A Review of Federal Prison Industries' Electronic-Waste Recycling Program

Office of the Inspector General
Oversight and Review Division
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EXECUTIVE SUMMARY

I. Introduction

This Executive Summary describes the results of an investigation by the Office of the Inspector General (OIG) into the health, safety, and environmental compliance practices of Federal Prison Industries' (FPI) electronic waste (e-waste) recycling program. Federal Prison Industries, which is known by its trade name "UNICOR," is a government corporation within the Federal Bureau of Prisons (BOP) that provides employment to staff and inmates at federal prisons throughout the United States. UNICOR sells a variety of consumer products and services, such as office furniture and clothing, and industrial products, such as security fencing and vehicle tags. As of June 2010, UNICOR had 103 factories at 73 prison locations, employing approximately 17,000 inmates or 11 percent of the inmate population.

Starting in 1997, UNICOR began to accept computers, monitors, printers, and other types of e-waste for recycling at federal prisons. UNICOR sold these e-waste items to its customers, sometimes following refurbishment, or disassembled the items into their component parts and sold the parts to recyclers for further processing.

E-waste contains many toxic substances that can be harmful to humans and to the environment. For example, a computer can contain toxic metals, such as cadmium, lead, mercury, arsenic, and beryllium. Cathode ray tubes, which are found in televisions and computer monitors, typically contain between 2 to 5 pounds of lead. When e-waste is disassembled and recycled, workers can be exposed to toxic metals which can cause serious health implications.[1]

UNICOR's recycling of e-waste resulted in complaints from BOP and UNICOR staff and inmates, most notably from Leroy A. Smith, Jr., a former Safety Manager at the United States Penitentiary (USP) in Atwater, California. In particular, the complaints asserted that UNICOR's e-waste recycling practices were not safe and had made UNICOR staff and inmates sick. As a result of these complaints and at the request of the BOP, Department of Justice (DOJ), and attorneys for Mr. Smith, the OIG investigated the safety of UNICOR's e-waste recycling operations, as well as other allegations of theft,

[1] As used in this report the term "exposure" refers to the airborne concentration of a contaminant, such as cadmium or lead, that is measured in the breathing zone of a worker but outside of any respiratory protection devices used.

conflict of interest, and environmental crimes that arose during our investigation related to UNICOR's e-waste operations.

II. Methodology of the Investigation

Due to the technical nature of the issues involved in the investigation, the OIG sought assistance from four federal agencies with expertise in occupational health, safety, and environmental compliance: the Occupational Safety and Health Administration (OSHA), the Centers for Disease Control and Prevention – National Institute for Occupational Safety and Health (NIOSH), the Federal Occupational Health Service (FOH), and the United States Environmental Protection Agency (EPA).[2] Representatives from these agencies assisted the OIG with field work and analysis of UNICOR's operations. The agencies' representatives included Occupational Physicians, an Occupational Health Nurse, Certified Industrial Hygienists, Environmental Specialists, and Safety Specialists.[3]

The OIG also coordinated its work with other components within DOJ to complete its investigation, including the Environmental Crimes Section in the Environment and Natural Resources Division; the United States Attorneys' Offices for the Northern District of Florida, the Northern District of Ohio, and the District of New Jersey; and the Federal Bureau of Investigation (FBI), as well as the Internal Revenue Service.

During our investigation, the OIG team conducted more than 200 interviews and examined documents from BOP institutions and headquarters related to UNICOR's recycling operations and health, safety, and environmental practices. Among the witnesses we interviewed were UNICOR Chief Operating Officers, the BOP Assistant Director for the Health Services Division, BOP National Safety Administrators, staff of UNICOR's Recycling Business Group who managed UNICOR's e-waste recycling program, UNICOR factory managers and foremen, local Safety Managers, and inmates. We also reviewed more than 10,000 documents, examined numerous BOP and UNICOR e-mail accounts, and performed forensic examinations on hard drives and laptop computers of certain UNICOR personnel.

Our investigation involved extensive field work conducted with the federal agencies that assisted us. This field work evaluated e-waste recycling

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[2] The OIG received assistance from two components within NIOSH: the Division of Applied Research and Technology (DART) and the Hazard Evaluations and Technical Assistance Branch (HETAB) within the Division of Surveillance, Hazard Evaluations, and Field Studies.

[3] UNICOR authorized the expenditure of approximately $1.2 million for certain costs of the technical team that supported the OIG's investigation.

at the 10 institutions where UNICOR performed this work, although 2 of these (FCI Dublin and FCI La Tuna) had stopped recycling before our field work began in November 2006. The remaining eight institutions we visited were USP Atwater, Federal Correctional Institution (FCI) Ft. Dix, FCI Elkton, USP Leavenworth, USP Lewisburg, FCI Marianna, FCI Texarkana, and Federal Correctional Complex (FCC) Tucson.[4] This field work concluded in February 2009 when NIOSH performed its last site visit, which was conducted at FCI Marianna in Marianna, Florida.

During our field work we examined staff and inmate exposures to toxic metals, primarily cadmium and lead; the medical effects resulting from these exposures; legacy contamination in UNICOR's factories resulting from improper recycling practices; exposures to noise and heat stress; the incidence of injuries; environmental compliance; and general administrative control and oversight of UNICOR's e-waste operations. Due to the many hazards associated with recycling cathode ray tubes (CRT), much of our field work focused on UNICOR's handling of CRTs. As a result of economic considerations, UNICOR ceased all operations involving the breaking of CRT glass in May 2009, although inmates still disassemble computer monitors by removing the plastic casing and wiring.

At the conclusion of the site visits to the BOP institutions, the federal agencies that assisted the OIG provided written reports about their work to the OIG. The OIG promptly shared all the reports it received with the BOP and UNICOR. To consolidate this information, the OIG requested that FOH compile and analyze the agencies' findings, as well as information from OIG interviews and documents; address any discrepancies; and provide the OIG with comprehensive health, safety, and environmental reports on conditions from 2003 to 2009 for each of the eight UNICOR e-waste recycling factories that had ongoing operations during the OIG's investigation. These eight FOH reports were subjected to peer review by OSHA and NIOSH. We compiled all of these reports as an Appendix to this report, and posted them on the OIG's website. See http://www.justice.gov/oig/reports/BOP/index.htm. FOH submitted the last of its eight reports to the OIG in May 2010.[5]

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[4] A Federal Correctional Complex includes multiple BOP institutions at one location, such as a high security prison with other lower security institutions.

[5] In the course of our investigation, we learned of allegations of theft and conflict of interest at FCI Marianna relating to the e-waste recycling program. The OIG investigated these allegations and referred the matter to the U.S. Attorney's Office for the Northern District of Florida. As a result of that case, one UNICOR employee pled guilty to charges of theft of government property in January 2010 for stealing items that were to be recycled. In addition, in July 2010 a former UNICOR Factory Manager, James Bailey, and his cousin, Lee Temples, were indicted for conflict of interest, wire fraud, money laundering, and conspiracy, among other charges. According to the indictment, Bailey was responsible for eBay sales of surplus

(Cont'd.)

This report summarizes the findings of FOH, NIOSH, OSHA (the "OIG technical team"), and the OIG regarding recycling practices in UNICOR's e-waste factories and toxic metal exposure conditions from 2003 through 2009. It also provides conclusions regarding historical exposures prior to 2003 based on assessments performed by FOH and NIOSH-HETAB. In addition, the report presents information about environmental compliance issues and summarizes the OIG's examination of allegations of misconduct and performance failures by UNICOR and BOP staff.

III. Summary of Findings

Our investigation found that prior to 2009 UNICOR's management of the e-waste recycling program resulted in numerous violations of health, safety, and environmental laws, regulations, and BOP policies. We concluded that UNICOR's Headquarters staff poorly managed UNICOR's e-waste program prior to 2009.[6] UNICOR staff members often failed to perform hazard assessments on new e-waste operations or did so incorrectly, and important health and safety information was not shared with BOP executives and safety staff that could have prevented the violations from occurring. We also found that managers in UNICOR's Recycling Business Group, primarily General Manager Lawrence Novicky and his assistant, Bruce Ginther, concealed warnings about hazards related to toxic metals from UNICOR and BOP staff and from inmates.

Even after the hazards of e-waste recycling were clearly identified to the leadership of UNICOR's Recycling Business Group in 2002, primarily due to the efforts of Safety Manager Smith at USP Atwater, UNICOR was slow to make necessary changes. UNICOR sought advice from BOP safety staff concerning issues on which the staff was not qualified to provide assistance, and at times UNICOR failed to promptly act on the requests of Safety Managers when the requests conflicted with UNICOR's business priorities. The consequence was that UNICOR and BOP staff and inmates were needlessly exposed to cadmium and lead – two dangerous toxic metals – during recycling activities, and that parts of some BOP facilities where recycling activities had previously occurred

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computer equipment for UNICOR and directed the highest quality equipment to Temples's business, in which Bailey allegedly held a financial interest. On September 1, 2010, Temples pled guilty to conflict of interest, money laundering, wire fraud, deprivation of honest services, and obstruction of justice charges. On September 30, 2010, Bailey pled guilty to conflict of interest, money laundering, wire fraud, deprivation of honest services, and false statement charges.

[6] Unless otherwise noted, references to "we" in this report refer to the OIG and not to the OIG technical team. The technical team's review addressed field work and analysis of UNICOR's operations, while the OIG addressed additional issues, including misconduct allegations and assessment of individual responsibility.

without proper engineering and hygiene controls were contaminated with these metals and required remediation.

Overall, we found a culture at UNICOR that did not sufficiently value worker safety and environmental protection. We determined that the flawed organization and poor communication between UNICOR and the BOP made compliance difficult to achieve even with the best-intentioned employees.

Our investigation identified numerous systemic deficiencies in UNICOR's and the BOP's operations that we believe jeopardized UNICOR's ability to comply with applicable health, safety, and environmental requirements. These include a lack of technical resources (during our investigation the BOP and UNICOR only had a single Certified Industrial Hygienist to cover 98 UNICOR factories at 71 prison locations), as well as weak oversight of UNICOR's operations by the BOP and DOJ.[7]

We also found numerous instances of staff misconduct and performance failures. These included actions that endangered staff and inmates: dishonesty, dereliction of duty, and theft, among others. In all, we concluded that 11 UNICOR and BOP employees committed either misconduct or performance failures in their work related to the e-waste recycling program.

We also identified potential criminal conduct by BOP and UNICOR staff, which resulted in referrals to two other DOJ components. In February 2007, we referred information to the Environmental Crimes Section in DOJ's Environment and Natural Resources Division indicating that UNICOR managers had knowingly endangered staff and inmates, were aware of unlawful disposals of hazardous waste, and had concealed information from regulators. Following a lengthy investigation that the Environmental Crimes Section conducted in conjunction with the OIG, EPA, FBI, and the U.S. Attorneys' Offices for the Northern District of Ohio and the District of New Jersey, no action was initiated because of various evidentiary, legal, and strategic concerns.

Despite the many problems that our investigation identified with UNICOR's development of its e-waste program, we found that UNICOR began to institute significant health and safety improvements to its e-waste recycling operations starting in June 2003, primarily to control exposures to toxic metals. Since that time, UNICOR has made substantial progress to improve the safety of its e-waste operations. The improvements included changes to CRT glass breaking methods in 2003 and 2004, enhanced staff and inmate training beginning in late 2003 and 2004, development of written operating

[7] As of June 2010, UNICOR operated 103 factories in 73 federal prisons.

standards by 2004, and formalized job orientation training for inmates in 2005. UNICOR also has improved its exposure monitoring at its factories over time.

Our review determined that by 2009, with limited exceptions, UNICOR's e-waste operations (including CRT glass breaking activities) were compliant with OSHA requirements and were being operated safely, though the agencies that assisted us recommended some additional improvements. Moreover, in 2009 UNICOR also hired a new General Manager of the Recycling Business Group with more than 30 years of work experience for the EPA, Robert Tonetti, who has initiated changes that we believe will further improve health, safety, and environmental practices. For example, UNICOR is upgrading its environmental, health, and safety management systems by pursuing certification for all of its electronics recycling factories under a program endorsed by the EPA – the Responsible Recycling (R2) Practices program.

