

# DEFENSE NUCLEAR FACILITIES SAFETY BOARD

November 19, 1993

**MEMORANDUM FOR:** Board Members

**FROM:** Robert F. Warther

**SUBJECT:** Report on Configuration Management and Maintenance at the Pantex Plant

1. Purpose: This report documents the results of a Defense Nuclear Facilities Safety Board (DNFSB) staff visit to the Pantex Plant to review the implementation of maintenance and configuration management at Pantex. The review was conducted by R. Warther, H. Massie, and J. DeLoach of the DNFSB staff and Outside Expert J. Porter. Attachment I lists the standards used to perform this review.
2. Summary: The work control program at the Pantex Plant requires substantial upgrade to meet the guidance contained in the Department of Energy (DOE) Orders and to provide a margin of safety for the workers consistent with that at other sites. The pilot program for Configuration Management (CM) has not resulted in significant system and equipment documentation improvements at Pantex. This program will require substantial upgrade to contribute to the SAR upgrade, training, and maintenance programs. The following comments apply:

**USE OF STANDARDS** Few standards are rigorously followed at Pantex for either the CM program or the maintenance program. The CM program has only recently been initiated. Specific standards for this program have not been issued by DOE HQ, or locally by Mason and Hanger. The Pantex CM program reflects this lack of direction. Configuration management efforts for one new facility are proceeding very slowly. CM efforts for the remaining buildings are not proceeding at all.

**MAINTENANCE PROGRAM** The maintenance program requires significant strengthening to meet the requirements of DOE Order 4330.4A, Maintenance Management Program. Documentation provided for many maintenance practices contains few details, and is subject to the interpretation of the craftsmen working the job. Work packages do not reference CM documentation (e.g., drawings, part numbers, vendor manuals, etc.). Lockout and tagout requirements usually are at the discretion of the craft personnel. Drawings do not exist that show power supplies to electrical loads resulting in the practice that electrical loads are isolated using circuit tracers and voltage check meters. Retest requirements tend to be qualitative in nature, vice quantitative.

**WORK CONTROL AND CONDUCT OF OPERATIONS** Most maintenance packages contain a requirement for the systems to be transferred from operations to maintenance. A signature from operations and maintenance is required to effect this transfer. However,

based on the DNFSB staff's review of work packages in process, Facility Managers (FMs) do not always understand the nature of the maintenance, the effects on system capabilities and operations, and the duration of the system maintenance.

**PROCUREMENT PRACTICES** Craft personnel recommend and supervisors approve repair parts for procurement. These procedures do not meet the guidance contained in DOE Order 4330.4A, Maintenance Management Program, or DOE Order 5700.6C, Quality Assurance. Job orders reviewed by the DNFSB staff indicate that some parts substitutions have been made that are neither technically justified, or reviewed by engineering.

**WORK BACKLOG AND MAINTENANCE RESPONSIVENESS** Facility managers interviewed stated that the maintenance department has been much more responsive to their needs compared with the previous year. The observations of the FMs are reflected in the maintenance backlog, which has decreased over the past several months.

**CM SYSTEMS** M&H has initiated a prototype CM system in the High Explosive Machining Facility (Building 12-121). The scope of this two man-year prototype effort is limited to developing some CM documentation and labelling approximately 60 components for the fire protection and deluge system. The pilot labelling program does not meet the requirements of DOE Order 5480.19 because the components are not uniquely identified. It was not clear that the FM was aware that the orders and standards were not satisfied. M&H personnel have no plans to critically evaluate and assess prototype efforts before additional resources are invested.

3. **Background** DOE's Order 4330.4A, Maintenance Management Program, is one of the 51 Orders of Interest to the Board because of the effect maintenance can have on reliable operation of safety systems. Similarly, a sound configuration management program, including design and as-built bases, technical drawings, specifications for repair parts, and similar CM elements, is important to the safe and reliable operation of the facilities. As a result, the DNFSB staff and Outside Experts reviewed configuration management and maintenance at the Pantex Plant from October 19, 1993, through October 22, 1993.
4. **Discussion** Configuration management was discussed during the first day of the review. Maintenance practices were discussed and observed on the second and third day of the review. Maintenance technician and maintenance-related personnel interviews were conducted on the last day. The paragraphs in the maintenance section of this discussion relate directly to sections contained in DOE Order 4330.4A, Maintenance Management Program. The results of the personnel interviews are not discussed in a single paragraph, but are related to individual topics relating to the orders and standards.
  - a. **Configuration Management:** The scope of the CM effort at Pantex includes over 350 facilities with approximately 300 critical and 460 important systems. M&H has 75 billets assigned for design engineers, and five billets assigned for system engineers. Of the five system engineer billets, two are filled. Four FTEs from

industrial engineering are assigned to implement CM at the site. No CM program exists for the \$300 million design and construction program as required by DOE Order 6430.1A.

