



U.S. Department of Energy
Office of Inspector General
Office of Inspections and Special Inquiries

Inspection Report

Chemical Safety Protocols at the Pantex Plant

DOE/IG-0756

February 2007



Department of Energy

Washington, DC 20585

February 2, 2007

MEMORANDUM FOR THE SECRETARY

FROM:


Gregory H. Friedman
Inspector General

SUBJECT:

INFORMATION: Inspection Report on "Chemical Safety Protocols at the Pantex Plant"

BACKGROUND

The Pantex Plant (Pantex) uses approximately 3,000 different kinds of hazardous chemicals. To ensure the safety of its workforce, BWXT, the primary contractor, must follow various safety and health regulations, including Occupational Safety and Health Administration (OSHA) regulations, National Fire Protection Association standards, and Department of Energy (DOE) orders that are included in the BWXT prime contract.

The objective of this inspection was to determine if BWXT implemented an effective chemical safety program. Hazardous chemicals examined during this review included acids, bases, other corrosives, flammable and combustible liquids, compressed gases, toxics, and explosives, including shock sensitive compounds.

RESULTS OF INSPECTION

We concluded that in most respects, BWXT implemented an effective chemical safety program; however, we identified several areas that needed improvement. Specifically, we found that:

- A compressed gas facility that contained numerous flammable chemicals lacked a means to summon the fire department, as required by DOE, and a fire extinguisher, as required by OSHA;
- Safety warning signs were not posted outside several facilities that contained hazardous chemicals such as flammables and explosives, as required by OSHA and the National Fire Protection Association; and
- An eye wash and a safety shower in a hazardous chemicals storage building were not inspected, as required by Pantex procedures.

We also observed significant discrepancies in the hazardous chemicals inventory. For example, the database quantities of acetic anhydride, ammonia, dimethyl sulfoxide, and hydrochloric acid were significantly different than actual quantities. It is important for the site to have an accurate inventory of its hazardous chemicals for its emergency assessment and planning process. We



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recommended corrective actions to improve the Pantex chemical safety program regarding the assessment and mitigation of hazards, posting warning signs, inspecting safety showers and improving the inventory process for hazardous chemicals.

MANAGEMENT REACTION

Management agreed with our recommendations. However, because the comments did not include planned corrective actions with target completion dates, a Management Decision is required. Management's comments are provided in their entirety in Appendix B of the report.

Attachment

cc: Deputy Secretary
Chief of Staff
Administrator, National Nuclear Security Administration
Chief, Office of Health, Safety and Security (HS-1)
Director, Policy and Internal Controls Management (NA-66)
Director, Office of Internal Review (CF-1.2)
Manager, Pantex Site Office

CHEMICAL SAFETY PROTOCOLS AT THE PANTEX PLANT

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Overview

INTRODUCTION AND OBJECTIVE

The Pantex Plant (Pantex) mission includes, among other things, the assembly and disassembly of nuclear weapons and the manufacturing and testing of non-nuclear high explosives. To accomplish this mission, Pantex uses approximately 3,000 different kinds of hazardous chemicals. Effective management of these chemicals is an important element in protecting the health and safety of the Pantex workforce. BWXT Pantex (BWXT) is the prime contractor that operates Pantex for the Department of Energy's (DOE's) National Nuclear Security Administration. As such, BWXT is responsible for managing the Pantex occupational safety and health program.

To properly manage its hazardous chemicals, BWXT must follow various safety and health regulations, including Occupational Safety and Health Administration (OSHA) regulations, National Fire Protection Association (NFPA) standards, and DOE orders that are included in the BWXT prime contract.

The objective of this inspection was to determine if BWXT implemented an effective chemical safety program.

