent to the Laboratory for analysis. The operator was sent to the Whole Body Counter. WHC Dosimetry, was notified.

PROBABLE CAUSE OF EVENT:

The operator indicated that the Velcro on the inner coveralls was irritating the neck. The operator grabbed at the outer coveralls (with work gloves on) "a couple of times" in an attempt to stop the irritation. It was also stated that the operator's chin touched the outer pair of Protective Clothing (PCs) when looking down into the work area to manipulate the equipment being used.

SOURCE

Health Physics Information Exchange & Lessons Learned - HP/LL-94-60, Steve Lewis, Health Physics. This bulletin is being disseminated per the request of Jim Konyu.

Westinghouse Hanford Company
Site Wide Lessons Learned
INFORMATION BULLETIN

Date: August 18, 1994 Number: 94I034 Page 1 of 2

PERSONNEL CONTAMINATION BY DEGRADED CESIUM-137 SOURCE

CONTAMINATION OF PERSONNEL BY DEGRADED CESIUM-137 SOURCE

Authored by Lars Edvalson, 373-2672

On June 29, 1994, a scientist, two senior chemical technicians, and an operator were performing non-destructive assays in Building 231-Z, using a Cobalt-60 source, a Cesium-137 source, and a Americium-241 source. After completing the assays the individuals returned the sources to Building 234-5Z. At about 10:00 p.m. the scientist exited Building 234-5Z, used a hand and foot counter, and detected beta/gamma contamination on his hands.

Low-level contamination was subsequently discovered on two of the four individuals involved. The contamination was found to have originated from handling a small, wafer-like, plastic sealed Cesium-137 source. A detailed inspection of the source revealed a small area of degradation which was allowing the release of Cesium-137. The degradation is suspected to have been caused by repeated taping of the source to the counting system in order to assure proper geometry for achieving the desired response information.

The control and accountability of the Cesium-137 source was found to be less than adequate. The source had recently been identified as a source during an audit and was in the process of being added to the current source control program.

Survey requirements involving sources were not addressed in the Radiological Work Permit. Inadequate survey requirements allowed one of the four individuals involved to leave the site, increasing the potential for radiological contamination to be taken off-site. All barriers to prevent radiological contamination from being taken off-site were compromised in this near miss incident.

LESSONS LEARNED

This event occurred as a result of less than adequate source control and degradation of the source encapsulating material due to age and the methods in which it was handled.

This event underscores the need to conduct periodic inspection of radioactive sources as required by DOE requirements. Chapter 4 of the DOE Radiological Control Manual states: "Sealed source integrity testing shall be done at least every six months or whenever damage might have occurred." DOE N 5400.9, Sealed Radioactive Source Accountability, states: "A test of source integrity shall be made every six months or whenever damage might have occurred."

Lock and Tag
Steam System Operation
Freeze Protection

Westinghouse Hanford Company
Site Wide Lessons Learned
INFORMATION BULLETIN

Facilities should consider using age as a determining factor for disposal of sources that have a potential for the encapsulating material to fail.

Personnel should use care in the handling of sources that utilize encapsulating materials that could fail if the source is subjected to stress caused by bending, twisting, etc.

Adequate survey requirements at DOE facilities, of radioactive samples and sources is essential in preventing the potential for radiological contamination to be taken off-site.

SOURCES

1) Occurrence Report Number RL-WHC-PFP-1994-0028

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

Date: March 7, 1995 | Number: 95I011 |

PLUTONIUM INHALATION

OPERATIONAL DIFFICULTIES NEED TO BE COMMUNICATED

On December 13, 1994, two operators at the Plutonium Finishing Plant (PFP) were internally contaminated. The event occurred when double bags surrounding a half-liter polyjar plutonium storage container were breached when they were being removed from an overpack. Unattended storage of fissile material in the overpack is a criticality prevention specification non-conformance. Contamination levels up to 25,000 dpm alpha were detected in the area and adjacent rooms.

Four polyjars were double bagged and placed in seismic overpacks for storage on swing shift. Two polyjars were placed in larger version overpacks without any problems. Two polyjars were placed in smaller version overpacks (approx. 6" tall and 6" diameter). Tolerance problems prevented proper placement of the polyjars into the smaller overpacks.

On day shift, the bags surrounding one of the polyjars were torn when it was removed from the overpack lid. Two of the five employees in the room at the time were asked to leave while the other three performed surveys. Upon discovering contamination, the polyjar was placed into another bag when the room CAM alarmed. All personnel exited the room. Two of these employees had positive nasal smears.

LESSONS LEARNED

o Operational problems encountered during each shift need to be communicated through shift turnover and/or in log entries. No turnover or log entries existed to communicate the problems associated with loading the bagged polyjars into the overpacks.

o New devices/equipment training is essential to ensure proper usage and needs to encompass all support activities. Personnel involved in this event were not aware that the overpacks were not authorized for out-of-glovebox storage. Support activities were not included in the training program for the sludge stabilization training. Personnel were not trained to the nuclear material movement procedure nor were they adequately trained to operate the glovebox equipment.

o Mandatory compliance to procedures and criticality prevention specifications is required. Failure to verify the seismic overpacks were approved storage devices resulted in a CPS non-conformance.

o Employees have the right and responsibility to identify unsafe work practices or conditions. None of the individuals involved recognized the potential hazards associated with difficult loading or unloading of the overpack and potential for exposure from packaging failure.

o Senior management mentoring is essential to convey their expectations and rigor of Conduct of Operations in the conduct of daily activities. This occurrence identified conduct of operations deficiencies pertaining to communications, logkeeping, turnover, and procedure compliance.

SOURCE

For more information refer to Occurrence Report RL--WHC-PFP-1994-0056 or contact W. J. Leonard at 373-1820.

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

Date: March 23, 1995 | Number: 951014 |

CONTAMINATION FROM SMOKE DETECTORS

Old Smoke Detectors Pose Contamination Hazards

The following lessons learned is issued verbatim as received from PFP. If further information is required contact Mr. W.J. (Bill) Leonard at 373-1820.

INCIDENT

On February 1, 1995 three personnel at the Plutonium Finishing Plant (PFP) were contaminated while placing old used smoke detectors into a radioactive material waste drum for disposal. A radiological survey found about 21,000 disintegrations per minute (dpm) alpha and about 30,000 dpm beta/gamma contamination on one person's gloves and 500 dpm to 700 dpm alpha contamination was found on the hands of the other two individuals.

In late January, old Pyrotronics high voltage smoke detectors were removed from PFP as part of a fire system upgrade project. They were turned over to operations personnel for disposal as radioactive solid waste. Operations personnel removed the smoke detectors one at a time from a bag and placed them into a radioactive material waste drum. Smoke detectors already in the drum were handled to make room for the additional detectors as they were placed in the drum. Upon exiting the area, an operator performed a radiological survey of his gloves and detected contamination. He informed the other two operators and they performed surveys and both detected low levels of contamination. The Radiological Control Technician (RCT) office and the operators' manager were notified. An RCT performed surveys and identified contamination on the operators as well as minor contamination on the lid of the drum and on a plastic drum lid cover. All personnel were taken to the Decontamination Room, decontaminated and released. Contamination samples were sent for analysis. The results of the samples identified the primary isotope involved as Americium 241, the radioactive source used in the smoke detectors.

Investigative surveys were performed for other involved personnel and for the areas traversed when the smoke detectors were transported from and to Building 234-5Z. No contamination was detected.

PROBABLE CAUSE

The most likely cause of contamination is the failure or degradation of the Americium 241 source located in one or more Pyrotronics smoke detectors. The exact cause of the source leakage was not determined, however, the following information is provided which identifies some potential reasons for the source to lose its integrity.

The smoke detectors are approximately 40 year old Pyrotronics Model F5B and Model F3/5A. The radioactive source consists of 80 microcuries of americium oxide mixed with gold powder and formed into a small compact or billet. This compact is then placed between a sheet of silver and a sheet of gold and is rolled into a foil under high heat and pressure. The manufacturer indicated that the cause of failure may be associated with the way the detectors were handled during removal (i.e., dropped during removal or while being placed in the drum for disposal, etc.). This is highly possible since no precautions were conveyed regarding any special handling requirements for the detectors during removal as part of the fire system upgrade project. Another possibility discussed was radiation degradation of the source's integrity either from the americium source itself, or a combination of radiation from the source and the radiation fields where the detectors were located. Many of these detectors were installed in radiological areas in the facility.

It should be noted that it is only because these detectors were installed in a nuclear facility where radiation monitoring is required, that the contamination was detected. Should any of these detectors leak americium contamination at any facility where radiological monitoring is not performed, it would not be detected.

LESSON LEARNED

When handling smoke detectors containing radioactive sources, care should be taken not to damage the detector, which could result in a loss of the source's integrity. Consideration should also be given to the age of the detector and the environment in which it is installed.

Facilities having these types of detectors should consider including this information in maintenance procedures used to service these types of smoke detectors to warn against a potential contamination hazard and to require radiological surveys before and after handling these types of detectors.

A good practice realized as a result of this occurrence was the survey performed by one of the individuals involved. This survey was not mandatory due to the nature of the work being performed, but the individual routinely performed precautionary radiological surveys as part of his normal work practices. This allowed the detection of a contamination problem, and prevented the spread of contamination to other areas in the facility.

SOURCE

OCCURRENCE REPORT NUMBER:
RL--WHC-PFP-1995-0003

A review of the ORPS data base identified two other occurrences which indicate problems with smoke detectors. In one of these occurrences, Pyrotronics Model F3/5A smoke detectors were cited specifically as the source of contamination.

CH-AA-ANLE-ANLEESH-1991-1001
RL--WHC-SOLIDWASTE-1993-0015

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

Date: July 25, 1995 | Number: 95I031 |

RADIOLOGICAL HOLD POINTS MUST BE OBSERVED

PROBE CUTTING SPREADS CONTAMINATION

SUMMARY:

Inadequate radiological work practices caused an unneccessary spread of contamination and could have caused serious internal contamination to three workers.

DETAILS:

In late February 1995, a three meter (ten foot) long contaminated sample probe was removed from the PUREX canyon ventilation exhaust duct. The old probe was being replaced with a new probe so that the historical contamination on the old probe would not affect data that was needed to characterize the current canyon ventilation stream. The probe was successfully removed, double bagged, and temporarily stored in a building on the backside of PUREX.

On March 6, 1995, three operators cut the probe in half in a glove bag for disposal. The following deficiencies in radiological work practices were identified during the investigation:

- The work was performed without Radiological Control Technician (RCT) coverage.
- The work was performed without observing a radiological hold point in the governing work package. The operators were unaware of the work package since they normally perform this sort of work under an operations procedure instead of a work package.
- While "bagging out" the saw after the operation, one of the operators slipped with the knife and cut the glove bag in two places. The cuts were immediately sealed with masking tape. However, the RCT was not notified of the breached containment.
- Not using the correct RWP to support the work.
- Not performing the work in accordance with a standard waste handling procedure when they elected to perform the work outside of the approved specific work document.
- The removal of radioactive material from a contamination area without the required RCT coverage.
- The use of self survey instruments without following the instrument checkout procedure.
- Inadequate pre-job briefing.

The next day when the violation of the radcon hold point was discovered, comprehensive surveys of the work area were performed. Contamination levels up to 200,000 dpm beta-gamma and 14,000 dpm alpha were identified in the marked and posted contamination area where the probe parts were stored. The contamination apparently had escaped through one of the inadvertant cuts in the glove bag when the masking tape peeled open.

The actual safety impact of this event was relatively minor. However, the potential safety significance was much larger since the personnel performing the work did not fully understand or question the contamination levels on the probe. Furthermore, the work was performed outside of many fundamental elements of the DOE's program to control work and provide worker safety. Fortunately no personnel were contaminated during this incident.

This event was self-reported to the DOE Office of Enforcement on April 12, 1995 and thereby precipitated an informal conference convened by that office. See Lessons Learned bulletin 95I028 for lessons learned from that conference.

LESSONS LEARNED:

Radiological conditions of a job must be known to all involved workers. Work must be performed under the appropriate RWP.

Hold points shall be incorporated into work documents for steps that could result in exposures exceeding administrative control levels, high airborne radioactivity, or a release to the environment. They MUST be rigorously observed.

REFERENCES:

Occurrence report:
RL--WHC-PUREX-1995-0006
Internal memo:
PUREX, 17000-95-072, dated June 15, 1995

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

Date: September 28, 1995 Number: 951041

EXCEEDING WORK SCOPE RESULTS IN PERSONNEL CONTAMINATION

LIMITS IN RWPs MUST BE STRICTLY OBSERVED

SUMMARY:

On 7/12/95 an operator received significant levels of contamination on his modesty clothing and skin when he performed work beyond the limits of the approved Radiological Work Permit (RWP) for his assigned job.

DETAILS:

The operator entered the K East Basin to perform routine housekeeping activities dressed in a single pair of anti-contamination coveralls and a respirator as required by the radiation work permit for routine housekeeping. During his time in the basin, he was requested to assist ICF KH laborers who were loading a burial box with contaminated grating. A failed ion exchange module (IXM) vent tree was in the path to the burial box. The workers moved the vent tree. After loading the contaminated grating into the box, the operator noticed water leaking from the air-water separator on the vent tree. The operator moved the vent tree to a nearby floor drain and loosened the vent fittings to aid in draining. When there was no more apparent water in the vent tree, the operator dismantled it, placed inside a plastic bag, and loaded it into the box. Dismantling and packing the vent tree was outside the scope of the RWP and the work assigned by the Shift Manager.

Levels of contamination on the worker were as high as 40,000 dpm/100 cm^2 beta-gamma on the right thigh and 7,000 dpm/100 cm^2 beta-gamma on the back of the right elbow. He had no alpha contamination.

Survey swipes of the work area after the incident indicated up to 50 mRad/100 cm^2 beta-gamma and 1,400 dpm/100 cm^2 alpha. These elevated levels of contamination cannot be measured with Geiger-Meuller instruments normally available at the facility. Access to the north transfer area was restricted until the area was decontaminated.

LESSONS LEARNED:

This event highlights the need for individuals to verify before they begin work that the limits established by RWPs will not be exceeded during the course of their job. All radiological workers need to recognize the boundaries of the RWP and the importance of consulting Radiological Control Technicians and the Shift Manager prior to initiating work that might be beyond the allowed work scope.

The operator failed to recognize that the levels of potential contamination from the IXM vent tree were significantly higher than those associated with general housekeeping. The degree of protective clothing required would therefore have been greater as well.

REFERENCES:

Occurrence Report
RL--WHC-KBASINS-1995-0018
Radiological Problem Report K-95-062

Facilities should consider using age as a determining factor for disposal of sources that have a potential for the encapsulating material to fail.