The importance of CM was articulated most clearly by one of the Facility Managers, who stated that he could not implement an effective facility training program without accurate configuration management information, including system and component drawings and specifications.

1. Configuration Management Standards and HO Direction. DOE issued a DOE Standard on configuration management in November 1993. DOE-STD-1073-93 is titled Guide for Operational Configuration Management Program, Including the Adjunct Programs of Design Reconstitution and Material Condition and Aging Management. Information contained in this standard has been available to the sites and facilities in draft form for over one year. However, it is not apparent that personnel at the Pantex Plant used the draft standard to implement their pilot CM program. As a result, the Pantex Plant program has little direction, and little CM accomplished to date.
2. Facility Manager Interview Results. Both Facility Managers interviewed stated that failure to provide accurate drawings and technical documentation impeded operation of their facilities, and that a successful training program could not be established until accurate technical documentation became available.
3. Existing CM Systems. M&H has initiated a prototype CM system in the High Explosive Machining Facility (Building 12-121). This building contains four or five critical systems. M&H and DOE personnel were not able to provide the number of important systems in this facility. The scope of this two man-year prototype effort is limited to labelling approximately 60 components for the fire protection and deluge system. The pilot labelling program does not meet the requirements of DOE Order 5480.19 (Conduct of Operations Requirements for DOE Facilities) because the components are not uniquely identified. Two valves labelled "Main Drain" were adjacent to one another. One valve was the main drain for the fire sprinkler system, and the other valve was the main drain for the deluge system. Both were painted red, both were at the same height, and they were connected by a (nominal) 4" pipe. DNFSB staff personnel asked what plans exist to critically evaluate and assess prototype CM efforts before additional resources are invested. M&H personnel responded that they have no specific plans at this time.
4. System Engineer Staffing. Sixty-three personnel are currently assigned to 75 billets in the design department, and approximately half function as

system engineers. However, these personnel are not assigned CM functions. As a result, the CM program for new construction facilities does not meet the requirements contained in DOE Order 6430. 1A.

- b. Maintenance. DOE Order 4330.4A, Maintenance Management Program, was issued on October 17, 1990, and required a Maintenance Implementation Plan (MIP). The Pantex Plant MIP was the first MIP approved for sites under the oversight of the DNFSB. The order is 82% implemented according to Pantex and DOE personnel. Areas of non-compliance include training, work control, predictive maintenance, and cost controls. Full implementation is expected by 1995. In general, the procedures support the view that required maintenance is largely implemented at the Pantex Plant. However, actual practices are a significant area of concern at the Pantex Plant. This area requires further DNFSB staff review to determine if the practices observed are the exception, or the norm for maintenance at the Pantex Plant.
  1. Maintenance Training and Qualification. This program is a pilot program operated in the Carpenter Shop. The Carpenter Shop has 22 positions. Job analyses have been completed for 18 positions. Task analyses have been completed for 11 positions. Four maintenance craftsmen and two maintenance supervisors were interviewed as part of the maintenance review. The topics included work control, lockout and tagout, parts procurement and quality control, and retest requirements. In general, the maintenance craftsmen are senior individuals who are trained to follow Pantex procedures. Interview results are included in paragraphs 4.b.3, 4.b.5 and 4.c
  2. Maintenance History. M&H has a well-organized maintenance filing system, and was able to retrieve maintenance documentation readily when asked. Efforts to link this maintenance history system with a CM system are under consideration by M&H personnel.
  3. Maintenance Planning. Approximately 15 maintenance planners are assigned to the maintenance division at Pantex. These maintenance planners receive no formal training to conduct their jobs. Job task analyses will be initiated in March 1994, and training will commence in spring 1995. Two maintenance planning personnel were interviewed. One planner had over ten years experience at the site, and the second was recently assigned to the site with about two years experience in fire protection. This second individual was one of three certified fire protection specialists in the state. The results of the interview are as follows:
    - (a) The fire protection planner's duties and responsibilities were more related to fire protection than maintenance planning. This individual planned only fire protection jobs, and was unable to answer

questions concerning non-fire protection work packages.

- (b) Neither maintenance planner was able to explain how the retest requirements included in the job packages reviewed by the DNFSB staff are conducted by maintenance personnel. The planners generally are providing very limited detail for the work packages, and have limited knowledge regarding how the crafts personnel actually perform the retest requirements. Additionally, planners who write the retest requirements for the work packages are not familiar with how retests are performed which is not consistent with DOE Order 4330.4A section 9.