In addition, it is important to recognize that UNICOR employment provides inmates with job skills and helps to reduce inmate idleness. Inmates repeatedly told us during our investigation that they valued working for UNICOR and preferred the work experience to other opportunities offered by the BOP. We also believe that UNICOR deserves credit for seeking to provide the federal government and the public with recycling services. UNICOR has disassembled thousands of tons of e-waste since the inception of its recycling program, some of which otherwise could have ended up in landfills or with less responsible recyclers.

However, according to the agencies that assisted the OIG in this investigation, additional improvements are still needed in UNICOR's e-waste operations. For example, UNICOR and the BOP need to hire or retain staff that is adequately trained to identify and correct health, safety, and environmental compliance problems.

Further details of the findings in 17 areas from our full report are presented below.

1. Staff and Inmate Exposures to Toxic Metals

Our findings concerning toxic metal exposures focused on different types of recycling activities, such as glass breaking, disassembly of computers, and cleanup activities, during two distinct periods of time. The first period was from the start of UNICOR's recycling program in 1997 through approximately June 2003, when UNICOR first issued detailed glass breaking procedures and began to institute significant health and safety improvements in its e-waste recycling operations. The second period was from June 2003 to 2009, when UNICOR hired a new manager of the Recycling Business Group and instituted additional safety precautions.

Although our investigation evaluated potential exposures to 31 metals, including arsenic, barium, and beryllium, our findings primarily address cadmium and lead because exposures to these two metals were found at various times to be above OSHA occupational exposure limits at UNICOR's e-waste factories. Other metal exposures generally were negligible.

a. Exposures in Glass Breaking Areas

With respect to glass breaking operations, where air exposure monitoring data during glass breaking was available at certain BOP facilities prior to 2003, such as at USP Atwater, our investigation found that worker exposures were at times far higher than the applicable OSHA exposure limits for cadmium and lead. When such data were not available (due to UNICOR's failure to comply with OSHA regulations that required monitoring) FOH and NIOSH-HETAB concluded that it was not possible to quantify the severity of these early exposures. However, they concluded there is a strong likelihood that worker exposures in UNICOR glass breaking areas at times exceeded OSHA exposure limits, and probably occurred repeatedly given UNICOR's consistently poor work procedures and conditions, such as the lack of adequate ventilation and proper hygiene.[8] This determination was based on UNICOR's unsafe glass breaking practices at its factories during the first five years of recycling operations, the USP Atwater exposures prior to 2003, and the frequency of documented exceedances of OSHA exposure limits at UNICOR recycling factories after 2003, even though fewer numbers of CRTs were broken and better exposure controls were in place after 2003.

The OIG technical team also tested the levels of cadmium and lead contamination present in surface wipe and bulk dust samples taken inside glass breaking booths at UNICOR facilities. FOH and NIOSH-HETAB also tested in areas where glass breaking activities previously had occurred. These samples indicated that substantial toxic metals emissions occurred during early glass breaking operations, potentially exposing staff and inmates to the inhalation and ingestion of cadmium and lead.

FOH also discovered legacy contamination from earlier recycling activities at multiple UNICOR factories, particularly in areas of past glass breaking operations. FOH and NIOSH-HETAB concluded that activities that disturb this contamination still have the potential to create inhalation and ingestion exposures if the operations are not properly conducted with hazard controls in place, such as respiratory protection. In addition, particle size analysis performed by FOH and NIOSH on various dust samples from recycling operations revealed that 90 percent of the particles were small enough that

[8] FOH and NIOSH-HETAB evaluated exposures that occurred prior to 2003 using available workplace sampling reports and data that UNICOR and the BOP provided.

they could remain airborne for relatively long periods of time and could travel long distances before being deposited on surfaces.[9] Small particles also penetrate deeper into the pulmonary system for greater absorption into the body.

After June 2003, UNICOR gradually reduced worker exposures to cadmium and lead during glass breaking operations. However, UNICOR consultants found exposures above OSHA air exposure limits at various factories through mid-2004 and at FCI Elkton until early 2007. The OIG technical team also found violations of OSHA exposure limits had occurred, including major exceedances of cadmium standards at FCI Elkton during filter changing operations in the area where CRTs were broken.

By 2009, UNICOR corrected the problem of exceedances of OSHA occupational exposure limits for cadmium and lead at FCI Elkton, primarily through improvements to its handling procedures for glass booth filters. In addition, beginning in May 2009, UNICOR ceased all glass breaking operations in its computer recycling facilities and is now sending its CRTs to private firms for processing.

b. Exposures in Disassembly Areas

In addition to exposures in areas where glass breaking occurred, such as inside glass breaking booths, we evaluated exposures in areas where e-waste was being disassembled. Our investigation determined that prior to 2003 UNICOR recycling operations resulted in uncontrolled releases of contaminated dusts to general factory areas where e-waste disassembly work was being conducted, especially areas near unenclosed glass breaking operations. FOH and NIOSH-HETAB concluded that these uncontrolled releases from glass breaking, as well as contaminants from e-waste generally, contributed to higher exposures in factory areas than what would be expected for disassembly operations conducted in a manner that fully complied with OSHA requirements.

FOH and NIOSH-HETAB further concluded that the potential inhalation and ingestion exposures for workers engaged in disassembly activities were greater during the pre-June 2003 period than after, although the relative decrease in risk and exposures could not be quantified due in part to UNICOR's failure to perform necessary monitoring prior to 2003.

However, between 2007 and 2009, FOH, NIOSH, and OSHA conducted on-site evaluations and exposure monitoring for disassembly activities at

[9] The particle size analysis revealed that 90 percent of the particles were less than10 micrometers (μm) in size and that 40 percent were in the 1-2 μm range.

UNICOR factories and found that all exposures were less than OSHA exposure limits for cadmium and lead. We concluded that current UNICOR e-waste disassembly and related activities have minimal potential for inhalation exposure.

2. Worker Protection Measures

As noted above, our investigation determined that prior to June 2003 UNICOR did not implement adequate worker protection measures to control exposures to hazards associated with e-waste recycling activities, particularly cadmium and lead hazards. We found that UNICOR lacked proper engineering controls, work practice controls, personal protective equipment, and administrative controls such as hazard communication and training to mitigate toxic metals exposures that resulted primarily from glass breaking operations. As a result, UNICOR violated numerous OSHA regulations, including those dealing with cadmium, lead, hazard communication, personal protective equipment, and respiratory protection.

For example, prior to 2003 UNICOR failed to perform adequate hazard assessments in its recycling factories to identify necessary personal protective equipment. As a result, BOP and UNICOR staff and inmates at times lacked personal protective equipment to effectively mitigate exposures to cadmium and lead. At the startup of glass breaking operations at many factories, UNICOR either did not provide respiratory protection or provided paper dust masks that were not approved by NIOSH for toxic metals. In addition, even when UNICOR provided respiratory protection to inmate glass breakers, the respirators at times were insufficient to adequately safeguard workers against the excessive exposures, which violated OSHA respiratory protection and personal protective equipment regulations.

Engineering controls were similarly inadequate prior to 2003. We found that UNICOR largely left the design of its glass breaking booths to local factory and institution staff who lacked industrial hygiene and engineering expertise, with the result that recycling factories either did not have exhaust ventilation and containment systems when glass breaking started or used ineffective make-shift systems that were improperly designed.

Our investigation revealed that after June 2003 UNICOR made substantial improvements to its worker protection practices for e-waste recycling by: (1) issuing glass breaking and other operating procedures, (2) implementing better engineering and work practice controls for glass breaking in 2003 and 2004 and then gradually improving these controls over time, (3) upgrading respiratory protection for glass breaking in 2003 and standardizing the type of respirators used in late 2004, (4) improving other personal protective equipment for glass breaking, and (5) providing increased training for staff in late 2003 and 2004 and formalizing job orientation training for

inmates. UNICOR also improved its exposure monitoring at its factories over time.

3. Medical Effects from Toxic Metal Exposures

NIOSH's review of available staff and inmate medical records revealed that the results of biological monitoring generally were unremarkable. NIOSH did not identify any blood or urine testing in staff and inmates that revealed exposures exceeding occupational standards for cadmium and lead. These conclusions are subject to qualification, however. For example, because UNICOR and the BOP failed to comply with OSHA biological monitoring regulations (see discussion of medical surveillance below), the biological monitoring records that NIOSH reviewed were incomplete and did not include data from periods when exposures were likely greatest.

In addition to reviewing medical records, NIOSH also evaluated a wide array of adverse health symptoms that staff and inmates reported in their interviews and attributed to their work in UNICOR's e-waste factories. After considering available evidence, including medical records and information obtained during interviews, NIOSH concluded that none of the reported ongoing health problems could be linked to recycling work. However, due to variations in susceptibility to adverse health effects from toxic metal exposures, some contribution to future health problems from exposures at UNICOR cannot be completely ruled out.

4. Medical Surveillance of Staff and Inmates

NIOSH found that the BOP's and UNICOR's medical surveillance of staff and inmates at FCI Elkton and USP Atwater was inadequate and failed to comply with OSHA regulations. NIOSH determined that medical examinations were not completed on inmates as required by the OSHA cadmium and lead standards, and that medical records were not properly retained by the BOP. Biological monitoring also was not standardized, resulting in some staff and inmates not receiving the testing required under OSHA regulations and some staff and inmates not being informed of their testing results.

Despite these problems, NIOSH concluded that the only persons currently working in e-waste recycling that required continued medical surveillance were inmates at FCI Elkton who performed glass breaking operations or the monthly change of the glass booth filters and inmates at USP Atwater who performed the same functions in the event that glass breaking operations restarted there. However, because UNICOR ceased all glass breaking operations in 2009, no persons currently meet these criteria.

NIOSH also concluded that some former FCI Elkton inmates and staff may require surveillance under the OSHA cadmium standard based on the likelihood that they were exposed to cadmium prior to 2003. NIOSH also

recommended that UNICOR or the BOP retain a board-certified, residency-trained Occupational Medicine Physician to oversee future medical surveillance activities.

The BOP recently retained an Occupational Physician from FOH to oversee medical surveillance of UNICOR staff and inmates in the e-waste program. In March 2010, the BOP notified the OIG that biological monitoring was underway for inmates that formerly worked in e-waste recycling at FCIs Elkton and Texarkana (institutions that had glass breaking operations prior to 2003), that remained in the BOP's custody, and that had not previously been tested. The BOP has agreed to share these results with the OIG when they are available.

5. Remedies for Toxic Metal Legacy Contamination

FOH and NIOSH tested for cadmium and lead surface contamination in bulk dust samples taken from areas likely to contain legacy contamination from early recycling operations. High levels of contamination were found at recycling factories with prior routine glass breaking and lead desoldering operations on surfaces that were not subject to regular cleaning, such as beams, light fixtures, in cable boxes, on roofs, inside general ventilation duct work, around former glass breaking areas where uncontrolled releases occurred, and in former disassembly areas. The extent of this contamination creates the potential for additional exposures caused by worker contact with the affected surfaces or other disturbance of the dust. As a result of these findings, the OIG technical team made recommendations to UNICOR to abate known areas of contamination and to perform additional testing in areas that could be contaminated.

6. Health and Safety Planning – Hazard Assessments

We determined that UNICOR failed to properly assess hazards related to e-waste in its recycling factories and to warn staff and inmates in a timely fashion about the presence of toxic metals in their work areas. In addition, we concluded that due to UNICOR's failure to conduct such assessments, UNICOR did not properly integrate hazard controls into its e-waste work processes. Instead, these control measures evolved slowly over periods of years, through a process of "trial and error" at some factories, before cadmium and lead exposures were controlled to levels below OSHA exposure limits.

We also determined that UNICOR and the BOP did not have policies that required UNICOR to have qualified personnel, including staff from the BOP's Health Services Division, conduct assessments on UNICOR's new operations, or on significant changes in existing operations, that would identify the hazards that UNICOR is required to disclose under OSHA regulations. The

BOP Health Services Division recently drafted procedures that address these assessments.