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SOURCES

1) Occurrence Report Number RL-WHC-PFP-1994-0028

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

Date: March 7, 1995 | Number: 95I011 |

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LESSONS LEARNED

o Operational problems encountered during each shift need to be communicated through shift turnover and/or in log entries. No turnover or log entries existed to communicate the problems associated with loading the bagged polyjars into the overpacks.

o New devices/equipment training is essential to ensure proper usage and needs to encompass all support activities. Personnel involved in this event were not aware that the overpacks were not authorized for out-of-glovebox storage. Support activities were not included in the training program for the sludge stabilization training. Personnel were not trained to the nuclear material movement procedure nor were they adequately trained to operate the glovebox equipment.

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SOURCE

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Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

Date: March 23, 1995 Number: 95I014

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LESSON LEARNED

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Facilities having these types of detectors should consider including this information in maintenance procedures used to service these types of smoke detectors to warn against a potential contamination hazard and to require radiological surveys before and after handling these types of detectors.

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SOURCE

OCCURRENCE REPORT NUMBER: RL--WHC-PFP-1995-0003

A review of the ORPS data base identified two other occurrences which indicate problems with smoke detectors. In one of these occurrences, Pyrotronics Model F3/5A smoke detectors were cited specifically as the source of contamination.

CH-AA-ANLE-ANLEESH-1991-1001
RL--WHC-SOLIDWASTE-1993-0015

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

Date: July 25, 1995 Number: 95I031

RADIOLOGICAL HOLD POINTS MUST BE OBSERVED

PROBE CUTTING SPREADS CONTAMINATION

SUMMARY:

Inadequate radiological work practices caused an unneccessary spread of contamination and could have caused serious internal contamination to three workers.

DETAILS:

In late February 1995, a three meter (ten foot) long contaminated sample probe was removed from the PUREX canyon ventilation exhaust duct. The old probe was being replaced with a new probe so that the historical contamination on the old probe would not affect data that was needed to characterize the current canyon ventilation stream. The probe was successfully removed, double bagged, and temporarily stored in a building on the backside of PUREX.

On March 6, 1995, three operators cut the probe in half in a glove bag for disposal. The following deficiencies in radiological work practices were identified during the investigation:

- The work was performed without Radiological Control Technician (RCT) coverage.
- The work was performed without observing a radiological hold point in the governing work package. The operators were unaware of the work package since they normally perform this sort of work under an operations procedure instead of a work package.
- While "bagging out" the saw after the operation, one of the operators slipped with the knife and cut the glove bag in two places. The cuts were immediately sealed with masking tape. However, the RCT was not notified of the breached containment.
- Not using the correct RWP to support the work.
- Not performing the work in accordance with a standard waste handling procedure when they elected to perform the work outside of the approved specific work document.
- The removal of radioactive material from a contamination area without the required RCT coverage.
- The use of self survey instruments without following the instrument checkout procedure.
- Inadequate pre-job briefing.

The next day when the violation of the radcon hold point was discovered, comprehensive surveys of the work area were performed. Contamination levels up to 200,000 dpm beta-gamma and 14,000 dpm alpha were identified in the marked and posted contamination area where the probe parts were stored. The contamination apparently had escaped through one of the inadvertant cuts in the glove bag when the masking tape peeled open.

The actual safety impact of this event was relatively minor. However, the potential safety significance was much larger since the personnel performing the work did not fully understand or question the contamination levels on the probe. Furthermore, the work was performed outside of many fundamental elements of the DOE's program to control work and provide worker safety. Fortunately no personnel were contaminated during this incident.

This event was self-reported to the DOE Office of Enforcement on April 12, 1995 and thereby precipitated an informal conference convened by that office. See Lessons Learned bulletin 95I028 for lessons learned from that conference.

LESSONS LEARNED:

Radiological conditions of a job must be known to all involved workers. Work must be performed under the appropriate RWP.

Hold points shall be incorporated into work documents for steps that could result in exposures exceeding administrative control levels, high airborne radioactivity, or a release to the environment. They MUST be rigorously observed.

REFERENCES:

Occurrence report:
RL--WHC-PUREX-1995-0006
Internal memo:
PUREX, 17000-95-072, dated June 15, 1995

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

Date: September 28, 1995 Number: 95I041

EXCEEDING WORK SCOPE RESULTS IN PERSONNEL CONTAMINATION

LIMITS IN RWPs MUST BE STRICTLY OBSERVED

SUMMARY:

On 7/12/95 an operator received significant levels of contamination on his modesty clothing and skin when he performed work beyond the limits of the approved Radiological Work Permit (RWP) for his assigned job.

DETAILS:

The operator entered the K East Basin to perform routine housekeeping activities dressed in a single pair of anti-contamination coveralls and a respirator as required by the radiation work permit for routine housekeeping. During his time in the basin, he was requested to assist ICF KH laborers who were loading a burial box with contaminated grating. A failed ion exchange module (IXM) vent tree was in the path to the burial box. The workers moved the vent tree. After loading the contaminated grating into the box, the operator noticed water leaking from the air-water separator on the vent tree. The operator moved the vent tree to a nearby floor drain and loosened the vent fittings to aid in draining. When there was no more apparent water in the vent tree, the operator dismantled it, placed inside a plastic bag, and loaded it into the box. Dismantling and packing the vent tree was outside the scope of the RWP and the work assigned by the Shift Manager.

Levels of contamination on the worker were as high as 40,000 dpm/100 cm^2 beta-gamma on the right thigh and 7,000 dpm/100 cm^2 beta-gamma on the back of the right elbow. He had no alpha contamination.

Survey swipes of the work area after the incident indicated up to 50 mRad/100 cm^2 beta-gamma and 1,400 dpm/100 cm^2 alpha. These elevated levels of contamination cannot be measured with Geiger-Meuller instruments normally available at the facility. Access to the north transfer area was restricted until the area was decontaminated.

LESSONS LEARNED:

This event highlights the need for individuals to verify before they begin work that the limits established by RWPs will not be exceeded during the course of their job. All radiological workers need to recognize the boundaries of the RWP and the importance of consulting Radiological Control Technicians and the Shift Manager prior to initiating work that might be beyond the allowed work scope.

The operator failed to recognize that the levels of potential contamination from the IXM vent tree were significantly higher than those associated with general housekeeping. The degree of protective clothing required would therefore have been greater as well.

REFERENCES:

Occurrence Report
RL--WHC-KBASINS-1995-0018
Radiological Problem Report K-95-062

Westinghouse Hanford Company
Site Wide Lessons Learned
BLUE/INFORMATION BULLETIN

Date: 12/14/95 Number: 95I051

FOUR INDIVIDUALS CONTAMINATED WHILE HANDLING WASTE

ROUTINE RADWASTE OPERATIONS SHOULD BE STOPPED WHEN PROBLEMS ARISE

SUMMARY:

On Monday, October 23, 1995, four workers at the Plutonium Finishing Plant were contaminated while packaging waste in the 232-Z Incinerator Building.

DETAILS:

Large heavy metal waste items were being removed from a glove box. The items were wrapped in plastic inside the glovebox, padded and taped at sharp points, sealed out of the glovebox, wrapped in additional plastic, surveyed for contamination, and placed near the Contamination Area (CA)/Radiological Buffer Area (RBA) boundary.

A Laboratory Technician then performed a non-destructive assay measurement of the packages prior to their being removed from the CA for disposal in a 208 liter (55 gallon) drum located in an adjacent RBA. During this activity, an individual attempted to exit the building and found contamination on his shoes. All individuals working this job then performed surveys of their shoes and found contamination levels of approximately 10,000 disintegrations per minute (dpm) alpha.

Radiological Control Technicians were notified and responded to Building 232-Z. All individuals working there were surveyed and sent to the PFP ACES station for a final survey and release. One operator detected 1,400 dpm alpha contamination on his left forearm.

All individuals involved in the event were requested to receive nasal smears. There were four confirmed positive nasal smears with the highest level being 115 dpm alpha. Repeated blowing of the nose and additional smears reduced all four to nondetectable.

An investigation determined that the plastic wrapping had likely failed, allowing contamination to leak out and contaminate the individuals.

LESSONS LEARNED:

Waste handlers should be cautious when placing sharp, rigid, extremely heavy or irregular-shaped objects in radioactive packages. These objects pose a risk in puncturing packages and may cause the spread of contamination.

Survey procedures should be followed. In this event, the packages were manipulated in a CA and were then relocated to a Radiological Buffer Area (RBA) without a proper survey.

Individuals need to ensure that all details involved in a task are addressed and followed per the pre-job instructions. If any issues arise, the job should be "stopped" until those issues or concerns are addressed. In this event, the operators were confused on the location of the drum: the pre-job instructed it to be placed in a CA yet the drum was actually in a RBA. The operators performing this job were aware that there were discrepancies between their actual work process and the way they were briefed in the pre-job yet none of the operators stopped the job to reconcile the differences.

Procedures should be followed as they are written. Heavy items were not placed in approved containers as directed by the procedure. If the items had been placed in an approved container this event could have been avoided.

When handling items in a Contamination Area workers should be dressed in appropriate protective clothing. In this event items were manually manipulated during the NDA process without protective clothing.

Work plans should be written to ensure all highly hazardous operations can be accomplished in a safe and efficient manner. In this event standard operating procedures were in use rather than a thorough and comprehensive work plan. All aspects of the procedures were not fully analyzed and updated prior to applying them to the job for which they were not intended. In this event the items were too large to be placed in the approved container (the 208 liter drum).

Pre-job briefings need to address emergent conditions which could be encountered and the expected responses to those conditions. The pre-job in this event did not cover what actions that should be taken if contamination from a breached package is found.

Persons In Charge (PICs) should assure that work is being performed as planned during the work process. They should inquire about the status of the work activities and verify that the operation is proceeding as planned. In this event the PIC had made frequent visits to the work site but was not informed of any problems pertaining to the deviation from the pre-job briefing.

When contamination is found work should be stopped immediately and the area evacuated. In this event there seemed to be more interest in finding the source and taping shoes to prevent spreading contamination than in getting the unprotected personnel out of the area.

REFERENCES:
Occurrence Report
RL--WHC-PFP-1995-0055

Westinghouse Hanford Company
Site Wide Lessons Learned
YELLOW/CAUTION

Date: December 22, 1995 Number: 95I053

PERSONNEL CONTAMINATION CAUSED BY POOR WORK PLANNING

WORKERS MUST BE INFORMED OF HAZARDS AT WORK SITE

SUMMARY:

An ICF Kaiser pipefitter received internal contamination while modifying a sample station in 105KE Basin.

DETAILS:

On 11/8/95, workers were dismantling drain lines in a sample station as part of a modification to the station. Prior to the start of work, contamination surveys (smears) on the outside of the cabinet were performed at the request of the pipefitter on the job. In the morning, work was performed without incident inside the cabinet under close supervision of Radiological Control Technicians (RCTs). In the afternoon with only part-time RCT coverage, workers pulled the drain tubing up through the top of the sample cabinet, disconnected a hose clamp, and pulled the sections of tubing apart.

When crews exited the basin at 1530 hours after disconnecting the piping and performing other jobs, the pipefitter alarmed the portal monitor. A survey recorded readings of 15,000 dpm beta-gamma direct on the pipefitter's mustache. Nasal smears and a whole body count performed on 11/9/95 confirmed an internal deposition. The committed effective dose equivalent (CEDE) was 61 mrem.

Smears of the sample station cabinet on 11/09/95 indicated contamination levels of 650,000 dpm/100 cm2 beta-gamma on the counter. High surface contamination controls were put in place until the cabinet was decontaminated.

LESSONS LEARNED:

All personnel involved in a job must be aware of the potential for changing radiological conditions during the job. This sample piping had been in place for many years. The interior of the cabinet was known to be highly contaminated from a history of minor piping leaks. However, the personnel assigned to this job were from a different organization and were not familiar with the historical contamination problems. In this case contamination was transferred to a relatively clean work area when the old piping was pulled up through the sample sink drain and onto the counter.

All work groups involved in a job need to be represented in the walkdown for the job. A joint walkdown with all groups would have provided each group with the same basic information. Had the right information been made available to the RCTs, hold points for the work inside the sample cabinet and during the dismantling of the piping would have been established.

REFERENCES:

ORPS REPORT
RL--WHC-KBASINS-1995-0025

STEAM SYSTEM OPERATION

A fatality occurred at Hanford in June 1993 because of poor Conduct of Operations and inadequate knowledge of steam system phenomena, particularly condensation-induced water hammer. Several of the following bulletins deal with that mechanism. The others are included to help improve the safety of operating this high-energy, potentially deadly, system.

LESSONS LEARNED BULLETIN - 93I043.BU
AUGUST 6, 1993

FATALITY - STEAM VALVE FAILURE

On June 7, 1993, a power operator received fatal burns while attempting to open a 8-inch steam valve at the bottom of the 21-foot deep U-3 steam valve pit in the 300 Area. His burns resulted from a catastrophic failure of a 6-inch, blanked valve located in the pit approximately 10-feet above the 8-inch valve being operated.

The following lessons learned were issued from the investigation by the Manager of Utilities. ORT-WHC-300EM-1993-0022, "Hanford Site Steam Pit U-3 Steam Valve Failure Resulting in a Fatality on June 7, 1993" is the draft Type 'A' Accident Investigation written on this incident. Occurrence report number RL--WHC-WHC300EM-1993-0022 was issued to report this incident. A root cause analysis was conducted listing the root cause as "Management Problem, Inadequate Administrative Controls". This incident has been given a risk value of 1536.

LESSONS LEARNED

The Hanford site's steam piping systems utilize loops to facilitate alternate steam supplies or piping routes to be used during outages for routine maintenance. In the course of these outages, valves in the loop are shut and portions of the piping system cool and collects condensate. System design did not always incorporate condensate drains or an adequate method to control the rate of steam introduction(bypass valves) during restoration. The portions of the steam system that do not have adequate design features to drain condensate and control steam rate (bypass valves) can be classified as areas of concern or problem areas/valves. Introduction of steam into a horizontal pipe containing water or condensate can result in condensate induced water hammer. Condensate induced water hammer can occur in piping configurations, such as that found in the U-3 pit, where a large quantity of sub-cooled condensate comes into contact with a saturated steam space. The cool water, acting as a heat sink, rapidly condenses the steam causing a vacuum. The vacuum rapidly draws water into it's space at sonic velocities. When the moving water is stopped by a reduction of flow area or a valve, " a bang " is heard . If the pressure boundary integrity is not breached, force waves are generated between wave reflectors and violent pipe movement can occur from the pulsating force waves.

Extreme caution is necessary when operating "problem valves" . These valves / areas will to be identified on a case by case basis and procedures established for their operation. These procedures should be based on an analysis of the system configuration, with emphasis on isolating each valve prior to opening it. Administration control will be utilized until corrective engineering design changes are accomplished.