- 4. **Maintenance Work Packages Review.** The staff reviewed several Maintenance Repair Orders (MROs) and Job Orders. The packages consisted of an outline for the job, with little detailed technical information as required by DOE Order 4330.4A section 8. These packages were not consistent with job packages reviewed at other sites and facilities in the complex. The following examples are provided:
  - (a) Most maintenance packages contain a requirement for the systems to be transferred from operations to maintenance. A signature from operations and maintenance is required to effect this transfer. However, based on the DNFSB staff's review of work packages in process, this transfer is not formal. The FMs do not always understand the nature of the maintenance, the effects on system capabilities and operations, and the duration of the system maintenance.
  - (b) Most of the packages contained a requirement to lock and tag the system or components. The packages did not specify how to isolate, tagout and lockout the system or component. As a result, tagout criteria potentially vary across the site. No signatures verifying lockout and tagout specifics are required from shift supervisors or Facility Managers. This does not satisfy statements contained in DOE Order 5480.19.
- 5. **Procurement of Parts and Materials.** In general, parts, materials, and services required for maintenance activities are available when needed. Maintenance workers are responsible for identifying required replacement parts for maintenance, and forward purchase requests to their supervisors on handwritten slips of paper. This process does not meet the guidance of DOE Orders 5700.6C and 4330.4A. Maintenance supervisors are responsible for actual procurement of material at the Pantex Plant. Replacement material is ordered based on vendor manual information and a

like-replace-like concept. This like-replace-like concept is based on form and fit. Material specifications generally are not included in this evaluation. As a result of this order process, virtually all replacement material is ordered to level two (commercial grade) specifications. Level one procurement requirements may result from a redefinition of safety level systems and components from Consequence of Failure Level A (CFL-A) to critical and important systems. The following was noted with procurement of parts and materials:

- (a) One work package required installation of gasket material for HEPA filters. No gasket material was specified.
  - (b) No clear process for substitution of items is in place at Pantex as required by DOE Order 4330.4A section 10. Pantex Plant maintenance supervisors notify engineering when they believe that the part being procured may not be an equivalent substitute for the originally installed part. In general, engineering approval is received for substitutions that affect facility configuration. However, this approval is as a result of the experience of the supervisors, not as a result of following rigorous procedures.
  - (c) One job order to replace a hoist stop required spare parts and material to be ordered. The order numbers were lined out with no initials or justification, and another replacement part number substituted. The source of material for this job is not clear.
  - (d) One job order showed equivalent parts were used for an automatic transfer switch for an emergency power supply. No certification or justification for equivalency was included in the work package.
- c. Control of Maintenance Activities. The DNFSB staff and OE observed one job with potentially serious consequences from the perspectives of systems engineering, work control and conduct of operations. The DNFSB staff and OE observed repair/replacement of a hot water pump in the Equipment Room for Building 12-94. The controller for the pump was tagged and locked for removal of the motor pigtail. The inlet and outlet valves to the pump were located approximately 12 feet high near the ceiling. These valves were shut, but not locked and tagged. The craft personnel loosened the flanges, drained the water from the pipe, and removed the pump. The flanges continued to leak water. The staff was extremely concerned with the potential for water dripping or spraying onto electrical equipment and causing an electrical short or sparks. High explosive (HE) material is not normally used or stored in this room, and therefore the probability of a severe accident was significantly reduced. The following work practices were observed:

- (a) The hot water was heated using a steam-fed heat exchanger. Steam to the heat exchanger was not isolated. As a result, the water that continued to drip was hot, though less than 212
- (b) No temperature gages were installed in the system near the heat exchanger. The FM did not know the temperature of the hot water, even as an approximation.
- (c) Electrical equipment, including a large battery pack were in the same room. The controller for the pump motor was beneath the flanges, slightly offset from vertical. Leakage from the flanges overhead had the potential to leak or spray on electrical equipment, thereby causing shorts or arcing.
- (d) The FM was informed of this lockout/tagout procedure. The FM did not show immediate concern, and it is not clear that the FM understood the potential safety issues. Pantex personnel indicated that the difficulty in reaching the valves provided adequate protection for the workers and equipment.
- (e) The FM was not familiar with the work package procedure used by the craftsmen. The FM stated that the job should be completed by the end of the day. Nearly 24 hours later, the craftsmen had not initiated troubleshooting on the pump because of other priorities.

1. Post-maintenance retest/system certification. Post-maintenance tests are not well defined. More importantly, not all maintenance planners are familiar with retest requirements. Craft personnel perform retests differently for different systems and components. For example, one work package required installation of gasket material for HEPA filters. The retest requirement consisted of verifying no blowby and a successful differential pressure test. No procedures to conduct these tests or criteria to evaluate the success or failure of the installation were specified. The work package was documented with "Passed" for the differential pressure test vice providing a specific differential pressure obtained.

- (a) Two maintenance planners were interviewed and asked how these tests were conducted. Neither of the planners interviewed was familiar with this package, and could not describe how these tests should be conducted. See comment 4.b.3.
- (b) The maintenance planners interviewed were not familiar with procedures used by craftsmen to perform vacuum leak checks following maintenance on the same HEPA filter

system.

- (c) Craft personnel were asked how a pump and motor removed for repair or replacement should be tested. Both persons interviewed stated that they would conduct an operational test of the pump and motor, including a leak test. No pressure was specified for the leak test. The more senior individual stated that he would, in addition, conduct a rotation check for the (three-phase) motor.