7. Hazard Communication and Warnings to Staff and Inmates

Prior to 2003, UNICOR did not provide adequate hazard communication and training programs for its recycling workers. For example, UNICOR staff and inmates who worked in or supervised glass breaking operations during 1998 through 2002 told us that they repeatedly were reassured by UNICOR managers that their work environment was safe, despite what they saw as unsanitary conditions. We found that UNICOR only gradually developed training that warned its workers of hazards associated with e-waste recycling.

8. Exposures to Other Hazards and Injuries

The OIG and OSHA found problems with UNICOR's handling of inmate injuries from e-waste recycling, and FOH and NIOSH indentified worker exposures to noise and heat that exceeded relevant standards.

Our interviews and review of inmate injury records revealed that inmates who worked in glass breaking operations frequently were cut by the broken glass, some resulting in serious injuries. Neither UNICOR nor the BOP shared injury information between factories, and lessons learned to prevent lacerations during glass breaking operations were not disseminated. We also concluded that the BOP does not have the ability to identify injury trends in UNICOR operations because it lacks procedures to collect and evaluate the information.

Our investigation also determined that the BOP and UNICOR violated OSHA regulations by failing to record inmate injuries on an injury and illness log that OSHA requires and inspects periodically. 29 C.F.R. § 1904 (describing requirements of OSHA's Form 300, Log of Work-Related Injuries and Illnesses). Although the BOP identified staff injuries on this log, it omitted inmate injuries. After consultations between OSHA and the BOP, the BOP concurred that inmates should be included on the OSHA Form 300 log.

Our investigation also determined that UNICOR and local safety staff often failed to identify noise sources and conduct adequate noise surveys of UNICOR recycling operations. Based on FOH and NIOSH noise monitoring tests, and from a review of recent noise testing results obtained by UNICOR and BOP consultants and safety personnel, we found inmate noise exposures above OSHA standards at various UNICOR factories during glass breaking operations, baling operations, hand-held power tool use, sander use, pallet manufacturing, and other activities.

We further determined that inmates had the potential for excessive exposure to heat, which could result in violation of OSHA's General Duty Clause, during glass breaking and other operations. 29 U.S.C. § 654. Evaluations conducted by NIOSH at FCI Marianna in Florida revealed exceedances of heat stress standards for certain UNICOR workers. The BOP and UNICOR did not have a heat stress program at the time of our field work at FCI Marianna. During later field work, FOH found that no UNICOR factories had conducted heat exposure assessments.

9. Violation of Health and Safety Regulations and Policies

UNICOR's e-waste recycling operations violated numerous OSHA regulations, including those dealing with cadmium, lead, hazard communication, personal protective equipment, and respiratory protection.[10] FOH's analysis of these violations revealed that the violations involved more than 30 different regulatory provisions. OSHA also determined that several of these violations would be considered "willful violations" within the meaning of its enforcement guidance, if they had been discovered during OSHA inspections.[11]

10. Inspections and Oversight of Recycling Operations

We determined that oversight of UNICOR's e-waste recycling program was inadequate and failed to identify the violations of health, safety, and environmental regulations and policies that we discovered during our investigation. Internal inspection oversight was provided by local and regional BOP safety staff, members of the Recycling Business Group, and the BOP's Program Review Division. The UNICOR Board of Directors also received reports of inspection activity from UNICOR staff. However, this oversight was not effective because the inspectors were not adequately trained to identify health, safety, and environmental problems.

External oversight by regulatory agencies was extremely rare prior to 2003. We found that the inspections that did occur, including those from UNICOR's e-waste suppliers, were in some instances compromised by UNICOR's concealment from inspectors of actual working conditions and

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[10] See generally 29 C.F.R. § 1910.1025, Lead; 29 § C.F.R. 1910.1027, Cadmium; 29 C.F.R. § 1910.1200, Hazard communication; 29 C.F.R. § 1910, Subpart I, Personal protective equipment; and 29 C.F.R. § 1910.134, Respiratory protection. Medical surveillance requirements are specified in the OSHA lead, cadmium, and respiratory protection standards cited above.

[11] OSHA makes "willful violations" subject to increased penalties. In the case of worker fatalities, willful violations may result in criminal enforcement. Penalties are not available against federal agencies for willful violations, although OSHA reports willful violations to the head of the offending agency and to the White House.

problems in the recycling factories. We also learned that DOJ did not, and still does not, provide health, safety, and environmental compliance oversight of UNICOR's and the BOP's operations.

11. Availability of Technical Resources

From its inception in 1997, UNICOR's e-waste recycling program lacked adequate technical resources. UNICOR and the BOP often assigned staff who did not have sufficient expertise to carry out duties such as establishing appropriate engineering controls in its e-waste recycling factories, identifying and assigning adequate personal protective equipment, and ensuring the effectiveness of exposure control measures and work practices. We also found instances where BOP safety staff provided advice on recycling issues that was incorrect. UNICOR's reliance on unqualified personnel stemmed in part from the lack of Certified Industrial Hygienists who evaluate workplace conditions that may cause worker illnesses or injuries. During our investigation, BOP and UNICOR only had 1 Certified Industrial Hygienist to service 98 UNICOR factories located at 71 prison locations, which employed approximately 19,000 inmates or 16 percent of the inmate population.[12] According to the OIG technical team, this level of staffing is inadequate given the size and complexity of UNICOR's operations.

12. Procurement of Health and Safety Services

We found that UNICOR's and the BOP's lack of internal technical resources created problems when they retained industrial hygiene consultants to evaluate its e-waste operations. For instance, FOH and NIOSH-HETAB found numerous examples where consultant reports were inaccurate, incomplete, or misleading, which was not recognized by UNICOR or BOP staff. As a result of UNICOR's ineffective consultant vetting or critical analysis of the reports it received, UNICOR frequently did not obtain adequate information to assess and improve worker protection and comply with pertinent health and safety regulations.

13. Sufficiency of BOP and UNICOR Health and Safety Policies

According to FOH, BOP and UNICOR lack cohesive safety policies and procedures for e-waste recycling operations. UNICOR did not implement policies that standardized health and safety practices between its recycling factories, and FOH identified numerous instances where policies were inconsistent or did not accurately reflect current work practices. With respect

[12] Due to the economic downturn and other factors, UNICOR has decreased its inmate employment. As of June 2010, UNICOR employed approximately 17,000 inmates, or 11 percent of the federal inmate population.

to many health and safety issues, rather than implement properly researched policies, UNICOR effectively operated its factories as stand-alone entities and left key safety-related decisions to the individual initiatives of local safety and factory personnel. FOH determined that this approach resulted in inconsistent standards of care and levels of compliance.

14. Assurances Concerning Exports of UNICOR E-Waste

UNICOR staff reported that e-waste was sometimes sold to vendors that exported it to other countries and that staff and inmates at times loaded international shipping containers with e-waste. Prior to approximately mid-2003, UNICOR did not seek any information about the fate of its e-waste and whether it was being unlawfully disposed of abroad or used in ways that created environmental and human health hazards. After mid-2003, UNICOR began to require vendor self-certifications providing assurances that the e-waste was being exported to other countries in compliance with national and international laws.

The current General Manager of the Recycling Business Group told the OIG that he intends to improve due diligence procedures for UNICOR e-waste that is exported.

15. Environmental Compliance

Our investigation determined that oversight of UNICOR's compliance with environmental regulations was inadequate, and that the e-waste recycling program was responsible for generating hazardous wastes that were unlawfully stored or disposed of at multiple BOP institutions. At times, UNICOR failed to fully evaluate environmental permitting requirements before starting new operations, did not properly evaluate hazardous wastes generated by its operations, and did not share information about environmental compliance requirements between recycling factories. For example, UNICOR initiated e-waste recycling operations at FCI Ft. Dix without authorization from the New Jersey Department of Environmental Protection.

16. UNICOR and BOP Staff Misconduct and Performance Failures

As noted above, we concluded that 11 UNICOR and BOP employees committed either misconduct or performance failures in their work related to the e-waste recycling program. The misconduct included endangering staff and inmates, dishonesty, and dereliction of duty. For example, we found that Novicky, the former General Manager of the Recycling Business Group at UNICOR Headquarters, committed numerous acts of misconduct. Other UNICOR and BOP employees also committed misconduct, including disabling a portion of a factory's fire alarm system to prevent alarms that were being caused by excessive dust from glass breaking operations, and disregarding a

Safety Manager's directive to halt work due to safety considerations. We are referring these matters to the BOP for appropriate action.

17. The Safety of Manual Glass Breaking and Disassembly Operations

Assessments performed by FOH and NIOSH-HETAB revealed that UNICOR's past method of manually disassembling computer monitors and breaking CRTs with hammers can be performed safely provided that careful attention is paid to industrial hygiene. Although cadmium and lead-laden dust is released during this type of monitor recycling, proper engineering controls, work practice controls, and personal protective equipment can effectively shield workers from cadmium and lead hazards.

FOH, NIOSH-HETAB, and OSHA determined that current exposures to toxic metals during disassembly activity are negligible, although thorough cleaning is necessary to prevent the build-up of contamination on recycling surfaces.

IV. OIG Recommendations

During our investigation, the agencies that assisted the OIG made more than 150 recommendations in their reports to address deficiencies they identified during their field work at UNICOR's e-waste factories. These reports were provided to the BOP and UNICOR as they were completed. In all, these recommendations addressed 47 issues in 12 general topic areas, including toxic metal contamination, personal protective equipment, medical surveillance, regulatory compliance, oversight, and glass breaking.

In September 2009, the OIG requested that UNICOR and the BOP provide the OIG with an update on their implementation of the recommendations. The BOP and UNICOR provided a written update in January 2010 (see Attachment 1). After reviewing this submission, we concluded that the BOP and UNICOR had made significant progress to implement the technical team's recommendations, but that 16 of the 47 issues required future updates to the OIG. These 16 issues involve matters such as decontaminating prior glass breaking areas, improving record keeping for medical surveillance data, monitoring surface contamination levels, and improving compliance with the OSHA noise standard.

In addition to the recommendations from the technical team, the OIG also developed 12 recommendations that we provide in this report to address the management and structural problems that we identified during our investigation. These recommendations, which are presented in Chapter Six, include strengthening the role of the BOP's Health Service Division in oversight of UNICOR's compliance with health, safety, and environmental regulations,

and ensuring that UNICOR and the BOP hold their supervisors accountable for such compliance. We also recommended that the BOP consider modifying the supervision of its safety staff so that they report directly to qualified senior health and safety managers.

Our recommendations also address other issues involving factory supervision and regulatory compliance. For example, we recommend that UNICOR and the BOP implement procedures that will hold supervisors accountable for compliance with health, safety, and environmental laws and regulations. We also recommend that UNICOR and the BOP ensure that supervisors' performance appraisals account for performance that directly impacts institution health and safety.

We also found serious problems with the effectiveness of inspections and oversight of UNICOR's operations. We recommend that the BOP's Health Services Division adopt a rigorous program of compliance enforcement utilizing inspectors with significant training in industrial hygiene and environmental protection. We further recommend that within 18 months from the date of this report, the Health Services Division, in conjunction with UNICOR and BOP hygienists and regional and local safety staff, complete industrial hygiene inspections for all UNICOR business groups.

We also believe that DOJ should take a role in ensuring that components within the Department, including UNICOR and the BOP, are fulfilling their obligations to comply with health, safety, and environmental regulations. In particular, we believe that DOJ should monitor UNICOR and the BOP's compliance performance and ensure that corrective action is taken in the event that it appears that the non-compliance is not being adequately addressed.

The OIG technical team concluded that UNICOR and the BOP have an insufficient number of industrial hygienists. We recommend that the BOP and UNICOR perform an evaluation to determine how many additional industrial hygienists are needed.

We also believe that UNICOR's compliance performance would benefit from enrollment in one of OSHA's cooperative programs. We recommend that UNICOR assess the feasibility of enrolling its factories in an OSHA cooperative program, and that the UNICOR Board of Directors be briefed on the results of this evaluation.

Other recommendations address the need to improve training, injury prevention, and communications between Safety Managers, and to better ensure that exports of e-waste from UNICOR operations are in compliance with U.S., host-nation, and international laws and do not result in harm to workers or to the environment.