Confined space entry is a high risk event and special precautions will be invoked to reduce , eliminate or mitigate the hazards. Alternatives such as remote operators, design changes , isolation of energy sources(steam, electricity, compressed gas, or other stored energy) and elimination of temperature or other environmental extremes will be pursued to the maximum extent possible. A combination of engineered alternatives, personnel protective equipment, formal procedures (an entry plan), and work control will be developed and implemented prior to any confined space entry. An objective review of the entry plan by a knowledgeable, experienced individual will be conducted to ensure that the correct perspective is utilized.

Operator aids, essential to evaluation and conduct of routine operations, become critical factors in actions necessary in an emergency or casualty situation. The risk associated with using uncontrolled / inaccurate aids is unacceptable. Equally unacceptable is the unavailability of the technical data, approved drawings or operator aids to the persons responsible for everyday and emergency decisions necessary for safe , efficient operation. All operating systems will be evaluated to ensure that only approved accurate drawings and aids are being utilized and that sufficient aids are available to perform the work in a safe efficient manner. A single line diagram showing current system status will be posted in the operating space. The diagram will provide visual display of isolation points,flow paths and current status. Restrictions or limitations on operations will be annotated for operator reference. Accuracy in the system representation and ease of use are key elements making this a useful tool.

Periodic overall evaluation of system integrity and condition is critical to long term safe operation. Although operating and craft personnel are encouraged to identify and report deficiencies as discovered, periodic condition assessment using established engineering criteria is needed to identify hazardous conditions and system degradation. These inspections will be conducted on a yearly basis by knowledgeable personnel; identified deficiencies will be reviewed by operations and engineering personnel and appropriate corrective actions implemented.

Knowledgeable employees are the first line of defense in identifying hazards and reducing the risks ; training and qualification is essential. The qualification training program should assume an active posture vice the simple exposure concept. Prior to qualification, personnel need to demonstrate a mastery of the skills and knowledge required; only qualified personnel will be assigned to operate or maintain equipment.

LESSONS LEARNED BULLETIN - 93I043.BU
AUGUST 6, 1993

Open communications and sharing of knowledge is one of the keys to safe and efficient operations. Pre-job briefs will involve all personnel associated with the evolution and will include as a minimum, job assignments, location, communications to be used,personnel protective equipment requirements, hazards involved, contingency plans for emergencies and a walk through of expected action in a step by step manner. Specific attention will be paid to past problems encountered, past evolutions of a similar nature, or potential problems. Complex hazardous evolutions will utilize dry runs and mock ups for training. In all cases, active participation is required by all personnel involved. Prior to starting an evolution, each individual will be able to state specifically what the overall objective is , what their responsibility is (their assigned task) and what is expected if an emergency occurs. Management needs to foster an atmosphere where all personnel are encouraged to ask questions and get involved. It should be stressed that last minute questions are not to be treated as a delay in getting work done, rather as the last barrier to doing an unsafe act. Management's prompt resolution and communication of the resolution is crucial to maintain this open and productive communication channel.

Identification of the hazards and risks involved in operations and maintenance is the first step in ensuring a safe work environment, the second step is elimination or mitigation of those risks and hazards. Administrative controls (eg. procedures for opening problem area valves) will be considered as interim control until an engineering solution (such as remote operators, proper drains,or by pass valves) is implemented. The preferred methodology for risk reduction should be, engineering solutions, personnel protective equipment and then administrative controls. Areas requiring improvement and action plans for correction of deficiencies will be identified. The action plans will include resource requirements, alternatives, risks and impacts on mission. A follow up inspection / assessment plan will be generated to provide periodic update or identify required modifications.

Conduct of Operations (DOE Order 5480.19) requires commitment from all levels of management and employees. It requires a continuous long term commitment to excellence and continuous reenforcement of it's principals. To institute the rigor and formality required by the DOE order immediate retaining of all Operation Support Service (OSS) managers is mandatory. Benchmarking techniques and teams of experts will be used to assist in identifying areas of training/implementation that need strengthening.

LESSONS LEARNED BULLETIN - 93I043.BU
AUGUST 6, 1993

Prolonged operations without an objective assessment may result increased exposure of employees to risk and degradation of operating efficiency. Two actions are needed by management to maintain operator safety and performance levels. One is the establishment of performance indicators, such as trend analysis of work backlog,safety concern resolutions,and the corrective action management system as a self assessment tool. The second step is an objective periodic assessment; performance of this assessment by someone outside the immediate organization will allow a set of "new eyes" (without the pressures normally associated with production) to evaluate compliance with DOE Order 5480.19 and WHC directives.

REFERENCES

- ORT-WHC-300EM-1993-0022 Type 'A' Accident Investigation, Titled "Hanford Site Steam Pit U-3 Steam Valve Failure Resulting in a Fatality on June 7, 1993" in **DRAFT** form.
- Occurrence Report number RL--WHC-WHC300EM-1993-0022, Titled Steam Valve Failure", 10 Day Update dated July 16, 1993.

Westinghouse Hanford Company
Site Wide Lessons Learned
HEADS-UP

Date: October 12, 1994 Number: 94I039

PUREX CONDENSATE INDUCED WATER HAMMER

ALL USERS OF STEAM - INCLUDING HEATING STEAM

Compliance to the following safety principle is mandatory and it is **URGENT** that the safety principle be applied to **ANY** steam system. **Do not mix steam with water, either by injecting water into a steam system or steam into a system containing water. Steam and water cannot be mixed safely in a piping system without risking the occurrence of condensate induced water hammer. Condensate should be assumed to be in all low points and dead legs until proven otherwise.**

To clarify the safety principle the following points are stressed:

1) **ASSUME** condensate is present in all dead legs and low points.
2) **DO NOT ATTEMPT** condensate blowdown with this condition and configuration with steam pressure in the line.

INCIDENT DESCRIPTION

A pressurized six inch steam line supplies 15 psi steam to the steam heaters for the office areas. The steam supply valve is bypassed via a .75 inch warmup line. The warmup line consists of two isolation valves with a blowdown leg between the isolation valves. The blowdown leg also has an isolation valve.

The first isolation valve on the PRESSURIZED warmup line and the blowdown leg isolation valve were opened to remove accumulated condensate. The second isolation valve on the warmup line and the steam supply valve remained closed. After approximately five gallons of condensate had been drained, the operators heard a loud noise indicating a condensate induced water hammer. The blowdown leg isolation valve was closed. After the valve was closed, four or five more condensate induced water hammers were heard. Total elapsed time was one to two minutes. (See Figure on page 2.)

Although this event did not result in any apparent material damage, analysis show that water hammer pressure pulses in 15 psi systems can be sufficient to fail cast iron components. The event could have been avoided by either of two actions. Careful planning prior to the isolation of the steam heating coils would have identified that periodic operation of the blowdown valves would have kept the line drained of condensate. Failing to prevent condensate build up, the only safe action is to depressurize and then drain the condensate.

For more information, see Utilities Procedure UO-A-0013, "Steam Service to Facilities." Contact: Rich Grantham on 373-1942.
Also see Lessons Learned Information Bulletin 94I033, "Steam Service to Facilities Procedure Available," dated August 11, 1994.

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

Date: November 21, 1994 Number: 94I048

INTRODUCING STEAM TO COLD STEAM LINES

IF IN DOUBT, REQUEST ASSISTANCE FROM OPERATIONS ASSURANCE

1. PURPOSE:

The purpose of this Lesson Learned is to correct misconceptions uncovered by the "WHC's Independent Assessment Team" on condensate induced water hammer. The guidance and actions should be incorporated into facility specific procedures for introducing steam into depressurized steam systems.

2. GUIDANCE:

Most site condensate induced water hammers have occurred due to condensate upstream of the system isolation valve.

Bypass valves are used to control down stream system heatup and pressurization rates. By themselves they do not prevent condensate induced water hammer.

Introducing steam slowly into a system is desirable, but going slowly will not prevent a water hammer if condensate is in the line.

Steam and water cannot be safely mixed in a closed piping system without risking condensate induced water hammer, with the exception of systems that are designed for this purpose (ie, steam jets).

Do not mix steam with water either by injecting water into a closed steam system or by injecting steam into a closed piping system that includes water (condensate).

Condensate should be assumed to be in all piping low points and deadlegs until proven otherwise.

Condensate can be upstream as well as downstream from the isolation valve.

Temporary deadlegs are particularly susceptible to condensate accumulation.

Water hammer can be started by draining condensate from a pressurized system.

Do not valve in steam until condensate has been drained out of the line.

Where feasible operate the valves remotely using mechanical extension linkage, reach rods or adequately controllable power operated valves.

3. ACTIONS:

3.1 Advance plan steam outages:

A. Do not close a valve and isolate a section of piping that does not have properly positioned steam traps and drain valves. Failure to follow the action creates a potential condensate accumulation area.

3.2 Actions to be taken before steam is

admitted to depressurized system:

A. Open drain valves to remove any accumulated condensate. Leave drain valves open until condensate is removed and dry steam is observed. Shutdown sequence of drain valves should be in the direction of steam flow. (Closest to source first to be closed - farthest from source last to be closed.)

B. IF the steam line upstream of the isolation valve is a low point or deadleg, THEN determine if condensate is present.

Use thermocouples, hand held pyrometers or other means when feasible to locate condensate accumulation.

C. IF condensate is present, THEN perform the following:

- Move the isolation boundary upstream to a location which is free of condensate.
- Depressurize down stream piping.
- Drain condensate from downstream piping.

D. Ensure all condensate has been removed from piping where steam can flow.

NOTE

If elevation drawings are not available, a field sketch of the system to be operated should be constructed. The sketch should include relative elevations, low points, blow downs, isolation valves, deadlegs, status of the system pressurized or depressurized, and other important information.

E. IF the isolation valve providing the boundary between the hot steam line and the cold steam line is greater than or equal to 6 inches in diameter and does not have a bypass valve installed,

THEN move the boundary to a position in the piping where an isolation is provided with a bypass valve.

- Provide instructions on the rate of opening bypass valves.
- Allow the section of piping between the original isolation valve and the new isolation valve to depressurize before proceeding.
- Slowly open the original isolation valve.

OR

IF a boundary cannot be established where the isolation valves have bypass valves installed,

THEN appropriate manager and cogni-

INTRODUCING STEAM TO COLD STEAM LINES

zant engineer approval is required before the isolation valve can be manipulated.

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WARNING

If any hammering or movement of the cold steam line occurs when opening the isolation valve or bypass valve, immediately close the valve. Stop the procedure. Notify supervision of the existing conditions.

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3.3 Action to be taken during steam line pressurization:

A. Activation of cold steam piping should be preformed slowly with steam trap blowdown valves open.

B. Verify all drains are blowing steam freely and no condensate is evident.

C. Close each drain valve as soon as dry steam is blowing.

D. Continue to cycle the drain valves open and closed while the line is being pressurized.

E. Allow time for the line pressure to build up.

F. When line pressure has equalized with steam supply, slowly open the steam supply valve to full OPEN position. Close the steam supply valve bypass if one was used.

G. Back off on the main steam supply valve one-half (1/2) a turn to prevent jamming the valve on the backseat.

H. After blowdown and bypass valves have been shut, cycle blowdown valves as required.

I. Frequently check all valves and steam traps for leaks and proper operation. Tighten packing on valves where required.

J. Verify all steam traps are operating properly.

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NOTE

Steam trap operation depends on the presence of condensate. If condensate is not present in the <u>STEAM TRAP</u>, it will not cycle.

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Site Wide Lessons Learned
YELLOW/CAUTION

Date: November 7, 1995 Number: 951048

CONDENSATION INDUCED WATER HAMMER STRIKES AGAIN

WINTER PREPS MAY INCREASE SUSCEPTIBILI-TY TO CONDENSATION INDUCED WATER HAM-MER

SUMMARY:
On Thursday, October 26, condensate induced water hammer occurred in a main steam line in the Plutonium Finishing Plant (PFP) while attempting to blowdown the end of a 350 kPa (50 psig) DN50 (2") steam line in which a trap had failed. No injuries or system damage occurred.

DETAILS:
A Power Operator and a Cognizant Engineer were preparing to perform a leak test on a D-7 branch line steam trap. Before initiating steam to the branch, they checked the main header trap located in the east end of the facility. The main header trap was not functioning and was cold. (See diagram below) Forty eight hours earlier, the same main header trap had been checked and was found to be operating.

The Power Operator felt branch isolation valves located just off the main line with his hand and noted they were slightly warm to touch. They decided to drain the liquid in the main line through a mudleg which bypassed the failed trap. When the Power Operator cracked open the drain valve, V-102, condensate induced water hammer was heard in the main header. Valve V-102 was immediately closed. The water hammer continued at irregular intervals but seemed to be gaining in intensity so the operator proceeded to close the main isolation steam valve to Building 241-Z. The water hammer stopped as soon as that valve was closed.

ANALYSIS:
Condensate had accumulated in the long slightly sloping main header while the main header steam trap was not working. When the trap bypass valve was cracked open, steam flow across the surface of the condensate was initiated, causing condensation induced water hammer.

LESSONS LEARNED:
Pressurized dead legs without functioning traps or periodic manual blowdowns must be assumed to have condensate present. The affected section of piping MUST be isolated, depressurized and drained before restoring steam to the system.

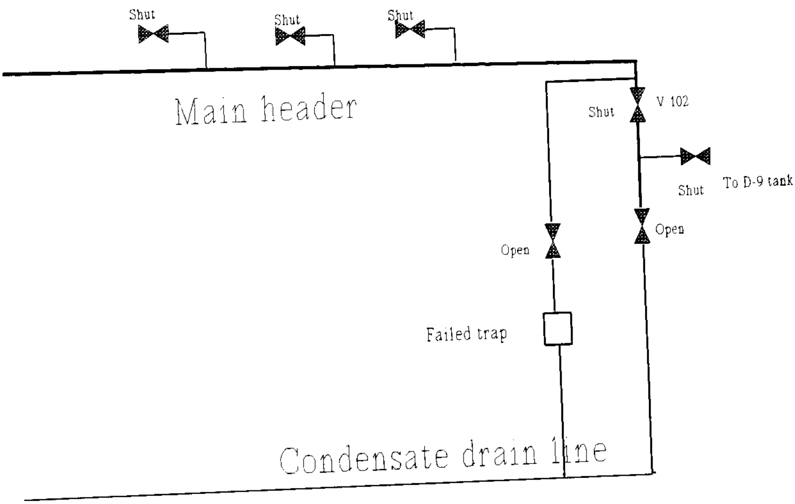
Always check the operation of main line steam traps before initiating steam to a branch header. When a trap fails, condensate can build up in a system in a very short time.

A condensation induced water slug can form at very low condensate flow conditions. "Cracking Open" valves in lines with condensate in them is NOT safe and can increase the severity of water hammer under some conditions.

Winterization activities may result in abnormal system lineups that can lead to condensate in dead legs. Extra caution should be used when restoring systems to service to insure that no condensate is present in any portion of the piping.