OBSERVATIONS AND CONCLUSIONS

We concluded that in most respects, BWXT implemented an effective chemical safety program; however, we identified several areas that needed improvement. Specifically, we found that:

- A compressed gas facility that contained numerous flammable chemicals lacked a fire extinguisher, as required by OSHA, and a means to summon the fire department, as required by DOE;
- Safety warning signs were not posted outside several facilities that contained hazardous chemicals such as flammables and explosives, as required by OSHA and the NFPA; and
- An eye wash and a safety shower in a hazardous chemicals storage building were not inspected, as required by Pantex procedures.

We also observed significant discrepancies in the hazardous chemicals inventory. For example, the database quantities of acetic anhydride, ammonia, dimethyl sulfoxide, and hydrochloric acid were significantly different than actual quantities.

Details of Findings

BACKGROUND

An August 10, 1992, Memorandum of Understanding (Memorandum) between OSHA and DOE states that DOE contractors must comply with applicable OSHA standards as well as other safety and health requirements. DOE's contract with BWXT contains Safety Requirements Identification Documents (S/RIDS) for safety and health and fire protection that BWXT must follow. These S/RIDS apply to aspects of Pantex' hazardous chemicals protocols and cite the OSHA Memorandum as well as numerous OSHA and NFPA standards and DOE orders as applicable to BWXT.

According to OSHA, a hazardous chemical refers to any chemical that is a physical or health hazard. A chemical that is a physical hazard includes combustible liquids, compressed gases, explosives, flammables, organic peroxides, oxidizers, or water-reactives. A chemical that is a health hazard may cause acute or chronic unhealthy effects in exposed employees. Health hazards include carcinogens, corrosives, toxic chemicals, and irritants.

Hazardous chemicals examined during this Office of Inspector General (OIG) review included acids, bases, other corrosives, flammable and combustible liquids, compressed gases, toxics, and explosives, including shock sensitive compounds. We also inspected indoor and outdoor hazardous chemical storage areas, as well as buildings and laboratories that contained hazardous chemicals.

FIRE SAFETY CONCERNS

We found that a compressed gas facility that contained numerous flammable chemicals lacked a fire extinguisher, as required by OSHA, and a means to summon the fire department, as required by DOE.

The compressed gas facility, known as the 12-5 North Yard, is an outdoor 3-sided building surrounded by a fence that also encloses a large area around the building. The facility is also adjacent to a primary road and a populated building containing large quantities of hazardous chemicals. We observed the following flammable compressed gas cylinders stored at the 12-5 North Yard: 6 acetylene cylinders, an ethane cylinder, several hydrogen cylinders, and numerous compressed oxygen cylinders. Acetylene, ethane, and hydrogen are highly flammable under pressure. Ethane and hydrogen also readily form explosive mixtures when in contact with air. Compressed oxygen enhances combustion and may increase the risk of fire in flammable materials.

The Pantex Fire Protection S/RID states that the contractor is required to perform fire prevention engineering activities to ensure that facilities and processes are provided with the required level of fire protection. OSHA 29 CFR 1910.106, “Flammable and Combustible Liquids,” states that suitable fire control devices, such as portable fire extinguishers, shall be available at locations where flammable or combustible liquids or flammable aerosols are stored, including outdoor container storage areas. A DOE EH Fire Protection Engineer stated that this regulation applied to the flammable compressed gases that the OIG identified at the 12-5 North Yard. Additionally, the Pantex Fire Protection S/RID states that fire protection systems and equipment shall be provided to detect, suppress, and limit the spread of fires in its facilities, and that portable fire extinguishers are maintained and located to permit personnel to extinguish incipient fires. DOE Order 420.1, “Facility Safety,” states that an approved means to summon the fire department shall be provided.

During our site inspection, we informed BWXT officials of our concerns that there were numerous cylinders of flammable compressed gases stored at the 12-5 North Yard, and that the facility did not have a fire suppression system or a means to notify the fire department in the event of a fire. After we raised our concerns, BWXT officials advised us that they subsequently determined that both were needed and would install a fire extinguisher and a telephone at or near the 12-5 North Yard.