The BOP and DOJ provided responses to our recommendations, which appear in Attachments 4 and 5. Our evaluation of these responses appears in Attachment 6.

V. Conclusion

In conclusion, our investigation identified serious deficiencies with UNICOR's e-waste recycling program, especially prior to 2003. In recent years, UNICOR has made substantial progress to improve the safety of its e-waste operations. However, we believe that the success of these efforts in the future could be hindered by lingering, systemic problems such as the lack of technical resources, inadequate oversight, and a Health Services Division at BOP Headquarters that lacks authority to manage the delivery of quality safety services throughout the BOP and UNICOR. We believe our 12 recommendations can help ensure that BOP and UNICOR conduct its operations, including its e-waste recycling program, in compliance with federal regulations and BOP policies, and with the necessary concern for the health and safety of BOP staff and inmates.

CHAPTER ONE
INTRODUCTION

I. Introduction

Federal Prison Industries (FPI), otherwise known by its trade name "UNICOR," is a government corporation within the Federal Bureau of Prisons (BOP) that sells various consumer products and services, such as office furniture and clothing, and industrial products, such as security fencing and vehicle tags. UNICOR employs staff and inmates at federal prisons throughout the United States to support its operations.

Starting in 1997, UNICOR began to accept computers, monitors, printers, and other types of electronic waste (e-waste) for recycling at federal prisons. UNICOR sold these items to customers, sometimes following refurbishment, or disassembled them and sold the component parts to recyclers for further processing. This disassembly and recycling can release toxic metals that can be harmful to humans and to the environment, including cadmium, lead, mercury, arsenic, and beryllium.

As a result of complaints raised about the e-waste recycling program and at the request of the BOP and the Department of Justice (DOJ), the Office of the Inspector General (OIG) investigated the safety of UNICOR's e-waste recycling operations, as well as allegations of theft, conflict of interest, and environmental crimes that arose during our investigation. Due to the technical nature of the issues involved in this investigation, the OIG sought assistance from four federal agencies with expertise in occupational health, safety, and environmental compliance: the Occupational Safety and Health Administration (OSHA), the Centers for Disease Control and Prevention – National Institute for Occupational Safety and Health (NIOSH), the Federal Occupational Health Service (FOH), and the United States Environmental Protection Agency (EPA). Representatives from these agencies assisted the OIG with field work and analysis of UNICOR's operations. The agencies' representatives included Occupational Physicians, an Occupational Health Nurse, Certified Industrial Hygienists, Environmental Specialists, and Safety Specialists.

The OIG also coordinated with other components within DOJ to complete its investigation, including the Environmental Crimes Section in the Environment and Natural Resources Division; the United States Attorneys' Offices for the Northern District of Florida, the Northern District of Ohio, and the District of New Jersey; and the Federal Bureau of Investigation (FBI), as well as the Internal Revenue Service.

II. Origin of the OIG Investigation

UNICOR's recycling of e-waste resulted in complaints from BOP and UNICOR staff and inmates, including Leroy A. Smith, Jr., a former Safety Manager at the United States Penitentiary (USP) in Atwater, California, that staff and inmates were being exposed to toxic metals from UNICOR's processing of cathode ray tubes (CRT) found in computer monitors and television sets.

In November 2004, the Office of Special Counsel (OSC) referred to the Attorney General for investigation allegations it had received from Smith that UNICOR's e-waste recycling operations resulted in staff and inmate exposures to hazardous materials, including toxic metals such as cadmium, lead, and beryllium.[13] Pursuant to its standard practices, the OSC requested the Attorney General to complete an investigation of the allegations and to report his findings back to the OSC. In January 2005, Attorney General Ashcroft delegated responsibility for the investigation to BOP Director Harley Lappin.

In June 2005, the BOP submitted a report to the OSC that substantiated some of Smith's allegations but concluded that "BOP, [UNICOR] and Safety Staff appeared to have adequately addressed" the safety concerns raised in Smith's disclosure to the OSC. According to the BOP, along with UNICOR it had taken "appropriate steps to ensure factories were operating properly." However, the BOP's report noted that workers at USP Atwater were exposed to cadmium and lead at levels above OSHA regulatory standards, were not properly informed of testing results, and that medical surveillance and biological monitoring were not instituted as required. The report further concluded that if consultations with OSHA and the completion of a risk assessment that had been proposed by Smith had occurred prior to the start of recycling operations, those actions may have prevented the exposures that occurred at USP Atwater. The report also found that it was "reasonable to conclude" that some level of exposures

[13] Pursuant to 5 U.S.C. § 1213, OSC is authorized to receive disclosures of information from federal employees who allege violations of any law, rule, or regulation; gross mismanagement or gross waste of funds; abuse of authority; or a substantial and specific danger to public health or safety. If the head of the OSC (the Special Counsel) determines that there is a "substantial likelihood" that the information discloses a violation, the Special Counsel is required to transmit the information to the appropriate agency head and require the completion of an investigation and submission of a written report to the OSC. The complainant is entitled to review the report and provide comments to the OSC. After completing a review of the report to determine whether its findings "appear reasonable" and contain certain required information, the Special Counsel is required to transmit the report, any comments and recommendations, and any comments from the complainant, to the President and to the congressional committees with jurisdiction over the agency.

occurred at two other BOP institutions, the Federal Correctional Institutions (FCI) in Elkton, Ohio and Texarkana, Texas, where UNICOR processed computer monitors and televisions.

The BOP provided an addendum to its report in August 2005 advising OSC that it had instituted disciplinary action against three BOP employees for failing to take adequate safety precautions and had retained a contractor to perform assessments at UNICOR's recycling factories to ensure that they meet relevant safety and environmental standards.

After reviewing the BOP's report, Smith disputed its findings and provided OSC with documentary evidence to support his claims. Smith asserted to OSC that BOP investigators failed to interview witnesses with relevant information and that "FPI officials knowingly and willfully violated OSHA guidelines" and that BOP's investigation "was not impartial or comprehensive."

In a letter dated April 3, 2006, to the Director of the BOP, OSC stated that it had reviewed the BOP's reports and Smith's comments and had determined that the BOP's findings were "unreasonable" and "inconsistent" with the documentary evidence provided by Smith. In particular, OSC stated that the BOP's reports made little effort to explain why the documentary evidence furnished by Smith was unreliable or how it could be reconciled with the conclusions of the BOP investigation. OSC also asserted that the BOP conducted an investigation at institutions other than USP Atwater that "appears to have been cursory at best," and that offered "strained interpretations of applicable rules and procedures in order to justify past actions . . . ." OSC concluded that UNICOR and BOP managers "recklessly, and in some cases knowingly, exposed inmates and staff to unsafe levels of lead, cadmium, and other hazardous materials over a period of years." OSC also stated that it believed that an independent investigation into UNICOR's e-waste recycling activities was still required.

After receipt of the OSC's letter, the Director of the BOP requested that DOJ seek an OIG investigation into UNICOR's e-waste recycling practices. In April 2006, attorneys for Smith also wrote to the OIG requesting an investigation into Smith's allegations against the BOP and UNICOR.

In May 2006, the OIG opened an investigation into this matter.

III. Methodology of the Investigation

We evaluated e-waste recycling at 10 BOP institutions. During our investigation, UNICOR performed recycling at USP Atwater, FCI Ft. Dix, FCI Elkton, USP Leavenworth, USP Lewisburg, FCI Marianna, FCI Texarkana,

and Federal Correctional Complex (FCC) Tucson.[14] The remaining two institutions (FCI Dublin and FCI La Tuna) stopped recycling before our field work began. UNICOR also suspended its recycling operations at FCI Elkton in 2008 after we found extensive cadmium and lead contamination in recycling areas there.

We conducted more than 200 interviews, including of UNICOR Chief Operating Officers, the BOP Assistant Director for the Health Services Division, BOP National Safety Administrators, UNICOR factory managers and foremen, local Safety Managers, and inmates. We also reviewed more than 10,000 documents, examined numerous BOP and UNICOR e-mail accounts, and performed forensic examinations on hard drives and laptop computers of certain UNICOR personnel.

The OIG also conducted extensive field work at UNICOR's e-waste recycling factories with the assistance of other federal agencies. After opening its investigation, the OIG requested in May 2006 that OSHA, FOH, and NIOSH participate on a team of health and safety professionals led by the OIG (the OIG "technical team") to collect data, analyze health and safety issues concerning UNICOR's recycling operations, and provide recommendations for improvements to those operations. Each agency agreed to assist the OIG with its investigation.

OSHA assessed UNICOR's existing recycling conditions for compliance with OSHA safety and health regulations, and provided guidance on the interpretation of OSHA regulations and enforcement policies. FOH evaluated workplace exposures to toxic metals from the start of UNICOR's e-waste recycling operations in 1997 through 2009 and supplemented OSHA's evaluation of current exposure and safety conditions.[15]

NIOSH provided technical assistance to FOH, such as laboratory services, and peer reviewed all FOH work products. Additionally, NIOSH's Division of Applied Research and Technology (DART) helped assess existing exposures of staff and inmates to toxic metals at UNICOR's recycling factories and evaluated heat stress and noise issues. NIOSH's Division of Surveillance, Hazard Evaluations, and Field Studies examined medical and

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[14] A Federal Correctional Complex includes multiple BOP institutions at one location, such as a high security prison with other lower security institutions.

[15] As used in this report the term "exposure" refers to the airborne concentration of a contaminant (e.g., cadmium or lead) that is measured in the breathing zone of a worker but outside of any respiratory protection devices used. Unless otherwise noted, "exposure" should not be confused with the ingestion, inhalation, absorption, or other bodily uptake of a contaminant. Concentrations reported and discussed in this report are not adjusted based on respirator protection factors.

industrial hygiene issues related to toxic metal exposures, including historical exposures.

FOH and NIOSH-DART made their first site visit to a BOP institution in November 2006. That visit, to FCI Elkton in Ohio, was followed by multiple inspections by FOH, NIOSH, and OSHA to UNICOR's e-waste recycling factories with ongoing operations. The OIG technical team visited six of the institutions at least three times. FCI Elkton received seven visits, the most of all the institutions.

By mid-2007, FOH had received testing results from field work at FCI Elkton, completed at least a preliminary site visit at six other institutions, and obtained the findings from a preliminary medical review. Based on information obtained from its site visits, FOH recommended that the OIG's investigation include a full medical review of the BOP's medical surveillance practices and staff and inmate medical records.

The testing results from FCI Elkton led FOH to issue an interim report to the OIG in November 2007 about exposure conditions at that institution.[16] In its report, FOH stated that significant contamination from cadmium and lead had been found at various recycling locations at FCI Elkton and that personal exposures of workers to those toxic metals likely occurred in the past. FOH recommended that BOP develop a remediation plan to abate the contamination. FOH and NIOSH also noted hazards associated with the cleaning and replacement of local exhaust ventilation filters and cleaning in areas where computer monitor glass breaking activities occurred. The exposures recorded during filter-related operations were so high that they exceeded the protection factor provided by the inmates' respirators that were in use during the maintenance operations. FOH also expressed concerns to the OIG about potential toxic metals exposures at other institutions, including FCI Texarkana.

In light of the preliminary findings from the study of toxic metal exposure conditions in UNICOR's e-waste factories and FOH's conclusions regarding the need for a medical review, the OIG sought NIOSH's assistance in forming a medical team to evaluate whether staff and inmates were at risk of harm from exposures to toxic metals from UNICOR's e-waste recycling operations. NIOSH assigned personnel to this work in December 2007 from its Division of Surveillance, Hazard Evaluations, and Field Studies's Hazard Evaluations and Technical Assistance Branch (HETAB), including an experienced Occupational Physician. Representatives of the NIOSH medical team visited four BOP institutions (FCIs Elkton, Texarkana,

[16] FOH issued another interim report in September 2007 which addressed heat stress conditions at FCI Marianna.

and Marianna, and USP Atwater) which had documented staff and inmate exposures to toxic metals or had significant numbers of health-related complaints from recycling staff.