REFERENCES:
Occurrence report number:
RL--WHC-PFP-1995-0059

CONDENSATION INDUCED WATER HAMMER STRIKES AGAIN



Steam System Schematic

Site Wide Lessons Learned
YELLOW/CAUTION

Date: November 7, 1995 Number: 95I048

CONDENSATION INDUCED WATER HAMMER STRIKES AGAIN

RECOMMENDED
SAFE OPERATIONAL AND DESIGN PROCEDURES
TO PRECLUDE WATER HAMMER

SAFETY PRINCIPLE

Do not mix steam with water, either by injecting water into a steam system or steam into a system containing water. Steam and water cannot be mixed safely in a piping system without risking the occurrence of condensation induced water hammer. Condensate should be assumed to be in all low points and dead legs until proven otherwise.

Following are 13-recommendations for Safe Operational and Design procedures for Steam Systems that should be observed:

1. Review and inspect all steam systems to insure proper distribution and sizing of steam traps for startup, and operation; also that all low points have steam traps and blowdown valves. Give maintenance the highest priority.

2. Frequently inspect all steam traps to insure that they operate properly and that no condensate accumulates. Immediately repair or replace erratic steam traps. Use thermocouples where feasible to locate condensate accumulation.

3. Do not use the method of "cracking open" valves with or without bypass systems to avoid condensation induced water hammer. This will not guarantee safe operation. The formation of a Condensation induced water slug can occur at very low condensate flow conditions.

4. Valves in pipe lines which lack properly positioned steam traps or drain valves should remain open at all times or preferably should be removed from the piping system.

5. Before opening valves in steam lines, certify that the steam traps operate properly. Fully open the blowdown valves to remove any condensate, leave open until condensate is not noticeable or for a minimum of three minutes.

6. Where feasible, operate the valves remotely using mechanical extension linkage, reach rods or adequately controllable power operated valves.

7. Inspect the piping system for sagging, where necessary install steam traps or repair the sagging.

8. Check and repair the piping insulation, it will save energy and reduce condensate accumulation in the piping system.

9. Warm up of cold steam piping should be performed slowly with trap blowdown valves continuously open. Do not introduce steam into a piping system without verifying water is not present. If a condensate removal system does not exist, do not introduce steam until the system is corrected.

10. The above list of recommendations should be followed irrespective of piping size. Do not exclude small pipe sizes without an appropriate analysis.

11. All isolation valves are to have bypass systems, however, bypass operation will not prevent water hammer if condensate is present.

12. Placement of blowdown valves before and after a vertical rise (such as over-the-road) is required to prevent possible condensate accumulation.

13. Improperly designed steam/water systems should not have the incorrect features overcome by operational methods. The systems must have the improper design corrected.

FREEZE PROTECTION

Each year much time and money are spent repairing damage caused by freezing. This bulletin recounts some of the significant cases in 1994. Constant vigilance is required, especially with the rapidly changing configurations in many of the DOE facilities.

Westinghouse Hanford Company
Site Wide Lessons Learned
INFORMATION BULLETIN

Date: September 5, 1995 | Number: 951038 | Page 1 of 1

FREEZE PROTECTION REMINDER

FOUR CASES OF FREEZE DAMAGE AT HANFORD IN 1994-95

SUMMARY:
Preparation for cold weather needs to start early enough to allow time to correct deficiencies before cold weather arrives. Paragraph 5.1 of Section 220 of WHC-CM-8-7 requires facility managers to inspect their facilities, prepare NEW checklists, update freeze protection plans, and correct equipment deficiencies that impact cold weather protection on a phased timeline.

DETAILS:
The following four cases of freeze damage at Hanford during the winter of 1994-95 demonstrate the need to thoroughly prepare for cold weather early and to continue close surveillance throughout the winter:

1. On January 9, 1995, a 6" raw water header valve on the second floor of 224-B cracked and leaked approximately 6,000 gallons of water into an elevator pit on the floor below. No significant damage occurred because the building is a surplus, inactive, unoccupied facility. A project to isolate water from the building would have prevented this incident but it had been delayed by procurement problems.

2. On 02/15/95 a frozen sprinkler tee on the outdoor dock on the north side of the 327 building thawed. The flow of water activated the building audible fire alarm system causing the building to be evacuated. The wet sprinkler system did not meet fire code and had been authorized to be taken out of service in 1991. The installed electrical heat tape was inadequate to prevent this freeze-up.

3. On 12/8/94 the heating coils in the new supply fan mounted on the 329 building roof were discovered to be ruptured from freeze damage. There was minor damage to the interior of the building. This design coil has no provisions for freeze protection if the circulating pump stops. In this incident the electricity was off for only a few hours during a planned outage.

4. On 12/9/94 a plug of ice formed in the fire system risers to the coal ramps at 284 E&W that would have prevented the flow of water if the dry system had been activated. There was no damage to the pipe but the Fire Department was required to stand by during coal handling operations until the system was restored.

LESSONS LEARNED:
Preventing freeze damage requires diligence in performing the preliminary inspections, attention to detail in correcting deficiencies, and continued monitoring during cold weather.

Many facilities have changed configurations (dismantled buildings, added new systems, removed old systems) and may have unknown vulnerabilities to freezing.

Experienced maintenance personnel should be included in the inspection party.

REFERENCES:
Occurrence reports:
RL--BHI-DND-1995-0001
RL--PNL-PNLBOPEM-1995-0002
RL--PNL-PNLBOPER-1994-0069
RL--WHC-KHS&W-1994-0039

ELECTRICAL INCIDENTS

As DOE facilities age, the insulation on electrical equipment degrades, increasing the potential for shock to our workers. Furthermore, electrical equipment removal, installation, and upgrading exposes workers to dynamic configurations that may pose additional shock hazards. These bulletins document some of the more significant cases from the recent past.

LESSONS LEARNED BULLETIN - 941003.BU

JANUARY 25, 1994

ELECTRICAL SHOCK TO EMPLOYEE

The lessons learned bulletin attached describes an occurrence of electrical shock to an employee at the Plutonium Finishing Plant (PFP) on
December 20, 1993 (Occurrence Report Number RL--WHC-PFP-1993-0064). This is one of five occurrences reported by Hanford contractors this fiscal year
(FY 94).

The DOE Complex had a surprising rise in electrical shock occurrences in fiscal year (FY) 93 over the preceding years. Statistics are shown below for FY 1991 - FY 1993.

Fiscal Year	Number of DOE Complex Occurrences
1991	13
1992	9
1993	23

The reported occurrences for Hanford contractors were as shown below:

Fiscal Year	Number of Hanford Contractor Occurrences
1991	2
1992	1
1993	3

However, in the first four months of FY 94, the DOE Complex reported 14 occurrences with six (6) of those occurrences resulting from the Hanford contractors in the area of electrical shock.

Contractor	Number of Occurrences - Electrical Shock
PNL	1
WHC	
- B Plant	1
- 200 EM	1
- PFP	1
- FFTF	2

IMPORTANT NOTE: The number of **near-misses** for the DOE Complex with **electrical shock potential** reported in FY 93 was eight (8).

The number of **Hanford contractors near-misses with electrical shock potential are up to four (4) in**

FY 94. This constitutes 50% of the DOE Complex total and is at least double the reported occurrences in the three previous fiscal years (FY 91 - one (1), FY 92 - two (2), and FY 93 - two (2).

Facilities and support services are requested to analysis the attached lessons learned for applicability to their facility.

LESSONS LEARNED BULLETIN - PFPLLER2.BU
ELECTRICAL SHOCK TO EMPLOYEE

On December 20, 1993, a WHC worker received a mild electrical shock from a piece of equipment (Remote Sampler Unit) installed at the new Low Level Waste Treatment Facility (LLWTF) at the Plutonium Finishing Plant (PFP). While performing an Operational Test Procedure, a nuclear operator came in contact with the plug prongs of a power supply cord attached to a remote sampler. The shock caused no apparent injury. The incident was immediately reported and investigated. A potential of 110 volts AC was found across the plug prongs. After the incident, all power supplies to this system were locked and tagged out of service.

The remote sampler units had been procured and installed by one sub contractor for the LLWTF project and then direct wired by an electrician for a second sub contractor per the design drawings. The units were supplied with a power supply cord for plugging into a normal power receptacle. The cords with male plug ends were rolled up and not visible behind the units, which were set with the cords to the wall. The power cord lugs terminated at the same terminals being direct wired. The electrician had seen the power cord lugs but assumed that the cable went to some other internal instrument of the sampler unit.

The vendor drawings did not show a power cord but does show terminal lugs for direct wiring. The vendor stated that the units, as ordered, were fabricated to be plugged into a receptacle and was unaware that they would be direct wired.

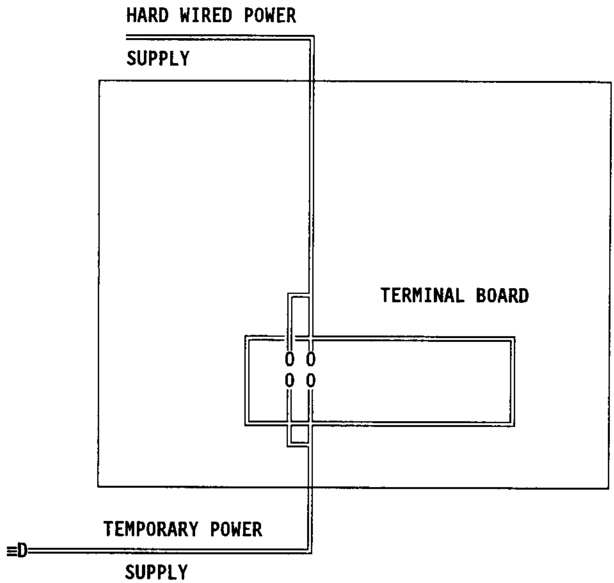
The designer did not realize that the units came with a power cord and specified the units to be hard wired in a weatherproof enclosure.

LESSONS LEARNED

When systems originally wired with a power supply cord to receive normal 110 V AC power from a wall outlet are to be hard wired, the power supply cord should be removed prior to installation to prevent a shock hazard.
Installation instruction should be provided to state explicitly the removal of temporary power cords for hard wired units prior to installation.

For more information, contact Eric Vogt, PFP Manager or Rich Redekopp, PFP Deputy Manager.

COLLINS MODEL 50 AUTOMATIC SAMPLER (S-101) UNIT



Westinghouse Hanford Company
Site Wide Lessons Learned
INFORMATION BULLETIN

Date: June 27, 1994 | Number: 94E029 | Page 1 of 2

ELECTRICAL SHOCK - GROUNDING

MAKE SURE IT'S GROUNDED !!

Five electrical shock occurrences have been reported in the DOE Complex during the last three months that could have been avoided if proper electrical grounding had been used. All five of these occurred around electrical equipment which is commonly used at facilities, is not considered "dangerous", and grounding is taken for granted.

A Hanford employee performing a Non Destructive Examination on one truck frame received a shock when he touched an adjacent truck frame that was being welding on. This incident points out that a separate earth ground should be used on welders and the work surface being welded. (RL--WHC-KHFAB-1994-0005)

An employee received a shock of 120 volts when a fluorescent light plugged into an ungrounded outlet shorted to the ungrounded metal chassis. The salvaged 1960 fixture was hung from an ungrounded cross-member, and plugged into an ungrounded wall outlet. Since it was not grounded, when the chassis developed a short, it remained energized and it did not trip the circuit breaker. The shock occurred when the employee touched the grounding support rods of a cable tray with one arm and touched the chassis with the other. (ALO-LA-LANL-LANL-1994-0007)

Two employees were shocked while working on a panel isolated from ground by nylon washers and paint. The first employee was shocked when he placed his hand on the panel and the other on the opposite wall. The second employee received a shock while attempting to correct the problem. (ALO-KO-SNL-CAFAC-1994-0001 and ALO-KO-SNL-CAFAC-1994-0003)

While attempting to use a floor grinder, an employee received a shock when operating a switch which was too large for the housing and had been improperly installed. The grinder was not equipped with insulated handles nor was it receiving power from a Ground Fault Interrupter (GFI) circuit. Consequently, the magnitude of the current through the employee's body exceeded the "no-let-go" threshold, therefore he was unable to immediately release the machine. (CH-BH-BNL-BNL-1994-0011)

These incidents occurred because good working practices were not observed and violations to the National Electrical Code (NEC-ANSI/NFPA-70) dealing with grounding and installation of plugs and fixtures. Moreover, these conditions were experienced at several DOE sites.

Westinghouse Hanford Company
Site Wide Lessons Learned
INFORMATION BULLETIN

A number of lessons can be learned from these incidents that impact work around fixtures and equipment that are often felt to be common place.

1) DO NOT TAKE GROUNDING FOR GRANTED. Equipment and fixtures need to be grounded to assure that they do not remain energized if they develop a short.

2) Check equipment and fixtures prior to using them to assure that they are labeled, installed, grounded, and used according to applicable codes and the manufactures's recommendations.

3) Assure electrical outlets are grounded prior to using them. If they are not, take the appropriate steps for assuring that they are upgraded.

SOURCES

1) Occurrence Reports:
RL--WHC-KHFAB-1994-0005
ALO-LA-LANL-LANL-1994-0007
ALO-KO-SNL-CAFAC-1994-0001
ALO-KO-SNL-CAFAC-1994-0003
CH-BH-BNL-BNL-1994-0011

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

Date: November 16, 1994 Number: 94E046

ELECTRICAL INCIDENTS AT INEL AND LANL

DON'T LET THESE TYPES OF SCENARIOS HAPPEN AT HANFORD!!

The following incidents have caused other sites to stop and reevaluate their procedures for conducting electrical work at their facilities. Appropriate actions should be taken by responsible organizations to assure that Hanford does not have similar incidents.

The first incident describes removal of front covers from energized electrical panels. The second incident describes an excavation incident where energized electrical cables were unearthed.

Luckily, neither of these incidents resulted in injured workers, however, the potential was present for major injuries to have occurred.

ELECTRICAL PANEL INCIDENT AT INEL

(Quoted from a cc mail message from B. J. Gray, Team Leader, Electrical Safety Project Team, Dated 10/13/94 except for the bolding)

"An incident occurred at Idaho National Engineering Laboratories (INEL) resulting in a stop-work for electrical work to be implemented. **Preliminary information reveals that a similar scenario may be possible on the Hanford Site.** A work crew was removing the cover from the wireway section of an energized 480 volt Motor Control Center (MCC) in preparation of connecting additional conduit and circuitry into the MCC. A decision was made not to de-energize the MCC.

It was known that the design of the 1950's vintage equipment allowed energized lugs to be near the front of the panel. However, it was also believed that the cover had an insulation material attached to prevent unintentional contact with the energized parts. Difficulty with the cover removal caused the cover to be tilted in such a manner as to contact the energized lugs. The insulating material was not present in the particular panel so either a ground fault or phase-to-phase fault developed. The workers were wearing protective equipment and no injury occurred. Safety issues were considered and discussed prior to beginning the task.