DOE Order 420.1, “Facility Safety,” states that comprehensive, documented fire protection self-assessments shall be performed and include all aspects of the fire protection program. We noted that the applicable Fire Hazards Facility Assessment covering the 12-5 North Yard was completed by BWXT in February 2005. This Assessment indicated that all of the stored gases were inert and that no fire suppression systems were required. A DOE Office of Environment, Safety and Health (EH) Fire Protection Engineer advised us that there is a continuing obligation to ensure that all fire hazards are identified and mitigated. The DOE EH Fire Protection Engineer also advised that installation of a fire extinguisher and telephone are minimal mitigating actions. He further advised that a thorough assessment of the storage facility could also lead to additional mitigating actions by BWXT. Therefore, it may be appropriate for BWXT to assess whether additional corrective actions should be taken.

SAFETY WARNING SIGNS

We found that safety warning signs were not posted outside several facilities that contained hazardous chemicals such as flammables and explosives, as required by OSHA and the NFPA.¹ These facilities included the High Explosives Synthesis Facility, a nearby portable storage facility, and the 12-5 North Yard. Subsequent to our inspection of the portable buildings, we were told that Pantex posted warning signs on the portable buildings. Also subsequent to our site visit, a Pantex Division Manager said that he developed an implementation plan and posted warning signs on the doors of the High Explosives Synthesis Facility.

The Pantex Occupational Safety and Health and Fire Protection S/RIDS states that both OSHA and NFPA posting requirements are applicable to facilities where flammable and other hazardous materials are present. OSHA posting requirements state that signs or tags shall be posted to ensure awareness of the hazards present. The NFPA lists numerous specific posting requirements for facilities where flammable and other hazardous materials are present. The DOE EH Fire Protection Engineer stated that these OSHA and NFPA requirements were applicable and should be followed.

The High Explosives Synthesis Facility contained numerous hazardous solids, liquids, and gases, including flammables and explosives. During our site inspection, we observed that a large sign marked “Danger - Hazardous Operations” was lying on the ground in back of the building. We also observed that a portable storage building, which was located about 65 feet beyond the High Explosives Synthesis Facility, contained flammable chemicals; however, warning signs were not posted. Further, the 12-5 North Yard contained flammable and potentially explosive compressed gas cylinders, but there were no warning signs posted.

BWXT officials told us that the hazardous operations warning sign on the ground in back of the High Explosives Synthesis Facility had fallen down from in front of the building “a long time ago.” A BWXT official said that BWXT planned to re-install the hazardous operations warning sign in front of the High Explosives Synthesis Facility. BWXT agreed that warning signs should be posted on the portable flammable chemicals building as well as on the nearby acids and bases portable buildings.

¹ The Pantex Occupational Safety and Health S/RID states that signs or tags shall be posted to ensure awareness of the hazards present, and cites OSHA 29 CFR 1910.145, “Specifications for Accident Prevention Signs and Tags,” and OSHA 1926.200, “Accident Prevention Signs and Tags,” as the applicable standards. Further, the Pantex Fire Protection S/RID identifies NFPA 30, “Flammable and Combustible Liquids Code,” (which incorporates NFPA 704, “Identification of the Fire Hazards of Materials for Emergency Response),” and NFPA 55, “Standard for the Storage, Use, and Handling of Compressed Gases” as applicable. Additionally, NFPA 30 and NFPA 704 are OSHA requirements pursuant to OSHA 29 CFR 1910.6, “Incorporated by Reference.” Thus, these OSHA and NFPA provisions are applicable at Pantex.