The OIG also sought assistance from the EPA starting in 2007 after FOH and NIOSH site inspections revealed potential violations of environmental regulations. At the request of the OIG, EPA conducted inspections at FCI Elkton in 2007 and FCI Texarkana in 2008.

The agencies' field work concluded in February 2009 when NIOSH performed its last site visit, which was conducted at FCI Marianna in Marianna, Florida. The OIG also visited FCI Elkton in December 2009 to examine the results of a remediation of UNICOR recycling areas that were previously contaminated with cadmium and lead.

At the conclusion of their site visits to BOP institutions, the federal agencies provided written reports to the OIG about their work. To consolidate this information, the OIG requested that FOH compile and analyze the technical team's findings, as well as information from OIG interviews and documents; address any discrepancies; and provide the OIG with comprehensive health, safety, and environmental reports on conditions from 2003 to present for each of the eight UNICOR e-waste recycling factories that had ongoing operations during the OIG's investigation. These reports were peer reviewed by OSHA and NIOSH, and are found on the OIG's website. See http://www.justice.gov/oig/reports/BOP/index.htm. FOH submitted the last of its eight comprehensive reports to the OIG in May 2010. The OIG promptly shared all such reports it received with the BOP and UNICOR.

In addition, in June 2009 the OIG convened a meeting in Washington, D.C. at which representatives of FOH, NIOSH, OSHA, and the EPA discussed their preliminary conclusions with the BOP and UNICOR. Following the meeting, BOP and UNICOR provided written comments on the agencies' technical reports. After considering UNICOR's comments, FOH made revisions as appropriate to its comprehensive reports.

This report summarizes the findings of the OIG and the technical team. It addresses toxic metal exposure conditions from 2003 through 2009 and, based on assessments performed by FOH and NIOSH-HETAB, presents conclusions regarding historical exposures prior to 2003. In addition to summarizing the technical findings, this report also includes the OIG's examination of allegations of misconduct and performance failures by UNICOR and BOP staff.[17] The report further identifies numerous

[17] Our investigation also resulted in criminal referrals. In July 2010, a former UNICOR Factory Manager, James Bailey, and his cousin, Lee Temples, were indicted for (Cont'd.)

management problems related to UNICOR's and the BOP's handling of health, safety, and environmental protection issues in the e-waste recycling program.

The information presented in this report takes into account UNICOR's comments on the agencies' reports. The OIG provided a draft of this report to the BOP, UNICOR, and DOJ for any comments on the report's factual accuracy.

IV. Organization of this Report

Chapter Two of this report provides background information about UNICOR, UNICOR's e-waste recycling program, and the hazards associated with e-waste. It also describes relevant industrial hygiene and environmental laws, regulations, and policies that apply to UNICOR's e-waste recycling program, and how oversight of UNICOR's operations is provided.

Chapter Three describes the development of UNICOR's e-waste recycling program from its inception as a pilot project in 1996 through 2009. Due to the special hazards associated with processing glass from CRTs, we describe in detail UNICOR's decisions regarding the handling of such glass and the events at USP Atwater that gave rise to Safety Manager Smith's allegations against UNICOR and the BOP. This chapter devotes significant attention to the improvements that UNICOR began to institute starting in 2003 in response to events at USP Atwater and the attention that UNICOR's e-waste recycling practices received in the media.

Chapter Four presents the findings of the OIG's health, safety, and environmental compliance investigation. It describes toxic metal exposure findings that are relevant to all UNICOR e-waste recycling operations, including an assessment of pre-2003 exposure conditions. It also describes

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conflict of interest, wire fraud, money laundering, and conspiracy, among other charges. According to the indictment, Bailey was responsible for eBay sales of surplus computer equipment for UNICOR. While Bailey was with UNICOR, Temples became its sole eBay contractor and was responsible for selling recycled UNICOR computers and equipment from the UNICOR factory in Marianna, Florida. Bailey allegedly held a financial interest in Temples's business, directed the highest quality equipment to Temples, and took steps to eliminate potential competition from other UNICOR contractors. On September 1, 2010, Temples pled guilty to conflict of interest, money laundering, wire fraud, deprivation of honest services, and obstruction of justice charges. On September 30, 2010, Bailey pled guilty to conflict of interest, money laundering, wire fraud, deprivation of honest services, and false statement charges.

NIOSH-HETAB's medical findings; problems with inmate injuries; hazards, such as heat stress; and environmental compliance issues.

Chapter Five evaluates the numerous management deficiencies that the OIG and the technical team found with UNICOR's operations and the BOP's and DOJ's oversight of them. It also discusses the misconduct and performance failures of BOP and UNICOR staff that we identified during our investigation. We found that 11 staff members, including senior leadership of the Recycling Business Group, committed misconduct or performance failures.

Chapter Six presents our conclusions about the role of safety in the development of UNICOR's e-waste recycling program; UNICOR's compliance with applicable health, safety, and environmental laws, regulations, and BOP policies; the ramifications of the toxic metal exposures identified in this report on staff and inmate health; and the lack of adequate oversight of UNICOR's operations. The chapter also includes recommendations designed to address the problems and deficiencies identified during our investigation, and it contains our analysis of UNICOR's efforts to implement the recommendations found in the institution reports from the federal agencies that assisted the OIG.

CHAPTER TWO
BACKGROUND

This chapter describes UNICOR's organization and functions; hazards associated with e-waste; UNICOR's Recycling Business Group and its e-waste operations; oversight of these operations by UNICOR, the BOP, and DOJ; and the health, safety, and environmental regulations and policies that apply to UNICOR's e-waste program.

I. Organization and Functions of UNICOR

UNICOR is a government corporation within the BOP that was created by Congress in 1934 to provide employment and training for federal inmates.[18] UNICOR is a "for profit" corporation and does not use taxpayer funding to pay for its operations. According to the BOP, UNICOR seeks to promote inmate rehabilitation, acquisition of job skills, and financial responsibility, and generally contributes to institution security by reducing inmate idleness.[19] UNICOR operates under the control of a Board of Directors whose members are appointed by the President and individually represent agriculture, industry, labor, retailers and consumers, the Attorney General, and the Secretary of Defense. The Director of the BOP is UNICOR's Chief Executive Officer and a BOP Assistant Director oversees day-to-day activities and functions as Chief Operating Officer. Harley Lappin is the Director of the Bureau of Prisons. Steve Schwalb was UNICOR's Chief Operating Officer from 1993 to 2007, when he was succeeded by Paul Laird who currently serves in that position.[20]

UNICOR has a headquarters located in Washington, D.C., and as of June 2010 had 103 factories located at 73 BOP institutions. UNICOR also has a Product Support Center (PSC) in Englewood, Colorado that performs product development and evaluation services, and a customer service center in Lexington, Kentucky.

In fiscal year 2009, UNICOR operated seven business groups: Clothing and Textiles, Electronics, Fleet Management and Vehicular

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[18] A detailed history of UNICOR is found in *Factories with Fences: The History of Federal Prison Industries*, printed by Federal Prison Industries, Inc. (1996) and available at: http://www.unicor.gov/information/publications/showpub.cfm?pubid=57.

[19] Id. at 10-11.

[20] Except for senior UNICOR and BOP executives and Safety Manager Smith, the names used in this report are pseudonyms. We have provided their real names to UNICOR and DOJ.

Components, Industrial Products, Office Furniture, Recycling, and Services. It employed approximately 19,000 inmates and generated total revenues of roughly $1 billion.

Federal inmates are not required by the BOP to work for UNICOR. As of September 30, 2009, 16 percent of work-eligible federal inmates were employed by UNICOR. Due to higher inmate wages in comparison to those offered by the BOP for regular BOP jobs, UNICOR typically has wait lists of inmates for each available position.

According to UNICOR's 2008 Annual Report, UNICOR "supports a commitment to sound environmental leadership" and the safety of its workers. The Report states that UNICOR "strives to become a 'green enterprise' – minimizing negative environmental impact, complying with all applicable regulations concerning safety and health conditions for both inmates and staff, and reducing landfill and hazardous waste generation."

II. E-Waste

Each year millions of used electronic items in the United States become obsolete. The EPA recently estimated that more than 200 million computer products, 140 million cell phones, and nearly 27 million televisions are taken out of service annually in the United States.[21] Of these totals, less than 20 percent were recycled. In 2007, the EPA estimated that more than 2.5 million tons of consumer electronics were discarded in the United States and were placed in municipal waste streams, of which more than half ended up in landfills.[22] The EPA also has found that approximately 70 percent of the toxic metals, such as lead, in municipal solid waste landfills came from discarded electronic items.[23] Some states have banned certain electronics from their landfills, including CRTs.

Chemicals contained in e-waste can be harmful to humans and to the environment. Different toxic materials are associated with the various individual components found in electronic equipment. A personal computer, for example, is composed of plastic casing, circuit boards, a central processing unit (CPU), a monitor, and a keyboard, among other

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[21] U.S. Environmental Protection Agency, *Electronic Waste Management in the United States, Approach 1*, EPA-530-R-08-009 (July 2008).

[22] U.S. Environmental Protection Agency Office of Solid Waste, *Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2006*, EPA-530-F-07-030 (November 2007), 5306.

[23] U.S. Environmental Protection Agency Office of Inspector General, *Multiple Actions Taken to Address Electronic Waste, But EPA Needs to Provide Clear National Direction*, Report No. 2004-P-00028 (September 2004).

components. Various peripheral devices also can be added, including printers and external hard drives. As indicated in the table below, several toxic metals are present in the components used to manufacture this equipment.

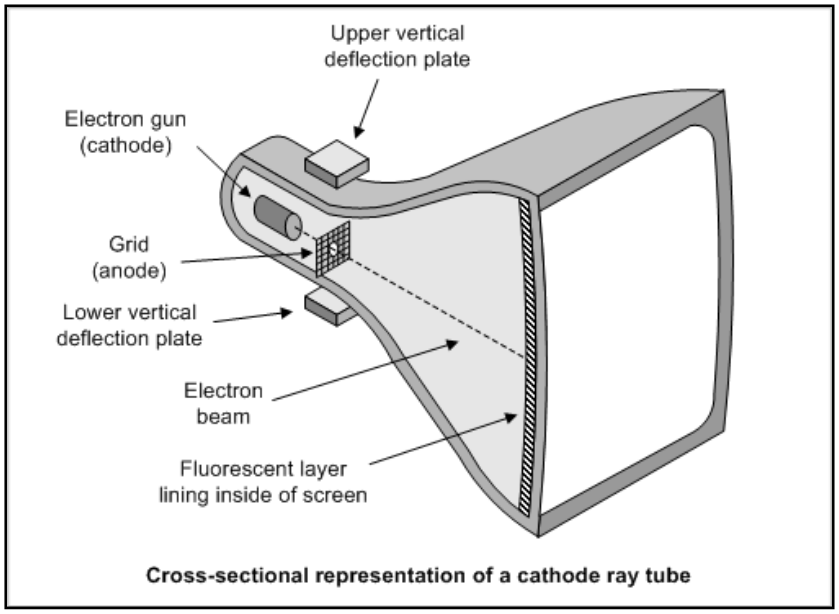
TABLE 2.1
Toxic Metals in Computer Components

Computer Component	Toxic Metals
Disk Drives	Nickel, Cobalt
CRT Glass	Lead, Barium and Cadmium Coatings, Vanadium, Yttrium
Circuit Boards	Lead, Mercury, Beryllium, Cadmium
Semiconductors	Gallium, Cadmium
Steel Housing	Nickel, Chromium
Connectors	Beryllium
Ni-Cad Batteries	Nickel, Cadmium
Wiring	Copper
Switches	Mercury
Plastic	Brominated Flame Retardants

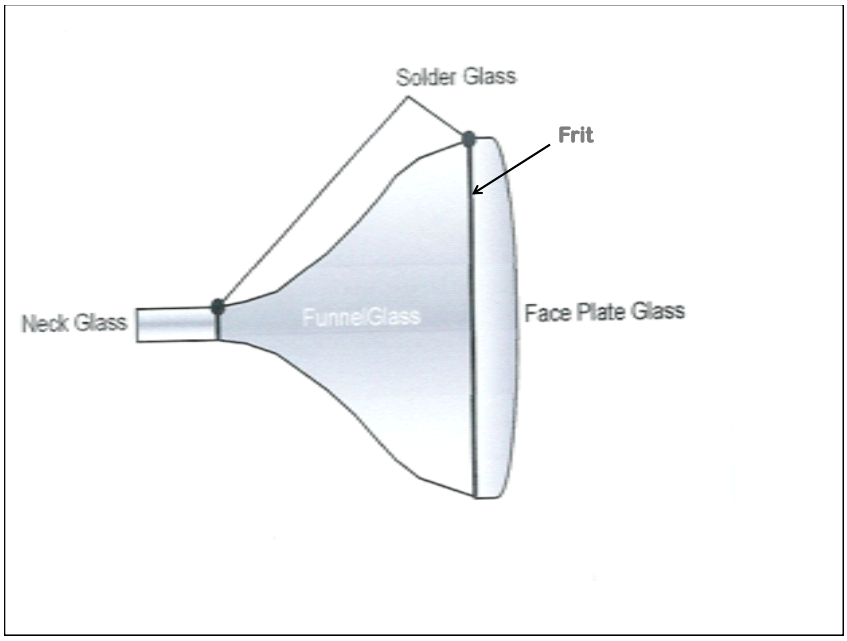
CRTs present special health and environmental problems. Televisions, computer monitors, and other electronic devices contain CRTs, which typically have between two to five pounds of lead. Florida, for example, has estimated that more than 40 percent of the lead in its municipal solid waste stream comes from CRTs in computer monitors and televisions.