Some procedures for performing electrical work at Hanford do not require de-energizing panels before removing covers of electrical equipment. They do require that no part of the worker or metal parts or tools enter the panel. It is also required that unless a greater risk is caused, equipment should be de-energized to the maximum extent. Workers need to be aware of the possibility of accidently dropping or tilting the cover into energized panels and plan for the unexpected.

Supervisors and persons responsible for electrical work should review this incident with their personnel. **Every effort should be made to prevent a related accident at Hanford by:**

- o de-energizing equipment,
- o being aware of the design and operation

of the equipment,

- identifying hazards associated with the equipment and task,
- stopping work when unexpected events appear and wearing appropriate personal protective equipment.

The Hanford Workplace Electrical Safety Board (HWESB) has released a statement regarding the intent of 29CFR1910 Subpart S (OSHA) on the subject. "It is the HWESB recommendation that during the planning stage for electrical work, the first consideration would be to de-energize the affected electrical circuit(s). If management determines the task must be done with the electrical circuit(s) energized, then each task must be evaluated for proper PPE based upon the age, condition and design of the equipment to be worked on. The specified PPE will be the minimum acceptable. The level of PPE may be increased at the discretion of the worker performing the task." Meeting Minutes, HWESB meeting, October 18, 1994.

Additional Source: Occurrence Report Number ID--LITC-PHASEOUT-1994-0001.

EXCAVATION INCIDENT AT LANL

(Summarized from Occurrence Report ALO-LA-LANL-HRL-1994-0004, Dated 10/26/94)

Note: As this summary is taken from the Notification Report the information is not complete.

On Wednesday October 26, 1994, a concrete removal operation was being performed during the installation of a floor drain pipe.

The concrete was cut and broken out by jackhammers. As the pieces of concrete were being removed, an audible sound coming from a conduit remaining in the floor was detected and a visible red glow was also seen.

"No breaker trip could be found for this conduit. The wires were found to be de-energized at 1430 hours on October 26, 1994, however, no action had been taken to de-energize the lines and no electrical breakers in the area had been tripped."

"A Stop Work Order was issued by the Facility Manager and a Work Restart procedure detailing the electrical safing and resumption of the project will be submitted to the Facility Manager for approval."

If you have any questions concerning these incidents please contact Mr. BJ (Bob) Gray at 373-7221.

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

Date: February 14, 1995 | Number: 951006 | Page 1 of 1

PREVENTION OF ELECTRICAL EVENTS

ELECTRICAL SHOCKS CONCERNS

On December 4, 1994, Hanford experienced an electrical failure of a cable-tapping splice resulting in a fire at the 351 substation in the 300 Area. This resulted in an intensive investigation being launched into electrical incidents at Hanford. Since the 300 Area fire, five events have been identified that had potential for an employee being seriously injured. Fortunately, no personnel were seriously injured from these events. The events are:

o Receiving a shock when fixing a paper jam in a computer printer.

o Receiving an electrical shock when sawing a water-filled pipe.

o An electrical pump from another site was found to have a hot wire attached to the motor case.

o Drilling into a concealed electrical romex conductor in a wall. The drill caused the breaker to trip. No shock resulted.

o Observing an arc when moving an electrical conduit. No shock resulted.

The Hanford Electrical Safety Committee (HESC) is taking every opportunity to heighten employee awareness of electrical dangers. The benefits of this are quite visible when employees report incidents so critiques can be conducted, causes determined, and corrective actions can be implemented before significant injury or damage occurs. To increase employee awareness, the HESC would like to emphasize some areas that will help minimize electrical dangers.

o Managers of non-electrical workers should not become complacent regarding electrical hazards to which their workers may be exposed. Electrical safety awareness meetings and electrical safety training courses are avail able addressing all workers regardless of the level of risk their jobs entail. For information on available resources on this topic, contact Herb Debban (376-5060) or Bob Gray (373-7221).

o Personnel receiving electrical shocks must receive medical attention since shocks may have delayed body response.

o Inspections should be conducted of all electrical cords and they should be replaced when they show signs of damage.

o Ground Fault Interrupters (GFIs) and proper tools must be used for wet locations.

o Malfunctioning office equipment shall be repaired by appropriate personnel utilizing appropriate safety requirements.

o Facilities shall establish safe work control boundaries prior to authorizing work. This includes the pre-planning of all work with walk-downs performed to assure that the configuration matches the drawings. Engineering configuration control and/or Lock and Tag procedure compliance is mandatory.

o Electrical equipment obtained from excess should be inspected by an electrician prior to use.

o Subcontractors should be closely monitored for adherence to electrical safety requirements.

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

Date: April 13, 1995 | Number: 95I020 | Page 1 of 1

SCREWS PENETRATE ELECTRICAL WIRING

OPERATIONAL DIFFICULTIES NEED TO BE COMMUNICATED

On February 21, 1995, maintenance personnel at Mound Plant had installed screws to secure a cover on the top of a cable tray. The screw extended down into the insulation of a 480-volt electrical cable. The cable was de-energized at the time. When the cable was energized, the operator observed sparks and noise in the cable tray and secured the system. No personnel were shocked or injured.

On February 23, 1995, a craftsman at B-Plant was attaching a kick plate to an electrical distribution center. One of the screws extended into the insulation of a 350 kcm electrical conductor. The craftsman heard a "bang" and smelled smoke, but no visible arc was observed, no electrical shock was received, and no personnel were injured.

On March 16, 1995, electricians at the Savannah River Site closed the access door to a Motor Starter Cubicle. The bottom screw latch contacted an electrical wire, damaged the insulation, and caused sparks and arching. The wiring had been connected to a bolt in the side of the panel and protruded into the cable access panel.

These incidents resulted when seemingly simple jobs were performed without considering all potential electrical hazards.

LESSONS LEARNED

1) Extreme care should be taken when modifying electrical equipment. Verify the location of all cables prior to drilling or installing screws into panels. Remove the panel cover if necessary.

2) Appropriate length screws should be used to assure no contact is made with electrical components.

3) Electrical equipment should be carefully inspected for bolts and screws that could contact conductors after any modifications are made and during periodic inspections.

4) Do not leave "traps" for future workers by routing electrical cables in precarious locations.

SOURCES

Occurrence Report:
OH-MB-EGGM-EGGMAT02-1995-0006.

B-Plant Critique Report 2B-95-06.

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

Date: July 10, 1995 Number: 95I029

IMPROPERLY WIRED PORTABLE TRANSFORMER CAUSES SHOCK HAZARD

FABRICATED ELECTRICAL EQUIPMENT SHOULD COMPLY WITH NEC

SUMMARY:
A serious electric shock hazard was created by an improperly wired output cable of a portable transformer in the S Tank Farm. Electricians were exposed to this unknown hazard for over 90 minutes during troubleshooting. Fortunately, no injuries or electrical shocks were received.

DETAILS:
On April 10, 1995, a core sampling team on swing shift was preparing to sample a tank. As part of the set up, the team electrically connected a hot water truck to a skid mounted transformer. The electrical connection supplies 240 volt power to the water heaters and 120 volt power to other loads on the truck. After connecting the transformer cable to the truck and energizing the transformer, there was no power to some 120 volt loads.

Troubleshooting the next day revealed that a "black" lead from the secondary side of a stepdown transformer was directly connected to a "green" ground lead in the output power cable. This resulted in the chassis of the truck being energized with 120 volts. Since the trailer was mounted on rubber tires an electrical potential was established between the trailer chassis and ground. Radiological protective clothing worn by the electricians apparently insulated them enough to keep them from being shocked even though anti-contamination clothing is NOT suitable protection for working on energized electrical equipment.

Specific deficiencies in the transformer wiring included:

* A three conductor cable was used for the power output cable instead of a four conductor cable called for in the revised design. The three conductor cable terminated with a four pronged connector with two adjacent prongs connected to "hot" (120v) leads coming from the secondary side of the transformer. This configuration violated National Electric Code (NEC) and resulted in energizing the chassis of the trailer with 120 volts AC.

* Junction boxes which connect the output side of the transformer to output power cables were inspected. In four cases the "hot" 120 volt black lead was directly connected to the green ground lead of the transformer output power cables.

* Several other NEC code discrepancies have been identified, including the use of underrated fuses and cabling.

LESSONS LEARNED:

Fabricated electrical equipment that does not meet National Electrical Code requirements may present a serious hazard to workers.

REFERENCES:
Occurrence Report
RL--WHC-TANKFARM-1995-0039
OE WEEKLY SUMMARY 95-16

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

Date: July 31, 1995 | Number: 95E033 |

ITE K600-S BREAKERS

BASIC MAINTENANCE INADEQUATE TO PREVENT FAILURES

SUMMARY:

On May 23, 1995, Savannah River Technical Center (SRTC) management issued a final report on an event at the Laboratory Technical Area where a breaker failed to close during an annual surveillance test of a sandfilter exhaust system. Facility investigators determined the breaker's solid state trip mechanism failed because of inadequate preventive maintenance. There were no releases of radioactive material as a result of this occurrence. (ORPS Final Report SR-WSRC-LTA-1995-0023)

DETAILS:

On March 4, 1995, Operators at Savannah River's Laboratory Technical Area (LTA) reported a failure to meet Operational Safety Requirements during a surveillance test of the facility's sandfilter exhaust system. During the test, the "North" sandfilter fan failed to start in the "Standby" position as specified in the annual test procedure. Facility personnel found that the breaker had remained in the "Open" position. Subsequent investigation determined that the breaker's solid state trip mechanism had failed, preventing the breaker from closing.

The final report indicated the root cause was less-than-adequate preventive maintenance (PM) performed on this particular type of breaker (ITE K600-S). This type of breaker received basic PM on a 3-year frequency; however, this PM only identified easily accessible deficiencies and provided some general cleaning and lubrication. Recent failure trend analysis by ITE indicated that a substantial number of breakers of this type had experienced failure after 12 years of operation. ITE recommended that a more comprehensive PM be performed every 10 years involving a complete breakdown inspection and repair or replacement of individual components. The LTA sandfilter breakers had been in service for approximately 20 years.

To prevent a recurrence, SRTC Facility Engineering department personnel added a 10-year in-depth disassembly and repair of the breakers to the current PM schedule. The 3-year PM activity and required periodic functional operability checks of the Sandfilter Exhaust System will be continued.

LESSONS LEARNED:

This event is significant because an OSR-related component failed to operate as required by the facility's design. Personnel at DOE facilities using ITE K600-S breakers may wish to review preventive maintenance schedules to determine if the frequency and type of maintenance is adequate. Further, they may wish to review maintenance requirements addressed in DOE 4330.4B, *Maintenance Management Program*. Attention should be paid to breakers that are sealed units, sensitive to age-related or environmental deterioration, or past the midway point of normal service life. Information associated with inspection and maintenance requirements for this equipment can be found in specific vendor manuals, or by contacting the manufacturer.

REFERENCES:

OE Weekly Summary 95-22

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

Date: August 9, 1995 Number: 95I035

ELECTRICAL ARCING OF 480V CIRCUIT WHILE TROUBLESHOOTING

ELECTRICAL TROUBLESHOOTING DOES NOT INCLUDE MAKING MINOR REPAIRS

SUMMARY:

On June 20, 1995, a 480V phase-to-phase fault occurred as an electrician and a pipefitter were performing trouble shooting of a refrigeration system control circuit per an approved work package.

DETAILS:

While trouble shooting a 480V HVAC system a refrigeration service team discovered that the refrigeration and economizer circuits had been wired incorrectly. The system prints also indicated miss-wiring. The electrician turned off control power and performed a zero-energy check on the 120 volt and 24 volt control power circuit. Two wires were removed from a terminal strip and were to be relanded on the proper terminals. While relanding the wires, a pair of exposed 480V terminals arced over (a 480V phase-to-phase fault). The 480V terminals were located within 3½" of the wires being landed. The electrician knew that there were energized 480V power in the area in which the work was being performed, but did not feel it was a problem since he was wearing the appropriate Pesonal Protective Equipment (PPE). No personnel injuries occurred.

The work package and E2 Energized Electrical permit did not clearly define stop points in the trouble shooting mode. The electrician thought that changing the leads and verifying system operation was included in the scope of trouble shooting.

LESSONS LEARNED:

- The limits of electrical trouble shooting should be well stated in the E2 Energized Electrical permit. The permit should emphasize the use of: stop points, special conditions, and isolation of all energy before starting repair jobs.

- To the extent possible, all ancillary electrical power within the craftsman's working area of performing live energized trouble shooting must be deenergized, and isolation and safe condition checks performed.

- **Trouble shooting live electrical circuits is for diagnostic readings of voltage and amperage readings ONLY. All methods of safety, PPE, isolation, distance, and insulating must be used at all times to insure the highest degree of worker safety.**

REFERENCES:

Occurrence Report RL-WHC-FMEF-1995-0002

Westinghouse Hanford Company
Site Wide Lessons Learned
YELLOW/CAUTION

Date: November 28, 1995 Number: 951047.REV

RCT RECEIVES SHOCK WHILE STARTING A CAM VACUUM PUMP

USE CAUTION WHEN WORKING AROUND ELECTRICAL EQUIPMENT

SUMMARY:

A Radiological Controls Technician (RCT) at T Plant received a mild shock when his hand brushed energized contacts inside an instrument cabinet. He was starting a vacuum pump for a continuous air monitor (CAM) and reached into the cabinet to verify pump operation. He was not injured.

DETAILS:

On 08/23/95, the RCT opened the door to the cabinet for the 2706-T ACT-1 Ventilation System and initiated a routine start-up inspection in accordance with the 2706-T HPT stack operation procedure. This inspection included positioning the #1 and #3 vacuum pump switches to the "on" position and visually verifying air flow through the system rotameters.

The RCT noticed that there was no air flow going through the alpha CAM rotameter. To determine why there was no flow, the RCT tried to verify that both #1 and #3 vacuum pumps were working properly. The RCT held onto the beta CAM metal rack with his left hand and reached in with his right hand to touch the pumps to verify their operation. The pumps are located in the back portion of the cabinet behind exposed electrical components.

The RCT inadvertently brushed his right outer forearm against the exposed 110 volt electrical components and received a mild electrical shock since he was grounded by the metal instrument rack. The RCT reported the incident to his manager and was evaluated by First Aid and the Hanford Environmental Health Foundation (HEHF).

LESSONS LEARNED:

The electrical safety training provided by Hanford General Employee Training (HGET) is not adequate for people who routinely enter energized electrical cabinets as these RCTs do. They should attend Medium Risk Electrical Safety (044480) training because this type of activity poses a higher than normal risk of contact with exposed energized parts.

Until such training is received, workers who reach into electrical cabinets should use extra caution to avoid contact with energized components. They should be particularly careful NOT to touch metal parts with their free hand since that sets up a current path directly through the heart. Use of Hot Work Authorizations per section WKS 15 of WHC-CM-1-10, *Safety Manual* should be considered.

Exposed electrical parts should be shielded from inadvertant contact in cabinets that must be entered routinely.