EYE WASH AND SAFETY SHOWER

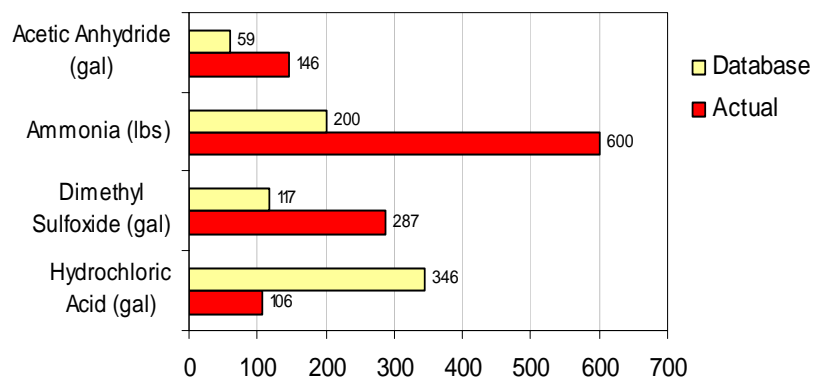
We found that an eye wash and safety shower in a hazardous chemicals storage building were not inspected, as required by Pantex procedures. When a hazardous chemical is splashed in the eye or on the body, decontamination with water from an eyewash or safety shower is the standard first aid response to mitigate potential serious injury. A Pantex site procedure titled “How to Inspect, Identify, Evaluate, and Abate Safety Hazards in or Around Facilities,” required Pantex to conduct quarterly inspections of its eyewashes and safety showers to ensure their proper function. The Pantex Building Facilities Manager acknowledged that they were required to conduct the inspections on a quarterly basis. We determined, however, that they were not inspected during the last four quarterly safety inspections. The eye wash and safety shower were in Building 12-118, a large hazardous chemicals storage building with repackaging laboratories.

OBSERVATION

We also observed significant discrepancies in the hazardous chemicals inventory. For example, the database quantities of acetic anhydride, ammonia, dimethyl sulfoxide, and hydrochloric acid were significantly different than actual quantities that we identified at Pantex Building 11-55.

As outlined in the chart below, we observed significantly less quantities of acetic anhydride, ammonia, and dimethyl sulfoxide in the Pantex hazardous chemicals database compared to the actual quantities that we identified at Building 11-55. We also observed that the database listed significantly more hydrochloric acid compared to the actual quantity that we identified at Building 11-55.

Quantities of Hazardous Chemicals Listed in
Pantex Database vs. Actual Quantities



Chemical	Database Quantities	Actual Quantities	Difference
Acetic Anhydride	59 gallons	146 gallons	87 gallons
Ammonia	200 pounds	600 pounds	400 pounds
Dimethyl Sulfoxide	117 gallons	287 gallons	170 gallons
Hydrochloric Acid	346 gallons	106 gallons	240 gallons

Acetic anhydride is flammable and corrosive and is a health hazard. Ammonia gas is flammable, corrosive, and a toxic inhalation hazard, and can also be fatal if inhaled. Dimethyl sulfoxide reacts violently with a number of materials and is an eye, skin, and respiratory irritant. Hydrochloric acid is extremely corrosive; vapor inhalation can cause serious injury, and ingestion can be fatal.

BWXT officials acknowledged that these discrepancies were a concern and that they were taking actions to try to improve the accuracy of their inventory. They stated that the centralized hazardous chemicals database was antiquated and limited and that they were upgrading the computer software. The central database is used for compiling an annual inventory of the site's hazardous chemicals, which is an important part of the site's Emergency Planning Hazards Assessment (EPHA). The EPHA is the basis of the site Emergency Management Program. Thus, having an accurate site inventory of hazardous materials is key to the adequacy of the Emergency Planning Hazards Assessment and the Emergency Management Plan.

During our site visit, we were told that Pantex last conducted a physical inventory of all its buildings in 1997. A DOE official responsible for issuing DOE-wide safety and health policies advised that, although there is no specific requirement for the site to periodically conduct a physical inventory of all of its hazardous chemicals, he considers it to be a best practice. Pantex, however, has a 2006 performance measure to conduct a physical inventory of all hazardous chemicals. Subsequent to our site visit, we were told that BWXT completed a physical inventory of all of the hazardous chemicals located at Pantex.