An illustration of a CRT, which includes the front “panel glass” or faceplate, funnel glass, a frit that is made of glass solder that joins the panel and funnel glass, and an electron gun, appears below.

DIAGRAM 2.1
Cathode Ray Tube Components



Cross-sectional representation of a cathode ray tube



Source: Maxfield, Clive and Brown, Alvin, "DIY Calculator: The origin of the Computer Console/ Display/Screen/Monitor," http://www.diycalculator.com/sp-console.shtml (accessed July 30, 2008); and ICER, *New Approach to Cathode Ray Tube (CRT) Recycling*, Report prepared for DTI, GW-12.10-130 (2003).

Approximately 75 percent of the frit, 25 percent of the funnel glass, and 3 percent of the panel glass in a CRT is made up of lead. In addition, coatings typically are applied to the panel glass, which can include cadmium, especially in older CRTs.

Cadmium and lead are both toxic to humans. According to the Centers for Disease Control and Prevention, lead can affect nearly every system in the body. Exposure to lead may result in damage to the kidneys, anemia, high blood pressure, and infertility. Studies have also shown impacts on renal function and cognition at low levels of concentration in the blood. Symptoms of chronic lead poisoning include headache, joint and muscle aches, weakness, fatigue, irritability, and depression. Long-term exposure effects of cadmium may include loss of the sense of smell, ulceration of the nose, emphysema, kidney damage, and an increased risk of cancer of the lung, and possibly of the prostate.

III. Overview of UNICOR's E-Waste Recycling Program

A. The Recycling Business Group

UNICOR's Recycling Business Group, formerly known as the Recycling Electronics Products and Services Group, is one of seven business groups within UNICOR. Although UNICOR started e-waste recycling in 1997, it did not establish a separate business group for its recycling operations until September 2000. According to the Recycling Business Group's first strategic plan, the mission of the group is: "to employ as many inmates as practicable in recycling activities, while being cognizant of community and environmental concerns related to such activities." According to the strategic plan, UNICOR sought to become "the premier electronics recycler in the United States," and to "meet the letter and spirit of all federal, state, and local environmental laws and regulations . . . ."

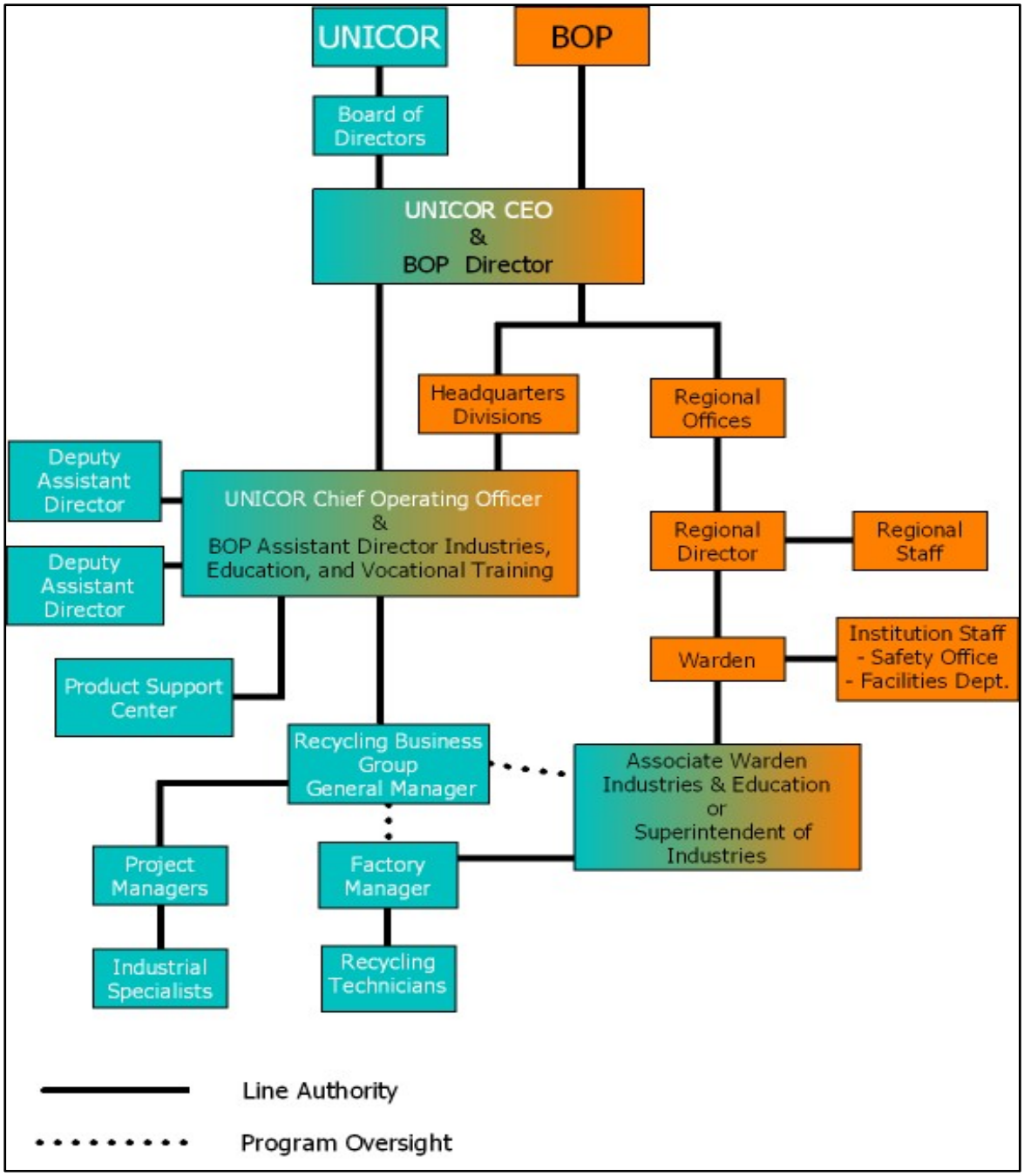
Prior to the establishment of a separate business group for recycling in 2000, a UNICOR Program Manager, Pauline Quinn, administered the e-waste program from UNICOR Headquarters. In 2000, Lawrence Novicky assumed Quinn's duties and later became the first General Manager of the Recycling Business Group, a position Novicky held until 2009. Novicky previously held several different positions with UNICOR, which he joined in 1983. Novicky was succeeded by Robert Tonetti, a longtime EPA scientist with extensive knowledge of e-waste recycling practices. In later years, UNICOR added additional Program Managers and support personnel to its Headquarters office.

Within BOP institutions, UNICOR typically has a Superintendent of Industries or Associate Warden and a Factory Manager or Production

Controller to oversee recycling operations. They are assisted by Recycling Technicians who oversee the work of inmates. UNICOR also has assigned a limited number of Industrial Specialists to its e-waste factories who provide assistance and guidance on marketing and production issues.

The following chart shows the organization of UNICOR and the BOP with reference to the Recycling Business Group.

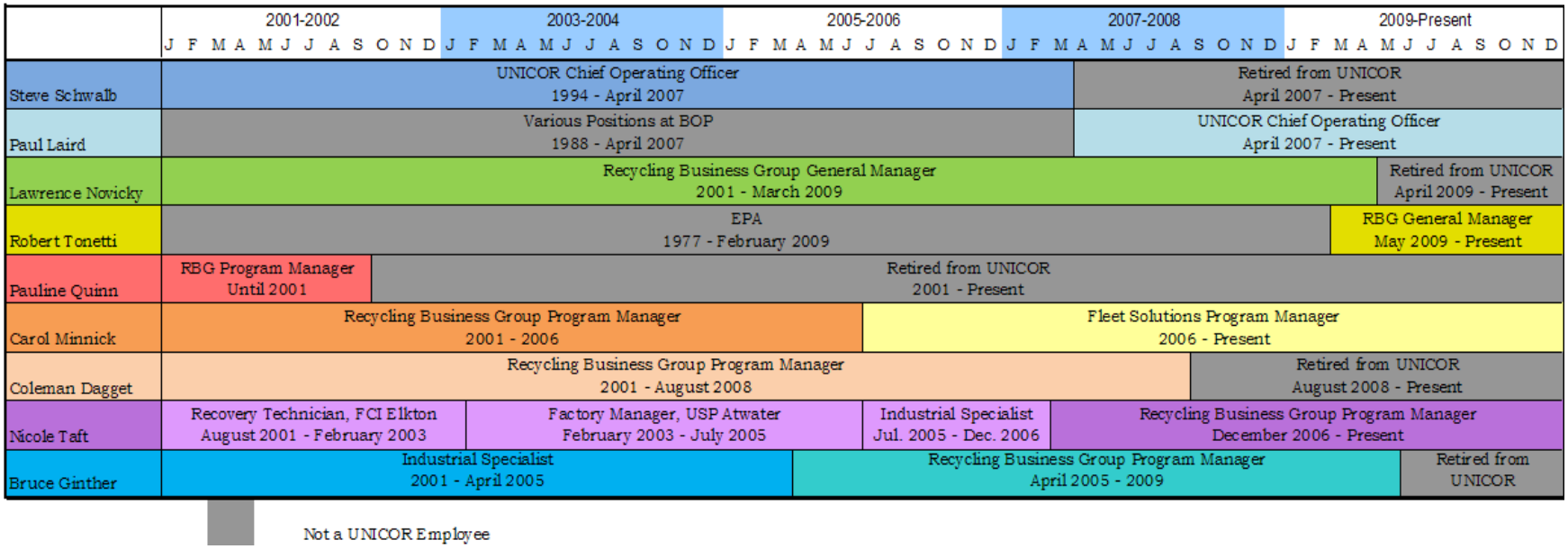
CHART 2.1



A chart of key UNICOR and Recycling Business Group managers, and their dates of service, appears below:

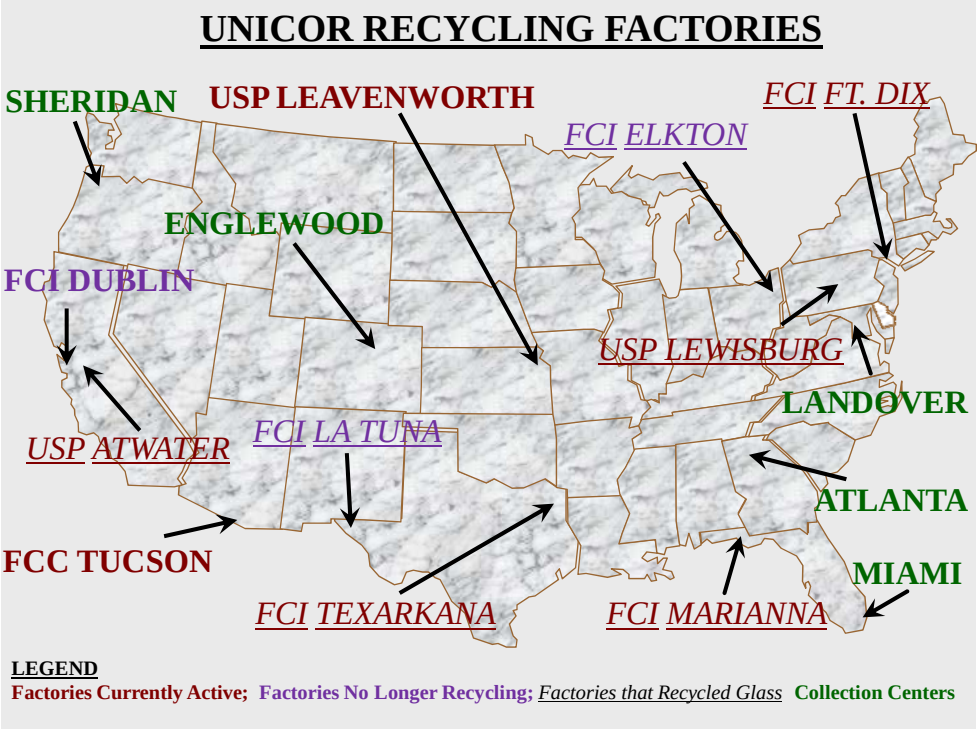
CHART 2.2

UNICOR MANAGERS



Between 1997 and 2009, UNICOR operated e-waste recycling factories at ten BOP institutions, of which seven performed computer monitor disassembly and glass breaking. UNICOR presently has seven recycling factories as well as collection centers in five locations. A map showing the location of UNICOR's e-waste operations appears below:

DIAGRAM 2.2
Locations of UNICOR E-Waste Factories and Collection Centers



The number of inmates employed at UNICOR's e-waste factories has fluctuated from less than 100 inmates prior to 2000, to over 1,000 inmates in 2006. UNICOR's largest e-waste factories were located at FCIs Elkton and Marianna, and USP Atwater. In some years, UNICOR processed more than 40 million pounds of e-waste. The charts below identify inmate employment and the volume of materials received by the Recycling Business Group.

CHART 2.3

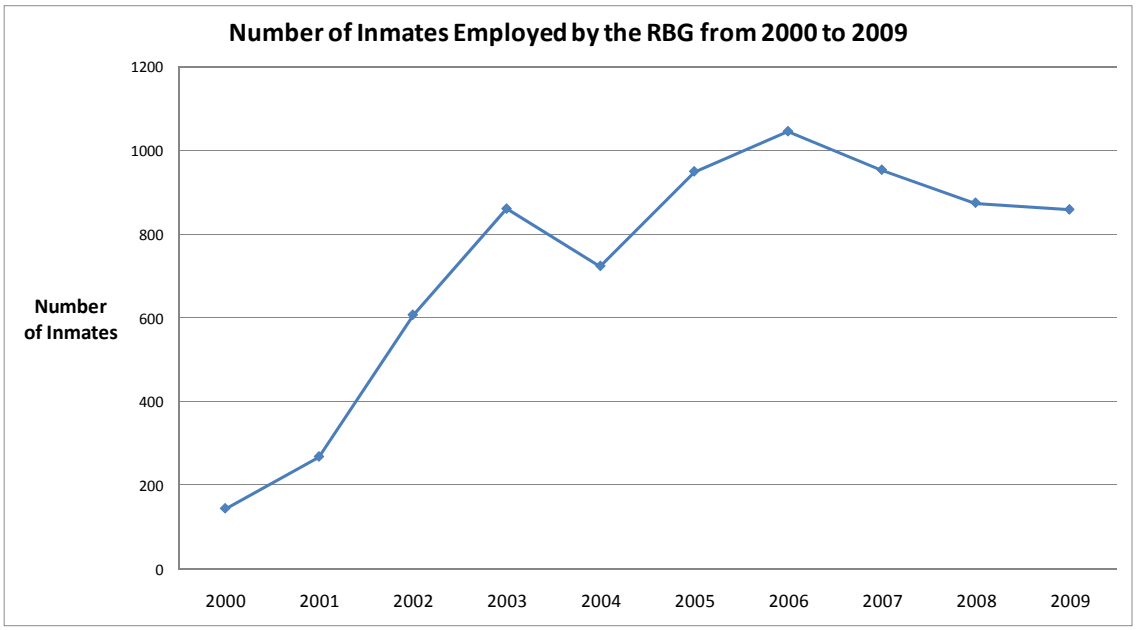
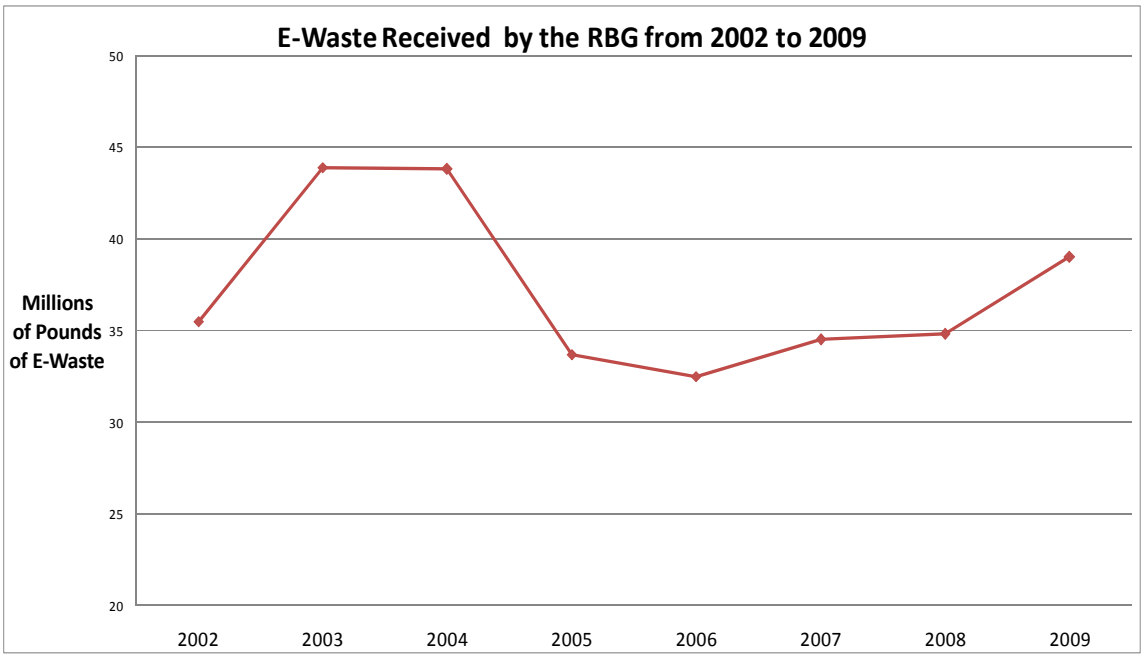


CHART 2.4



Revenues for the Recycling Business Group declined in 2009, due in large part to falling commodity prices for metals such as copper. As a result, UNICOR has suspended e-waste operations at one of its factories and reduced inmate employment. As of June 2010, nearly 1,000 inmates were employed in UNICOR e-waste factories.

B. UNICOR's E-Waste Recycling Operations

UNICOR's e-waste recycling operations typically involved four work procedures: receiving and sorting, disassembly, glass breaking operations, and packaging and shipping. UNICOR also performs cleaning and maintenance in support of these processes. UNICOR suspended glass breaking operations at all factories in May 2009 after the Recycling Business Group determined that these operations were not economical.

The recycling work often occurs in different buildings within the same UNICOR factory location, and the physical layout of these areas varies by institution. Most UNICOR e-waste factories consist of two facilities – a warehouse located outside the perimeter fence of the main prison compound where e-waste is received and sorted by inmates, and a recycling facility inside the main prison where the majority of recycling operations, such as disassembly, are performed. Limited disassembly work sometimes is done in UNICOR warehouses. Other factories consist of a single building located at a prison camp that houses a loading dock, warehouse, and recycling sections. Certain activities, such as compacting plastic and other materials also are conducted outdoors at some factories.

Below we describe common characteristics in UNICOR's e-waste work procedures. We present this information as "typical" of UNICOR work processes, although we identified many significant health and safety differences between factories and often found that many functions, such as design of glass booths and selection of personal protective equipment, were not standardized. We also describe common physical features in UNICOR's factories that affected worker health and safety, such as ventilation systems.

1. Receiving and Sorting

UNICOR obtains e-waste for recycling from various suppliers, including federal agencies, local governments and schools, community collection drives, and private industry. One of UNICOR's largest suppliers of e-waste has been the U.S. Department of Defense (DOD), working through its agency that handles excess DOD property – the Defense Reutilization and Marketing Service (DRMS).

UNICOR received e-waste at its recycling factories at warehouses or factory loading docks where it was sorted by inmates and inspected for contraband.[24] Monitors and other items that contain CRTs, such as televisions, were separated, along with computer central processing units,

[24] UNICOR also operates five recycling centers where e-waste is collected for shipment to UNICOR recycling factories.

servers, and similar devices. At some warehouse locations, electronic memory devices such as hard drives were removed and demagnetized or shredded. Inmates also segregated printers, copy machines, and any device that could potentially contain toner or ink, which were removed before sending the equipment for disassembly. Some items were also refurbished and prepared for resale.

In the past, monitors were sent to UNICOR glass processing areas for disassembly and breakage of the CRT. As noted above, UNICOR halted its glass breaking operations in May 2009. Currently, inmates disassemble the monitors by removing the plastic casing and loading the bare CRTs on pallets for shipment to one of two firms that have contracts with UNICOR to take the tubes.

Due to the large volumes of e-waste that UNICOR's factories often received, it was frequently necessary to store the e-waste at warehouses, loading docks, or inside tractor trailers until space was available within the disassembly facilities. A photograph of a UNICOR e-waste warehouse appears below:

PHOTOGRAPH 2.1
E-Waste Warehouse, FCI Elkton, 2007

2. Disassembly

In the disassembly process, inmates removed external cabinets, usually plastic or metal, from all devices and segregated the materials by type. Inmates conducted these activities using hand, electric, and pneumatic tools, and placed the various parts and materials into collection bins. Work tasks included removing screws and other fasteners from cabinets, unplugging and clipping electrical cables, removing circuit boards, and using other methods to break the equipment into its component parts. Valuable items such as copper wiring and aluminum framing were sorted into separate containers, as were circuit boards or chips that possibly contained precious metals such as gold or silver. With some exceptions, each of the inmate workers in the factory performed all tasks associated with the disassembly of a piece of equipment. UNICOR sold essentially all components for some type of additional recycling.

A photograph of a UNICOR disassembly area appears below:

PHOTOGRAPH 2.2
E-Waste Disassembly Area, FCC Tucson, 2007

UNICOR's ventilation systems for disassembly areas varied by type and quality. Factory ventilation was a factor that affected the airborne suspension and distribution of cadmium and lead bearing dust, as well as other potential hazards such as heat stress. Depending on the factory, ventilation consisted of general forced air ventilation provided by heating, ventilating, and air

conditioning (HVAC) systems; swamp coolers; passive ventilation from windows, doors, and bay doors; and use of various types of fans, especially in non-air conditioned areas. In recent years, UNICOR upgraded its ventilation systems by installing HVAC systems in several, but not all, factories.

3. Glass Breaking Operations

UNICOR's glass breaking operations involved inmates manually breaking CRT glass into smaller pieces using hammers. At one institution inmates broke the CRTs for a brief period by smashing them on hard objects, such as the bottoms of storage containers.