REFERENCES:

Occurrence Report
RL--WHC-TPLANT-1995-0022

PROCEDURAL VIOLATIONS

Procedural compliance has been a significant issue within DOE for many years. Unfortunately many facilities have poorly written or outdated procedures which lead to a cavalier attitude towards verbatim compliance. Few of the incidents described in this document would have occurred if the governing procedure had been followed regardless of its adequacy. The bulletins in this section are important to include in this document but do not fit well into one of the other categories.

Westinghouse Hanford Company
Site Wide Lessons Learned
INFORMATION BULLETIN

INCORRECT PROCEDURE REVISION IN WORK PACKAGE

TIMELY UPDATE OF PROCEDURES IN WORK PACKAGES IS CRITICAL

Authors: Marc Garland 373-0500
Lars Edvalson 373-2672

This event was not reportable, but the lessons learned from the event were deemed to be valuable to disseminate by formally critiquing the event and sharing the lessons learned with other interested parties.

SUMMARY OF EVENT

An observer, while observing the performance of a work package on annual HEPA filter DOS testing at PFP, noted that the procedure copy supplied by PFP Work Control for him to follow during his observation was Revision A-2 while the procedure copy in the work package was Revision A-1. During the pre-job briefing, the Person In Charge had noted labeling deficiencies on the filter box and stopped the job until the labeling deficiencies could be resolved. Following the pre-job briefing, the observer mentioned to the PFP Project Director that his copy of the procedure was Revision A-2 while the copy in the work package was Revision A-1. The correct revision was placed in the work package prior to the initiation of field work. The change incorporated was administrative in nature and performance of the procedure without the change would not have adversely affected facility safety.

PFP Work Control procedures require that controlled procedures contained in work packages be updated when changes are issued. The procedure update process is initiated by procedure control personnel informing Work Control Center personnel of procedure changes, either orally or by leaving notes, whenever procedure control personnel insert changes into controlled procedure books at the Work Control Center. Upon receipt of notification of procedure changes, Work Control Center personnel obtain a report of all work packages containing the modified procedures and retrieve the packages to incorporate the new revisions. Work Control Center Desk Instructions provide direction for Work Control Center personnel on the procedure update process, however, they do not identify that the process must be performed on a daily basis and do not dictate that records be kept as evidence that the process was completed.

CAUSES

The cause of this event was a personnel performance issue. The individual responsible for updating procedures in work packages had begun the procedure update process, but had not completed the task for the DOS test procedure revision. A contributing cause was the informality of the procedure update process.

Westinghouse Hanford Company
Site Wide Lessons Learned
INFORMATION BULLETIN

INCORRECT PROCEDURE REVISION IN WORK PACKAGE

CORRECTIVE ACTIONS

Revision A-2 of the procedure was incorporated into the work package. The Work Control Center needs to complete the procedure update process that was in progress and verify that all active work packages contain current revisions of procedures.

A formal mechanism for procedure change notification needs to be developed and the Desk Instruction revised to require daily performance of the procedure update process and require that procedure change notifications be initialed and retained to document satisfactory completion.

LESSONS LEARNED

1. The timely update of procedures in work packages is critical to achieve excellence in Conduct of Operations and Conduct of Maintenance. Management attention must be given to the process to ensure that only the most current revisions of procedures are used.

2. The formality of programs has a great influence on their success. Programs critical to ensuring excellence in Conduct of Operations and Conduct of Maintenance must be formally developed to ensure that personnel carry out their activities in an appropriate manner.

SOURCE

Critique Meeting Report CRT-PFP-94-003

Westinghouse Hanford Company
Site Wide Lessons Learned
INFORMATION BULLETIN

Date: March 31, 1995 | Number: 95I016 | Page 1 of 1

272 WEST AREA TAR POT FIRES

Precautions should be taken to ensure materials do not reach their flashpoints.

On August 15, 1994, near the 272 West Machine Shop, a fire occurred when tar was melted in a dual kettle design tar kettle. The melted roofing tar was being used to repair an adjacent building. The tar overheated and "flashed" into flame when the crew attempted to pour tar from the kettle. A fire resulted which spread to spilt tar on the ground, the kettle itself, the supply propane tank, and a nearby support trailer with a 25-gallon propane tank on it.

LESSONS LEARNED

Equipment must be maintained per the manufactures recommendations.

The tar kettle manufacturer stated specific maintenance items required to assure proper and safe operation of the kettle. This maintenance was not performed. As a result of not following the manufacture's recommendation to remove sludge and carbon build-up, the thermometer readings indicated low temperatures of the tar. This allowed the tar to be heated over its flash point.

Equipment must be properly stored and secured.

Neither propane tank was properly secured. The tank being used was standing vertically but was not secured in this position. When it was superheated, this tank vented properly but fell over adding fuel to the tar fire. The other tank was stored horizontally on the support trailer which is not correct nor was this tank secured. When this tank was superheated by the fire, the relief valve could not function as designed causing this tank to explode.

Personnel need to adequately trained on the equipment they are using.

The personnel operating the tar kettle were not adequately trained in its operation nor were operating procedures available at the job site. It was 14 months since the tar kettle was last used and the personnel had little hands-on experience. Personnel need to be trained to do the work assigned or being allowed to operate high-risk equipment.

Management must identify and communicate all potential hazards associated with the job.

The Hazard analysis did not address the flammability/tar fire hazard. The pre-job safety meeting discussed the potential hazards for hot tar spills, burns, and proper PPE but mainly focused on fall protection from the roof, as it was thought to be the greatest hazard.

SOURCE

Occurrence Report Number:
RL--WHC-KHCMAINT-1994-0011

For further information please contact Mr. J.B. Giesa at 373-5135.

LOCK AND TAG

One of the cornerstones in the foundation of worker safety is an effective system for isolating components and systems from potentially harmful energy sources. Every Site is required to have a lock and tag system to achieve that isolation. These incidents reveal inattention to detail in the lock and tag process that could easily result in serious injury or death.

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY BULLETIN

Date: December 22, 1994 | Number: 941053 |

LOCK AND TAG SECOND CHECKS

SECOND CHECKERS OF LOCK AND TAGS SHOULD NOT REMOVE LOCKS

DESCRIPTION

Some facilities are permitting their workers to remove locking devices from components in order to independently verify the position of the components being tagged. This is **NOT** consistent with the procedures in the Hanford Energy Control Program (Lock and Tag) procedure (WHC-CM-4-3, Volume 1, Section G-1). It also compromises the independence of the installation process in that the position of the component is based solely on the actions of the verifier.

The procedure calls for installing a lock and tag according to the following steps:

"7. Place the component in the position specified in block 19 of the tagout authorization, 'Required Position/Condition.'"

"8. Install the lock and/or tag on the component identified."

"9. Complete the "Installed By" blocks on the tag and tagout authorization form."

The procedure then goes on to specify the sequence for verifying the locks and/or tags:

"10. Verify the position and/or condition of the equipment or components covered by the lockout/tagout."

"11. Complete the "Verified By" block on the tag and tag authorization form."

LESSONS LEARNED

The Hanford Site Energy Control Program is very specific in its procedures for installing and verifying locks and tags. Facilities should not take license with that extremely important safety document.

The lock & tag procedure gives little guidance on how to verify the locked components. However, attachment A to Chapter 10 of the Westinghouse Conduct of Operations Manual, WHC-SP-0708, provides numerous techniques for verifying many different types of components, including ones that are locked. Many locking devices permit enough movement of valves to permit the independent verifier to actually move the valve enough in the SHUT direction to verify its position. Facility personnel should be trained in these techniques and be expected to use them when verifying locks and tags for energy control.

SOURCE

Meeting minutes of December 15, 1994 Operations Excellence Council meeting.

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

Date: May, 1, 1995 Number: 95I022

SAFETY RELIEF DRAIN LINE REPAIR WITHOUT LOCK & TAG

ENTIRE SYSTEM DETERMINES LOCKOUT/TAGOUT REQUIREMENTS

SUMMARY:

On March 9, 1995, a broken safety relief drain line on an operating boiler was repaired without locks and tags. The Lock and Tag procedure (G-1) should have been invoked because of the potential release of energy from the safety relief valve.

DETAILS:

During an RL sponsored safety walk-through of the 284E powerhouse, a 1" drain line on top of boiler #1 was found to be completely corroded through at a union. This line is a collection drain that takes condensate from drip trays and elbows on the boiler's safety valves. The separated drain line was brought to the attention of the plant management by RL. The acting plant manager placed caution tape around that portion of the boiler as a safety barrier and determined that corrective maintenance could be safely postponed until the next scheduled outage.

The next day, the Utilities division manager mentioned to the acting plant manager that RL had shown further interest in this separated drain line and inquired if repairs could be made before the scheduled outage. At this time, the acting plant manager discussed the matter with the maintenance manager. Since the work involved a drain line that was open on two ends to the atmosphere, they determined that a tagout was not needed and decided to perform the job usi[n] a J-3 work request. A specific job safe[t] analysis (JSA) was not prepared because [a] standard pre-approved JSA was considere[d] sufficient. They overlooked the fact that if a[n] unexpected release of energy from the safet[y] relief valve occurred, the drain line and elbo[w] would provid a direct path for the release o[f] steam at the work location. After informing th[e] shift supervisor, chief power operator[,] maintenance pipefitter, and safety representative[,] a J-3 work request was issued and the wor[k] began. Two 1" threaded pipe joints and a 1[”] threaded union were replaced. The job too[k] approximately 10 minutes.

LESSONS LEARNED:

1) Energy isolation (Lock and Tag) boundaries must be based on the entire work area, not just the component under repair. In this situation, Locks and Tags should have been used to prevent an unexpected release of energy from the safety relief valve. A relief valve cannot be relied on for isolation unless it is gagged to prevent lifting. It must be depressurized or isolated from the work site. The fact that caution tape had been placed around the corroded union should have been a clue that there was potential danger to the workers performing the repairs.

2) A willingness to please a new boss may have resulted in pressure to "get the job done" immediately instead of during a shutdown as scheduled. Outside organization interest in material problems should never cause safety to be compromised.

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

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DRUMS/CONTAINERS

The primary barrier between a hazardous material and the environment is the container in which it is stored. These incidents recount some inadequate work practices that jeopardized the integrity of those containers.

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

Date: March 7, 1995 | Number: 95E010 | Page 1 of 1

POLYCARBONATE BOTTLE FAILURE

Are the Contents Compatible With The Packaging?

INCIDENT

A Ready Safe™ liquid scintillation cocktail with naphthalene mixture was prepared at Pacific Northwest Laboratories for a customer on February 8, 1995. The mixture was put into a polycarbonate 1-liter bottle and placed in the same box in which the Ready Safe™ cocktail start material was originally received. The package was then placed near the door of the lab to await customer pickup.

On February 9, 1995, staff members discovered that the polycarbonate 1-liter bottle had split open and some of the naphthalene/Ready Safe™ mixture had leaked onto the floor.

After receiving input from a number of sources, appropriate safety precautions and regulations were followed and the material was removed from the floor.

PROBABLE CAUSE

The presence of the naphthalene mixture was determined to be the probable cause of this incident for two reasons. First, as an aromatic hydrocarbon, naphthalene will chemically react with some polymers. Second, as naphthalene sublimes it will build up a small amount of pressure within a closed container. The combination of increasing pressure and weakened polycarbonate resulted in the bottle splitting open.

LESSON LEARNED

Although polycarbonate is a high density, extremely tough and impact-resistant thermoplastic, that has an added feature of being transparent, it has explicit limitations in how it can be used. It is not recommended as a container for naphthalene.

This incident serves to illustrate the need for consulting proper references and/or experts to make sure of the compatibility of all materials and chemicals associated with a project; even the compatibility between a product and its proposed container.

SOURCE

Pacific Northwest Laboratories; For more information call Mr. R.A. Pollari at 376-4188.

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

SAMPLE CONTAINER DEGRADED BY CONTENTS

SPECIAL HANDLING AND STORAGE REQUIREMENTS SHOULD BE SPECIFIED FOR LAB SAMPLES

SUMMARY:

On April 10, 1995, a sample containing Acetylene Tetrabromide/295 Red Fluid at the 222-S Laboratory reacted with and degraded it's 125 ml plastic sample bottle. The material leaked out of the plastic bottle onto the floor and into a lead shielded detector cave. The affected area was isolated and the Hanford Hazardous Material Response Team was contacted. Clean-up activities were initiated by facility personnel.

DETAILS:

The sample was one of three Acetylene Tetrabromide samples originating from an on-site customer. The samples arrived at the laboratory in glass bottles and were placed into a refrigerator to await analysis. One of the samples required an analysis in a different sample container. The sample was transferred from the glass bottle to a plastic sample bottle and was placed inside a lead shielded storage cave in the laboratory counting room. Approximately 7 hours later, the plastic sample bottle degraded allowing the material to leak over the inside of the storage cave and drip into the detector cave below.

Investigation into this incident revealed that the Material Safety Data Sheet (MSDS) states that Acetylene Tetrabromide softens or destroys most plastics and rubbers.

The customer indicated on the Request for Sample Analysis (RSA) sheet that the sample material was known but did not provide the name of the material or a list of the known waste codes as required. The 222-S personnel signed off the RSA without the special storage and handling requirements being listed. As a result, material incompatibilities were not known.

LESSONS LEARNED:

1) Customers must provide the name of the material for known samples and attach the appropriate MSDS if available. In addition, special handling/storage instructions need to be included on the RSA (section 16 - "Storage Requirements").

2) Laboratory personnel receiving samples must ensure that the RSA contains all of the required information and that applicable paper work (e.g., MSDS) has been provided before receiving samples and proceeding with analyses.

HOISTING AND RIGGING

Lifting loads can be a very hazardous operation if equipment integrity and personnel safety are not verified before the lift. These incidents demonstrate workers exposing themselves to serious injury by disregarding generally accepted rigging precautions.

May 26, 1993

TYPE A INVESTIGATION

INDUSTRIAL ACCIDENT - FATALITY

This investigation was conducted to analyze an industrial accident at the Pond Waste Management Project (PWMP) that occurred at the Oak Ridge K-25 Site on November 14, 1992. This accident resulted in the death of one employee.

The accident happened during the placement of a polyethylene tank into a bermed area. The accident occurred during the hoisting and moving of this tank. The investigation revealed that there were many factors involved in the accident occurring. The direct cause is stated as a "failure of the tie down strap used to rig the storage tank". However four (4) root causes and eight (8) contributing causes were listed.

CAUSES

DIRECT CAUSE: Failure of the tie down strap used to rig the storage tank.

CONTRIBUTING CAUSES:

1) The rigging equipment selected was improper.
2) Lines of supervision were not clear.
3) On-the-job hazard recognition was less than adequate.
4) Hazard was underestimated by CWM management.
5) Work controls were less than adequate.
6) Roles and responsibilities were not understood by employees.
7) Schedule pressure emphasized production.
8) CWM Project Planing and Management were less than adequate.