We believe that upgrading the database and having an accurate physical inventory are significant steps towards improving site emergency assessment and planning. These actions should improve current accuracy of the hazardous chemicals database, which in turn, should increase the adequacy and effectiveness of emergency assessments and planning at Pantex. Therefore, we

believe that conducting periodic physical inventories of hazardous chemicals should be a continuing performance measure and/or site requirement.

RECOMMENDATIONS

We recommend that the Manager, Pantex Site Office, ensures that BWXT:

1. Assesses all hazards and conducts fire protection engineering activities to mitigate any hazards on an ongoing basis;
2. Posts appropriate safety warning signs at appropriate locations at all facilities that contain hazardous chemicals;
3. Inspects all eye wash and safety showers in buildings that contain hazardous chemicals to ensure their proper function; and
4. Continues to implement improvements that will enhance the accuracy of the central hazardous chemicals database and considers establishing a requirement to conduct recurring periodic physical inventories of its hazardous chemicals.

**MANAGEMENT
COMMENTS**

The National Nuclear Security Administration (NNSA) agreed with the report's findings and recommendations and directed the contractor to develop a corrective action plan. Management's comments are provided in their entirety in Appendix B.

**INSPECTOR
COMMENTS**

We found NNSA's comments to be responsive to our report. However, because the comments did not include planned corrective actions with target completion dates, a Management Decision is required.

Appendix A

SCOPE AND METHODOLOGY

We interviewed Federal and contractor officials at the Pantex Plant and DOE officials at DOE Headquarters. We reviewed relevant site, DOE-wide, and Government-wide documents. We also conducted a physical check of hazardous chemicals at several indoor and outdoor storage areas.

As part of our review, we evaluated BWXT's implementation of the "Government Performance Results Act of 1993." Specifically, we reviewed a performance measure that required BWXT to conduct a physical inventory in fiscal year 2006 of all hazardous chemicals present.

This inspection was conducted in accordance with the "Quality Standards for Inspections" issued by the President's Council on Integrity and Efficiency.

Appendix B

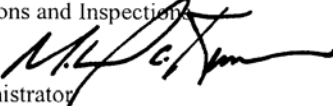


Department of Energy
National Nuclear Security Administration
Washington, DC 20585



January 29, 2007

MEMORANDUM FOR Christopher R. Sharpley
Deputy Inspector General
for Investigations and Inspection

FROM: Michael C. Kane 
Associate Administrator
for Management and Administration

SUBJECT: Comments to Draft Report on Pantex
Chemical Safety Protocols; S06IS008/2006-
00663

The National Nuclear Security Administration (NNSA) appreciates the opportunity to review the Inspector General's (IG) draft report, "Chemical Safety Protocols at the Pantex Plant. We understand that this inspection was conducted to determine if Pantex has implemented an effective chemical safety program. Equally, we understand that, while Pantex has implemented an effective program, there are several areas that need improvement.

NNSA agrees with the report and the recommendations. The Site Office has directed the contractor to develop a corrective action plan and submit it to the Site Office by January 29, 2007. Therefore, we request that the IG carry these actions related to this report into the formal Management Decision phase. We will then provide the IG with the Administrator's Management Decision on each recommendation.

Should you have any questions, please contact Richard Speidel, Director, Policy and Internal Controls Management.

cc: Dan Glenn, Manager, Pantex Site Office
David Boyd, Senior Procurement Executive
Frank Russo, Senior Advisor for Environment, Safety and Health
Karen Boardman, Director, Service Center



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1. What additional background information about the selection, scheduling, scope, or procedures of the inspection would have been helpful to the reader in understanding this report?
2. What additional information related to findings and recommendations could have been included in the report to assist management in implementing corrective actions?
3. What format, stylistic, or organizational changes might have made this report's overall message more clear to the reader?
4. What additional actions could the Office of Inspector General have taken on the issues discussed in this report which would have been helpful?
5. Please include your name and telephone number so that we may contact you should we have any questions about your comments.

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