ROOT CAUSES: 1) Line Management did not clearly establish its responsibility for safety.

2) Adequate work control practices and procedures for performance of non-routine maintenance and construction activities were not used by CWM or effectively administrated by MMES in accordance with subcontract provisions.

3) CWM failed to establish the expectation that the Safety Department would be involved in planning and evaluating non-routine work activities on the site. MMES did not ensure adequate industrial safety oversight and evaluation feedback to PWMP management.

4) The work practices and safety culture of temporary employees resulted in hazards going unrecognized or being ignored.

REFERENCES

1) DOE/OR-1081 "Type A Investigation of the Industrial Accident at the Pond Waste Management Project" dated November 14, 1992.

LESSONS LEARNED BULLETIN - 93E023.BU
June 14, 1993

EYE BOLT FAILURE

On October 15, 1992, a 22-ton concrete block was suspended from a 30-ton crane by two eye bolts. The eye bolts disengaged and the block fell causing excessive damage to equipment below. This work was being performed per approved procedures. The lifting scheme being used is a commercial system developed by the Richmond Screw Anchor Company, Inc. It uses eye bolts threaded into metal helical inserts (screw anchors) that are cast into the concrete at the time of block fabrication.

The direct cause of this incident is the condition of the screw anchor insert treads deteriorated over years of use and the accumulation of debris in the hole reduced the eye bolt engagement.

There are several contributing causes for the incident but the main one was the lack of procedures to detect potential hardware failures. Additionally, the personnel involved had not received any significant amount of rigging instruction. Therefore, none of these personnel had formal training or a working knowledge of the Richmond system.

The root cause indicated there were inadequate administrative controls. This was indicated by the lack adequate procedures for ensuring that Richmond shield blocks were lifted with an appropriate safety margin and by the lack of training of the personnel involved.

LESSON LEARNED

A lack of administrative control led to ever decreasing safety margins for the shield block moving operations, which finally led to the accident. Because of a lack of expert technical knowledge and oversight, and a lack of strict adherence to specific procedures, operating practices over the years deteriorated as on-the-job training promoted past practices, and practices were modified based upon convenience, not sound engineering judgment.

Established procedures and operations need periodic expert review and scrutiny to ensure that safety margins do not deteriorate and safety is not compromised.

REFERENCES

Occurrence Report Number: ALO-LA-LANL-ACCCOMPLEX-1992-0014, "Damage to Equipment Estimated in Excess of $100,000, Resulting From Fallen Concrete Shield Block", final dated June 3, 1993.

LESSONS LEARNED BULLETIN - 93E041.BU
AUGUST 5, 1993

OVERHEAD CRANE FAILURE - NEAR-MISS TO EMPLOYEE

The three excess stresses identified in this occurrence are believed to have produced an internal failure of the roller bearing components of the crane. WHC needs to recognize the importance of ensuring that cranes are being installed properly and maintained, and that crane safety is practiced by all employees that operate and work with cranes.

The vendor which supplied the crane has a design problem and a new recommended design is currently under safety review. The three stresses identified and believed to cause the near-miss are:

1. The roller guide bearing failed due to stress placed on it in excess of its material strength. An atypical design and consequent installation configuration placed excess stress on the roller bearing guide.

2. A collision of the bridge crane end trucks with the rail mounted end stops occurred because the end stops were installed past the end of the power strips, which interrupted operator control. (This collision did not occur during this occurrence, it was estimated to have occurred 28 months earlier).

o The design configuration of the end trucks, by the lack of means to mechanically alleviate the contact between the rail and the roller bearing.

The combination of these combined stresses caused the roller bearing to jam in place, producing a damaged state to cause the bolt to unscrew from its mounting and drop the bearing and monting hardware 18 feet to the floor missing an employee on the bay floor by 5 to 6 feet.

The installation of the crane was not done properly. Equipment being installed should be carefully scrutinized for conceptual flaws and system safety engineers should be performing verification checks of unproven design configurations.

REFERENCES

ALO-LA-LANL-WASTEMGT-1993-0002, "Crane Guide Roller Bearing Fell 18 Feet, Missing Employee by 5-6 Feet," Final dated 08/03/93.

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

Date: August 24, 1995 Number: 95I037

RIGGING NEAR-MISS WITH FORKLIFT ATTACHMENT

IMPROPER USE OF FORKLIFT ATTACHMENTS CAN BE HAZARDOUS

SUMMARY:

A Model 10-2-20 Caldwell lifting device mounted on a forklift became airborne when the load suspended from it shifted. The lifting device flew about 2.5 meters (7-8 feet), and nearly hit a Radiological Control Technician standing nearby.

DETAILS:

During swing shift on 08/01/95, a nuclear process operator (NPO), a radiological control technician (RCT), and two riggers were using a forklift to move a three legged mixer tank from the 2706-T bay into a low-level waste burial box located inside the 2706-T pad cover. The 10 ton overhead hoist was out of service. The tank and its contents (miscellaneous waste) was estimated to weigh 227 kilograms (500 pounds) but actually weighed close to 454 kg (1000 pounds). Attached to the forklift was a Caldwell two-ton capacity lifting device with a hook. This model 10-2-20 lifting device is a beam across the tines of the forklift with a hook attached to the center of the beam. It was secured to the forks by one wing screw on each fork. The lifting device was properly certified and tagged as ready to use.

Two of the assigned riggers attached the mixer tank to the hook with a wire choker shackled to a nylon choker around the mixer tank. As the forklift was being raised to lift the mixer tank, the tank moved away from the forklift as planned, shifting the center of gravity, and placing a horizontal (lateral) load on the hoist. Tension provided by the wing screws was inadequate to secure the hoist against the lateral forces. The lifting device slid off the forks, flew about 2.5 meters (7-8 feet) and landed near the RCT.

The worksite and equipment were inspected. Personnel were verified to have no injuries. With the tank now laying on its side, the forklift tines were tilted fully back, the wing screws were tightened with a wrench, and personnel were cleared from the area. The lift was completed successfully with the load supported vertically from the hook.

LESSONS LEARNED:

Care must be exercised when using add-on devices to lifting equipment even if those devices are commercially manufactured. Lifting with such devices should be used for vertical lifts only and not for complex rigging activities.

Shifting loads or non-vertical lifts can introduce significant dynamic loading to the lifting rig and can produce unexpected results.

Attachments to lifting devices must be positively engaged to prevent them from becoming detached when loads shift.

REFERENCES:

Occurrence report
RL--WHC-TPLANT-1995-0019

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

Date: September 18, 1995 Number: 95E040

RIGGING EQUIPMENT MUST BE INSPECTED PRIOR TO USE

ANNUAL TESTING IS NO SUBSTITUTE FOR PRIOR-TO-USE INSPECTION

SUMMARY:
A dropped load rigging incident occurred at the Y-12 Site on August 15, 1995. Although the incident was not caused by damaged Hoisting & Rigging (H&R) equipment, damaged and suspect-for-damage H&R equipment was discovered during a subsequent equipment review. In addition, interviews with the organization's employees revealed that some employees relied upon the annual inspection/ certification tag on the lifting equipment as the primary evidence for the equipment's usability.

DETAILS:
The investigation of this incident included interviews with Lockheed Martin Energy Systems (LMES) personnel by Department of Energy (DOE) Site Representatives. During these interviews some employees viewed the presence of an annual certification tag on the equipment as the primary deciding factor for the equipment's fitness for use.

Wire rope slings were discovered which were physically damaged or were suspected-for-damage because the wire ropes did not lay in a straight vertical position when stored.

Wire rope slings may take on bends or turns when in a resting or unloaded position. Gentle bends and curvatures alone in the wire rope sling do not render the sling unfit for use. A kink is a definite angular appearance involving permanent metal deformation that is neither a rounded slope nor bend. Kink damage most often occurs when a wire rope sling has been "point loaded." Point loading is when a wire rope sling has been used to lift an object having sharp outer walls without using padding or a rounded block to prevent the cutting effect from the object being lifted. If a wire rope sling exhibits this definite or acute angle (kink), the sling must be removed from service.

Fitness for use is also diminished by other types of physical damage such as broken wire, crushed wire facing, extreme twisting, damage to the core of the sling, bird-caging or ballooning (opening of the wire strands of the rope), or heat damage. Any of these renders the sling unfit for use.

As a result of the dropped-load incident, all nuclear operations initiated an immediate stand down for hoisting and rigging (H&R) operation until a root cause analysis could be performed. These operations have subsequently resumed.

LESSONS LEARNED:
Personnel who utilize hoisting and rigging (H&R) equipment cannot rely solely on the site's equipment inspection organization to ensure H&R equipment safety for day-to-day use. H&R equipment must be inspected both prior to use and upon completion of use in order to detect potential deficiencies.

If there is any question as to the fitness of any hoisting and rigging (H&R) component, it should be taken from service until inspected by Crane and Rigging Services.

REFERENCES:
MMES Yellow Alert:
Y-1995-OR-LMESY12-0802

Westinghouse Hanford Company
Site Wide Lessons Learned
YELLOW/CAUTION

Date: November 15, 1995 Number: 95I046.BU

LOAD HOOK FALLS FROM ONE-TON OVERHEAD CRANE

IMPROPER CRANE MAINTENANCE CAUSES SAFETY HAZARD

This bulletin supplements 95I046.HU URGENT HEADS UP - WIRE ROPE CRANES. It was extracted from Operating Experience Weekly Summary 95-43. See that publication for additional details and a diagram of the cable termination.

SUMMARY:
On October 17, 1995, at Hanford, a load hook from a one-ton gantry crane came loose and fell approximately 14 meters (47 feet), damaging an industrial dolly. Fabrication Services personnel were stowing the crane when the hook fell. No one was injured.

DETAILS:
During June, 1995, Crane Maintenance personnel replaced the wire rope on the crane hoist. A dead-end clamp secured the hook to the wire rope. The work package specified the torque for the clamp nuts. The work package inspection sheet for the wire rope replacement provided a signature space to indicate completion of all work, but not for individual steps. A crane maintenance man tightened the nuts until they were snug but not to the specified torque value. He signed the inspection sheet indicating that all work was done.

A third-party inspector examined the crane in July and noticed an abnormality in the dead-end clamp configuration. However, he did not think it was a problem and accepted the replacement. After the replacement, crane operators used the crane several times to lift loads from 130 to 225 kg (300 to 500 lbs). There was no indication of problems with the hook. The hook travel-limit device is designed to stop the crane drum from rotating when the hook is fully retracted. However, on October 17, a crane operator was raising the crane hook to its fully-retracted storage position when the limiter device did not stop the drum. It continued to pull on the wire rope, causing the clamp to loosen which allowed the 16 kg (35 lbs) hook to fall.

After the hook fell, investigators examined the wire rope and found no indentations to indicate that torque had been applied to the clamp bolts. They reviewed preventive maintenance documents and determined that monthly inspections of the wire rope had not been performed since it was replaced.

Corrective actions included:

- Changing the procedure for wire rope replacement to clearly identify the dead-end clamp torque requirements and to verify that torque is applied to the clamp.

- Changing the crane maintenance procedure to require a second party verification that work was performed.

LESSONS LEARNED:
Three barriers to prevent this failure were bypassed in this incident: If the crane maintenance man had followed the work package; or if the inspector had followed up on his abnormal finding; or if the monthly inspections had been performed the crane would not have failed.

REFERENCES:
ORPS Report RL--WHC-KHFAB-1995-0002

MISCELLANEOUS

These incidents are significant enough to be included in this document but do not fit into one of the other categories. They are included here for completeness.

LESSONS LEARNED BULLETIN - 93E028.BU
June 18, 1993

PERSONNEL SAFETY - NO FALL PROTECTION

On April 7, 1992, a Hanford employee fell to his death while working on a roof without fall protection equipment. A Type A investigation was conducted on this occurrence and the results were disseminated to all DOE facilities. One of the lessons learned from the investigation was the use of fall protection while working on roofs. Numerous safety bulletins were disseminated throughout the DOE complex emphasizing fall protection. In spite of these efforts, occurrences are reported of workers not using fall protection. One such indent is documented in Occurrence Report: CH-BH-BNL-PE-1993-0006.

LESSONS LEARNED

Management needs to emphasize, and workers need to recognize the need to use caution in the work environment. The aging facilities and greater demand on maintenance upkeep creates work environments that demand more scrutiny and adherence of safety policies.

REFERENCES

Occurrence Report Numbers:

- CH-BH-BNL-PE-1993-0006, "Contractor Working Without Fall Protection", Final dated June 16, 1993.

- RL--WHC-WHC100ERD-1992-0001, "Fall-Related Fatality at the Retired 105-F Reactor Building", 10 Day Update dated July 28, 1992.

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

Date: January 5, 1995 | Number: 95I001 |

GAS CYLINDERS

GAS CYLINDERS NEED TO BE LEAK TESTED PRIOR TO USE

The following information was submitted verbatim by Mr. B.W. Burns. For questions or more information concerning this incident please contact Mr. Burns at 373-3355.

INCIDENT

Pipefitters were soldering copper pipe on a metal work table in the 305A field fabrication shop. They were using a partially full, 40 cubic foot-capacity acetylene cylinder, positioning it on the floor at the corner of the table - within 3 feet of the workpiece. During the operation, flames were noticed emanating from the cylinder stem near the regulator. A fire watch was standing by with a 10-pound ABC dry chemical fire extinguisher and immediately extinguished the fire. The Hanford Fire Department, Industrial Safety and Health, and Construction Forces Management were notified. It was verified that the fire had been extinguished and that the incident was reported, as required by standing procedure.

INVESTIGATION

An investigation, involving employees, the acetylene vendor, the Hanford Fire Department, Construction Forces Management, and Industrial Safety and Health, was conducted. As a final measure, the cylinder was returned to the acetylene vendor for a thorough examination. The vendor explained that there was no evidence of carbon residue at the packing nut, fusible plug, or cylinder valve seat and there was no damage to the cylinder itself. Examination of the regulator determined that its adjusting nut was frozen, but no damage was observed that would have initiated, or contributed to, the fire. The hose was checked for leaks and none were detected.

The results of the investigation were inconclusive. The fusible plug may have been defective, but when the fire occurred, the plug functioned as designed, melting and releasing acetylene. The valve packing nut may have been loose; however, immediately after the incident, employees moved the cylinder to a controlled area and loosened the packing nut to bleed the remaining gas from the cylinder. The regulator connection to the cylinder valve may have leaked, but that connection was not tested before the cylinder was emptied.

It was learned that the vendor leak tests each cylinder prior to shipment, but this does not ensure that fusible plugs and valve packing nuts are not damaged or loosened during subsequent handling operations. The Compressed Gas Association recommends that a leak test be conducted before each use. ICF KH safety and health procedure, IS 10K, also requires that all gas welding and cutting equipment be inspected at the beginning of each shift to ensure leaking or damaged components are identified. The procedure however, does not include the inspection method, in this case the inspection was conducted visually.

LESSONS LEARNED

Leak testing of regulators, packing nuts, and hose connections shall be conducted before placing acetylene, or other fuel gas, cylinders in service. This can be conducted by applying a commercial leak-check fluid over the cylinder valve, packing nut, regulator and hose connections after the cylinder valve has been opened. Any evidence of leaking shall be corrected before welding, cutting, or heating operations are performed. Construction Forces has recommended to modify procedure IS 10K to include the above language.

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

Date: January 31, 1995 Number: 95E004

POOR WORK ENVIRONMENTS RESULT IN INJURIES

INSPECT FOR POTENTIAL HAZARDS YOURSELF

In calendar year 1994, there were seventy-four (74) occurrence reports issued across DOE Complex that were categorized Occupational Illness/Injuries, twenty-two (22) of which related to injuries resulting from falls. Westinghouse Hanford Company had (6) fall related incidents in calendar year 1994 which resulted in 170 lost work days and 99 restricted work days.

A pre-job walk-through of the work area to identify potential hazards would have greatly reduced the chance of accidents and injuries in many of the incidents. This is particularly true in incidents like the two described below.

EVENTS

Two Sandia employees arrived at a facility after dark to perform maintenance. Employee #1 crossed a 1 meter (3.5 foot) deep trench (which was flagged off) located in front of the facility and went ahead to unlock the doors, gates, and to turn on the lights. The truck lights were used to temporarily light the area until the building lights were turned on. Employee #2 stayed behind to unload safety equipment from the truck. Employee #2 removed the tripod and winch from the truck and approached the trench to wait for Employee #1 to help transport safety equipment to the steam pit located in the pool area. While waiting for Employee #1 to return, employee #2 slipped and fell into the trench which resulted in breaking his right leg. (ALO-KO-SNL-NMFAC-1994-0015)

A subcontractor working on a Kansas City Plant construction project fell 4 meters (13 feet 3 inches) to a concrete floor below. The subcontractor was carrying sheet rock to his work area on the mezzanine level of a KCP clean room construction project. The employee stepped on a 1.6cm (5/8-inch) piece of 70.5cm (27 3/4-inch) by 90.8cm (35 3/4-inch) plywood covering a 81.3cm (32-inch) square hole in steel decking. The plywood shifted causing the employee to fall through the opening to the floor below. (ALO-KC-AS-KCP-1994-0016)

The paths that both employees took were the same as they and their coworkers had used prior to the events. But in both of these events, neither the management nor the employees stopped to identify the potential hazard of crossing the areas on a regular basis. The employees became used to using these routes without seeking an alternate route or installing proper decking to cross the hole in the mezzanine or installing planking to cross the trench.

LESSONS LEARNED

o REMEMBER: Safety is the responsibility of every employee. Don't take someone's word that your work environment is safe; check it out for yourself.

o Extreme caution must be exercised when working near holes or trenches. Extended exposure to existing hazards may cause workers to relax their attention.

o When it is necessary to move equipment across a trench, hole, or other hazard, always use approved planking and decking. Better yet, use an alternate route to avoid the hazard.

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

WHC LOST & RESTRICTED WORK DAY CASES
"FALLS FROM TRUCKS"

TRUCK SAFETY

In 1994, WHC had five incidents of employees falling from trucks which resulted in 104 lost work days and 11 restricted work days. These incident happened while employees were getting into, out of, or working on trucks as part of their normal work activities. These incidents reflect only the injuries reported as lost or restricted work days. There may be more of this type of incident which result in minor injuries such as scrapes and bruises that go unreported or reported as first aid cases without lost work time.

INCIDENTS

On January 12, 1994, a WHC employee was unloading material from a truck when his foot slipped, he fell one meter, and landed on cart full of boxes. He was treated for a sore shoulder and an abrasion on his right side. Later, he was diagnosed with neck strain and advised to remain off work. The incident resulted in 67 lost work days.

On March 17, 1994, a WHC employee fell when he attempted to step down from the front bumper platform of a fire engine. His foot slipped and he fell against a vehicular roll-up door straining his back. The front bumper platform is 86 centimeters off the floor. The incident resulted in 18 lost work days.

On May 3, 1994, an employee struck a knee on the edge of a vehicle door which resulted in an infected contusion. This event resulted in 15 lost work days.

On July 22, 1994, while descending from a truck, an employee's right foot slipped off the second step while his left foot was still in the truck cab. The employee fell to the ground and strained his left knee. This resulted in 11 restricted work days.

On November 28, 1994, a WHC employee lost footing and fell about a meter when stepping down from a two-ton truck onto the bumper. He was diagnosed with multiple lacerations, abrasions; a strained neck, toe, and shoulder; and a probable concussion. He went to an offsite physician, received prescription medication, and was advised to remain off work. The incident resulted in four lost work days.

Each incident resulted in an employee injury. There may be similar injuries which do not result in lost work time. Therefore, it is important for employee protection and productivity that management stresses the importance of safety in every aspect of work being performed on site. Employees tend to become complacent when they're performing functions that are mundane and repetitious.

It is management's responsibility to ensure employees report all injuries. It is also management's responsibility to be actively involved in the decisions concerning injured employees work restrictions with medical professionals. Effective case management will assure the injured employee is returned as a productive contributor to the work force as soon as possible. It is an established fact that individuals recover faster at work, even if workers have some work restrictions placed on them.

SOURCES

HLAN WHC/BCSR Occupational Illness and Injury database.

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

UPLANNED EXPOSURES TO LEAD (Pb)

LEAD POISONING CAN BE PREVENTED

SUMMARY:
Several cases of unplanned exposures to airborne lead have occurred within the DOE complex recently. Since lead in elevated levels can be found in unexpected sources, extraordinary measures may be required to prevent overexposure.

DETAILS:
INCIDENT #1: At Hanford, construction workers were remodeling a portion of a building in the 300 area that was thought to contain lead based paint. The job required anchoring metal track material to the mating surface with a gun-powder actuated tool.

During the pre-job safety analysis, a section of the mating surface was suspected as being covered with lead based paint. Even though the potential for airborne lead was negligible, control and monitoring requirements were established. The installation of the track material was completed without incident.

Approximately 3 days later the monitoring results came back indicating exposure levels of 2 1/2 times the Permissible Exposure Limit (PEL). A very thorough investigation was conducted and the source of the lead exposure was determined to be from the gun powder used in the loads for the powder actuated tool.

INCIDENT #2: In December 1994, workers at the Los Alamos National Laboratory were steel-shot blasting the inside of a water tank using respiratory equipment approved by Industrial Hygiene and Safety. The airborne lead dust levels were much higher than anticipated and the dust was much finer than anticipated. Subsequent blood analysis showed that six workers had elevated levels of lead in their blood and one showed symptoms of lead exposure.

INCIDENT #3: Workers at Fernald were exposed to lead on 4/3/95 while cleaning the pistol range even though they were wearing the prescribed protective equipment. They were required to wear full face respirators with HEPA cartridges and liquid resistant contamination clothing. All openings were taped shut to prevent skin exposure. Based on the results of breathing zone air samples, exposures of 4147.0 and 76.8 $\mu g/m^3$ were calculated to two workers. The OSHA PEL for lead is 50 micrograms of lead per cubic meter ($\mu g/m^3$).

LESSONS LEARNED:
Lead is one of several heavy metals that present a hazard to workers at DOE facilities. Once ingested, it remains in the body. Frequent exposure to levels even slightly above permissible can result in a body burden that can cause long term health problems.

Jobs that have the potential for creating airborne materials must be carefully analyzed to ensure adequate respiratory protection is provided to the workers. In the case at Hanford the powder actuated tool was evaluated purely for its physical hazards. No one had considered the fumes from the ignition of the gunpowder as a potential source of exposure.

The other two cases resulted from inaccurate estimates of the levels of dust that would be generated.

Westinghouse Hanford Company
Site Wide Lessons Learned
SAFETY NOTICE

Date: October 10, 1995 | Number: 95E044 |

PVC PIPE EXPLOSION

6" PVC PIPE EXPLODES - TWO MINOR INJURIES RECEIVED

This bulletin was produced from information posted on the Internet Safety Listserver by Lorin Industries, a non-DOE affiliated facility, and other individuals.

SUMMARY:

A 15.24 cm (6") PVC pipe exploded while an attached steel pipe was being cut by a torch. About 100 meters (300 feet) of pipe exploded sending shrapnel throughout the building. Two people were sent to the hospital for minor cuts.

DETAILS:

Lorin Industries was building a new pipe line from all new plumbing. One end of the 15.24 cm (6") PVC pipe was connected to a steel pipe which was connected to a cooling return pump. The other end was plugged. The PVC pipe had been glued together approximately 3 weeks prior to the incident.

The contractor was using a torch to cut a hole into the steel pipe to attach a sensor when the entire section of PVC pipe exploded. Shrapnel spread over the entire 122 meter x 67 meter (400' X 220') building. There were about 40 people standing under the pipe at the time of the explosion. Two people were sent to the hospital for minor cuts.

The individual from Lorin Industries writing this report did not know the cause of the explosion. He requested anyone with expertise in this area to respond. Mr. Robert N. Nelson, Chemistry Dept., Georgia Southern University, Landrum Box 8064, Statesboro, GA 30460-8064 replied to Lorin Industries with his following personal opinion. Georgia Southern University disclaims any position on this subject matter.

LESSONS LEARNED:

The adhesives used in assembling the PVC pipe contain a variety of volatile solvents. With a 15.24 cm (6 in.) pipe a significant amount could be trapped in the joint and only volatilize over a period of time. Mr. Nelson suspects that the vapors accumulated causing an explosive mixture in the sealed pipe.

REFERENCES:

Andy Giza, Lorin Industries (616)722-1631
Robert Nelson, Georgia Southern University (912)681-5675.

Westinghouse Hanford Company
Site Wide Lessons Learned
YELLOW/CAUTION

Date: November 27, 1995 Number: 95I045.REV

TEMPERATURE CONTROL VALVE FAILS DURING REFURBISHMENT

VALVE FLIES APART UNDER PRESSURE

SUMMARY:

On October 5, 1995, maintenance mechanics at the Plutonium Finishing Plant were working on a pressurized temperature control valve when it failed, sending pieces flying across a maintenance shop. No one was injured because the mechanics heeded a warning label and positioned themselves away from the top of the valve out of the potential flight path. This event is significant because the failure of a pressurized valve can be a serious hazard to personnel.

DETAILS:

The valve was a Johnson Controls model V-502, DN125 (5 in) diaphragm-operated temperature control valve. It was built in the 1940s of cast iron and was designed to regulate 200 kPa (30 psi) steam heat to a supply fan. Mechanics had removed the valve from a steam heat system because it was leaking. They took it to the maintenance shop to refurbish it where they placed the valve on its side, opened the bottom, and replaced the valve packing and gaskets. The maintenance was controlled by a work package compiled from manufacturer's recommendations.

During reassembly, the mechanics were required to pressurize the diaphragm to 70 to 140 kPa (10 to 20 psi) as directed by the work package. In accordance with a warning label on the valve, they positioned themselves away from the top of the valve and applied about 80 kPa (12 psi) to the diaphragm. Within seconds, two of the three brass set screws that held the diaphragm assembly to the top of the valve yoke failed (see diagram on next page). The casting for the third set screw broke and the diaphragm assembly ejected from the yoke, traveling approximately 2 meters (6 ft). Once the diaphragm assembly separated from the yoke, the double spring assembly inside the yoke was no longer restrained, causing the spring-guide connection to shear and the springs to propel across the shop through an open door into the next room about 7 meters (20 ft) away.

There was no damage to the facility or injury to personnel as a result of the valve failure. The valve body was replaced with the upper assembly parts from another valve and was returned to service later in the shift.

LESSONS LEARNED:

This event demonstrates how important it is to be aware of hazards associated with a piece of pressurized equipment particularly if it is old or has been in service a long time. If the mechanics not been aware of the potential for injury and not positioned themselves accordingly, they could have been severely injured by flying valve pieces. Maintenance managers should review the maintenance practices at their facilities for adequate protection against the hazards of pressurized equipment.

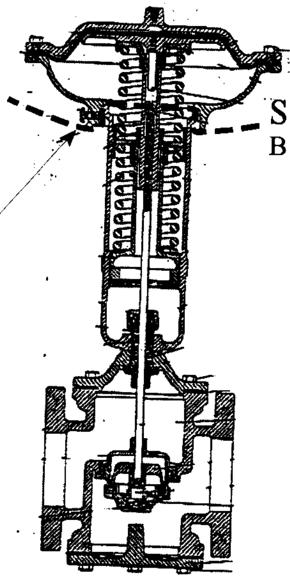
The PFP has initiated a work package to replace five other similar valves. Facilities with similar design valves should consider replacing them when they fail instead of attempting repairs.

The root cause of this incident was the material failure of the brass setscrews holding the diaphragm assembly to the top of the valve yoke. A contributing cause was poor design. This model and its replacement, model V-105, was discontinued in 1951.

REFERENCES:

Occurrence Report RL--WHC-PFP-1995-0053

TEMPERATURE CONTROL VALVE FAILS DURING REFURBISHMENT



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Westinghouse Hanford Company

Internal Memo

From: Operations and Maintenance Programs
Phone: 373-0781 R2-40
Date: March 5, 1996
Subject: SIGNIFICANT LESSONS LEARNED 1993-1995

78000-96-020

To: Distribution

cc: R. F. Bacon S7-85
RDR:JCB File/LB

The attached collection of lessons learned issued at Hanford from 1993 through 1995 was produced at the request of Mr. J. S. Moore, President, Westinghouse Governmental and Environmental Services Company. It contains bulletins that are significant because of their widespread applicability, frequent recurrence, or catastrophic consequences. This document should prove useful as a reference for training new employees as well as in continuing training programs at your facility. It will hopefully help prevent errors that could cause these lessons to be re-learned.

Questions or comments concerning any specific lessons learned or about the content of this document in general can be passed to Mr. J. C. Bickford at telephone 373-7664, e-mail John_C_Bickford@rl.gov, or FAX 372-0270.

R. D. Raaz
Director

skb

Attachment

78000-96-020

ATTACHMENT

WHC Significant Lessons Learned 1993-1995

WHC-MR-0519

J. C. Bickford

Date Published: February 1996

Author: Lana R Perry at ~WHC166
Date: 4/12/96 1:21 PM
Priority: Normal
TO: Kara M Broz at ~WHC338
Subject: MISSING RA FORMS

------------------------------------ Message Contents ------------------------------------

HI KARA,

CAN YOU CHECK THESE TWO WHC-MR DOCS AND SEE IF YOU HAVE PROCESSED CLEARANCE ON THEM? I HAVE COPIES HERE BUT I DON'T HAVE THE RA FORMS FOR THEM.

WHC-MR-0511
WHC-MR-0519

IF YOU DO, COULD YOU FAX THEM OVER? MY FAX NUMBER IS 376-5336.
THANKS.

LANA