UNICOR started glass breaking at various factories between 1998 and 2005 but discontinued these operations in May 2009 for economic reasons. Our investigation determined that substantial amounts of cadmium and lead containing dusts were generated from this work. A photograph of a dust plume resulting from an inmate striking a CRT appears below:

PHOTOGRAPH 2.3
Dust from Striking a Computer Monitor, UNICOR E-Waste Recycling Factory

Prior to approximately June 2003, UNICOR conducted glass breaking in various areas, including warehouses, loading docks, factories, and a barn. During this period, UNICOR used few and ineffective measures to control exposures to toxic metals. UNICOR generally did not use containment systems or high-efficiency exhaust ventilation systems (an engineering control to capture metal-containing dust emissions), or it used makeshift systems that were poorly designed and constructed.

After approximately June 2003, and during the OIG investigation, UNICOR's glass breaking operations were conducted only in glass breaking

booths (enclosed areas or small rooms) that isolated the glass breaking operation from other factory activities. UNICOR equipped these containment systems with local exhaust ventilation that served to draw metal dust emissions away from the breathing zone of workers and into filtration systems that removed the dust from the air.

However, UNICOR's glass breaking booths varied in design by factory. By 2005, a typical glass breaking booth was approximately 200 to 250 square feet in size with some combination of solid walls and walls constructed of plastic sheeting. One wall, or part of a wall, was generally constructed of plastic strip curtains to allow movement of personnel and material into and out of the booth. The exhaust ventilation system drew air away from the glass breaking work station and through a high-efficiency filtration system that removed cadmium and lead bearing particulates. At most factories, the exhausted air was then recirculated back to the glass breaking booth after high-efficiency filtration. However, this recirculation process was not recommended by FOH or NIOSH-DART because it did not achieve a "negative pressure" condition relative to the general factory area housing the booth. Negative pressure prevents cadmium and lead emissions in the booth from migrating outside the booth.

A photograph of a UNICOR glass booth appears below:

PHOTOGRAPH 2.4
Glass Breaking Booth, USP Lewisburg, 2008

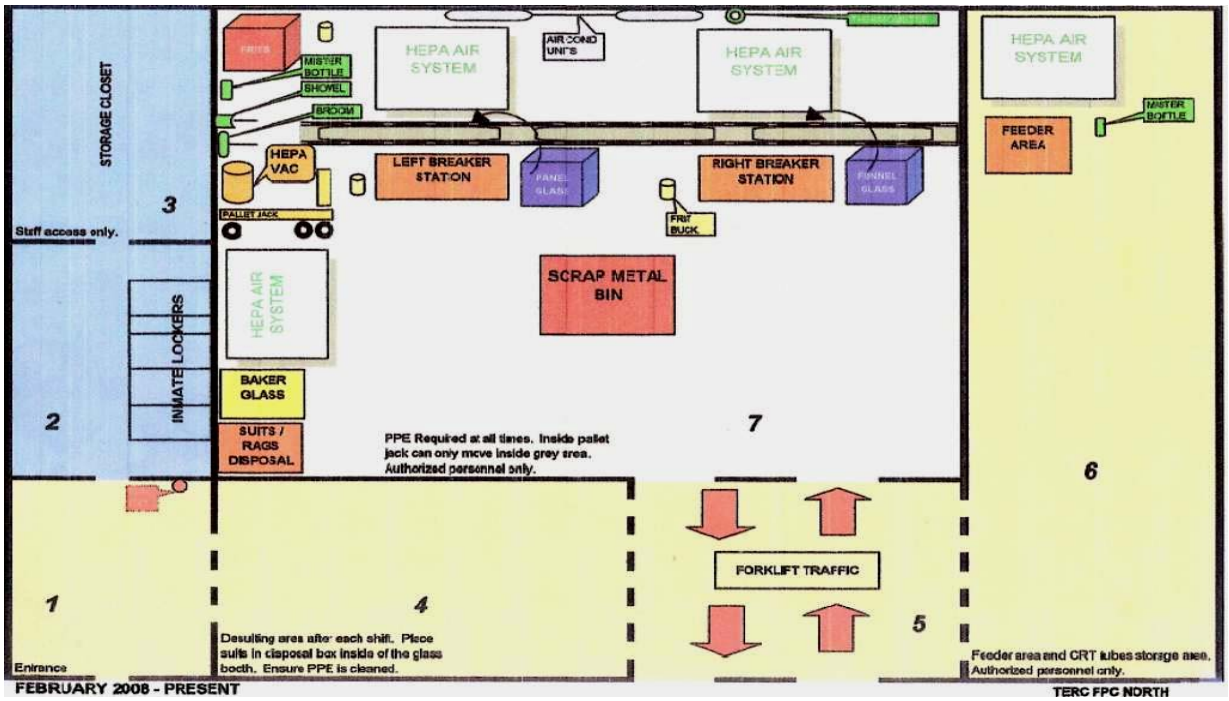
Individual factories applied many variations to the configuration described above, including the type and quality of the high-efficiency exhaust ventilation system and the configuration of the glass breaking booth.

UNICOR's transition areas between its glass breaking booths and disassembly areas varied widely.[25] For example, the glass breaking booth at FCI Marianna did not have any type of transition or decontamination area. Inmates stored respirators and "clean" protective clothing in lockers adjacent to the glass breaking area, which exposed the clean protective clothing to contamination. Conversely in recent years, FCI Texarkana had a 7-zone glass breaking area that included a decontamination area and separate clean locker and storage areas. The differences in approach between these factories resulted from local factory initiatives. UNICOR did not design and implement an acceptable and uniform approach for its factories' glass breaking booths and transition areas.

A diagram of FCI Texarkana's glass breaking area appears below:

[25] In general, the transition area between a hazardous materials work area and a standard occupied work area normally involves a 3-stage design that allows for workers to put on and remove protective clothing in separate areas and to decontaminate protective and other equipment within a contained space to prevent carry out of contamination. This type of design also provides for appropriate separation and storage of contaminated materials and clean materials, such as clothing and personal protective equipment, to prevent cross-contamination. UNICOR did not use a consistent transition and decontamination configuration in its glass breaking areas.

DIAGRAM 2.3
Glass Breaking Booth Diagram, FCI Texarkana, 2008



UNICOR's work process for breaking glass involved glass breakers working inside the containment area that were supported by glass feeders generally working outside the booth. Inmate feeders (usually two) placed large cardboard boxes containing CRTs in the area adjacent to the booth. Periodically, they moved the boxes or individual CRTs through a strip curtain wall or opening into the area where the breaking operation occurred. At some factories, feeders placed the CRTs on manual roller-type conveyors to move them toward the glass breakers. Feeders also removed gaylord, or pallet-sized, boxes of broken glass from the booth. At some factories, inmates used forklifts or other devices to remove boxes of broken glass. This movement of equipment into and out of the booth area resulted in some dispersion of contaminants.

A photograph of an inmate feeding CRTs to a glass breaker inside a glass booth appears below:

PHOTOGRAPH 2.5
Inmate Feeding CRTs to Inmate Glass Breaker Inside a Glass Breaking Booth, FCI Texarkana, 2008

When prepared to break glass, inmate glass breakers (usually two) entered the change area adjacent to or associated with the booth, where they put on protective equipment and then entered the glass breaking work area. Glass breakers stood at each end of a rectangular grated work surface. Exhaust hoods were located behind the breakers' work stations and drew air away from the workers. A plastic strip curtain partially separated the workers from the CRT. Feeders placed or rolled the CRTs onto the grate, and the glass breakers reached through the strip curtain and used a hammer to manually shatter the CRT glass. One inmate broke funnel glass at one end of the grated work station, and the other inmate broke panel glass at the other end. The broken glass fell into gaylord boxes positioned below the grate.

When the inmates finished breaking glass, they moved through any transition areas to decontaminate their protective equipment and clothing, remove their protective clothing, store respirators, and put on any regular work clothing before returning to the general factory area. Staff members entered the room only when there was no glass breaking underway to put away tools and search the area for contraband. Otherwise staff observed the inmates in the glass breaking booth through a window or plastic curtains.

4. Packaging and Shipping

Following completion of disassembly activities, inmates placed recyclables such as glass, plastics, and metals in containers and prepared them for shipping. To facilitate packaging, inmates often compacted plastic and metal materials using hydraulic baling equipment.

UNICOR sells its e-waste, including items that have been refurbished, to wholesale or retail vendors. In addition, UNICOR has marketing agreements with persons who sell UNICOR's e-waste on the Internet. Materials from recycling, such as plastic, aluminum, and copper, are sold to brokers of those materials. UNICOR currently delivers all CRTs to one of two private companies for recycling or shipment to others recyclers.

According to the current General Manager of the Recycling Business Group, as with most e-waste, the majority of electronic material that is handled by the Recycling Business Group eventually reaches international markets.[26] UNICOR staff reported to the OIG that international shipping containers at times were loaded with e-waste at UNICOR's recycling factories.

IV. Oversight of UNICOR's Health, Safety, and Environmental Practices

The BOP's national Program Statement on "Occupational Health and Environmental Safety" (Program Statement 1600.08, revised as 1600.09)("National Safety Policy"), assigns responsibilities to institution Chief Executive Officers, supervisors, and employees to ensure compliance with applicable health, safety, and environmental requirements in BOP facilities. To assist BOP and UNICOR staff with these duties, BOP health and safety personnel at BOP Headquarters, regional offices, and correctional institutions provide technical guidance and training. Routine compliance oversight generally is limited to inspections performed by institution safety staff.

In the following sections, we describe the duties and reporting hierarchy for those employees and groups who assist in evaluating UNICOR's regulatory compliance performance. The first section describes the duties of the BOP officials who work at BOP Headquarters in Washington, D.C. and at its six regional offices around the country. The second section describes the duties of

[26] Due to the toxicity of the various metals that are found in e-waste, concerns also have been raised about U.S. exports of e-waste to lesser developed countries. According to the United Nations Environment Programme, e-waste is projected to reach nearly 50 million tons annually and represents the world's fastest growing waste stream, which developing countries are ill-prepared to address. Open burning of e-waste, "backyard recycling," and disposal to surface waters are commonplace in many African and Asian countries.

a much larger group of officials who work inside the individual prisons, including UNICOR's sole Certified Industrial Hygienist. The third section addresses the inspection activity of regulatory agencies as well as organizations with contracts with UNICOR that call for onsite evaluation of UNICOR's recycling operations.

A. BOP Headquarters and Regional Office Oversight Duties

Occupational safety and health-related programs within the BOP are overseen at the national level by the BOP's Health Services Division, which is led by a BOP Assistant Director. The Health Services Division organizes the delivery of medical, dental, and mental health services to BOP inmates, and it coordinates the BOP's national safety program, primarily through the development and interpretation of national safety policies. The Health Services Division Assistant Director supervises a National Safety Administrator, who establishes and updates BOP policies related to occupational safety, fire protection, and environmental regulations, and provides technical advice to BOP Safety Managers when issues cannot be resolved at the institution or regional levels.

According to the BOP's current National Safety Administrator, his office has no supervisory or compliance oversight authority over the BOP's prisons or UNICOR factories. For example, the national safety staff does not typically perform inspections to determine compliance with occupational safety and health regulations, and does not otherwise regularly monitor institution compliance performance.

The Health Services Division also plays a significant role in setting the BOP's environmental policies and is coordinating efforts throughout the BOP to implement environmental management procedures such as an Environmental Management System (EMS) that federal agencies are required to establish.[27] The Health Services Division is auditing institutions' development of EMSs, and is attempting to recruit environmental specialists to assist with this work. It also participates in a "Central Office Environmental Task Force," which includes representatives from several BOP offices as well as UNICOR. The Task Force reviews environmental requirements, discusses environmental best management practices, and advises the Health Services Division Assistant Director on compliance and other issues.

[27] Executive Orders 13148 and 13423 require federal agencies to establish environmental management systems that create measurable environmental goals. Executive Order 13423 requires that agency EMSs reflect the "elements and framework" found in the International Organization for Standardization Environmental Management System standard, ISO 14001:2004. That standard creates a "Plan, Do, Check, Act" management system model.

In addition to its Headquarters safety personnel, the BOP has six Regional Safety Administrators, each of whom reports to a BOP Regional Director. Safety Administrators collect and evaluate information from institution safety staff and provide technical assistance to institutions when requested. Like the National Safety Administrator, Regional Safety Administrators do not perform routine compliance inspections, although they may assist institutions to prepare for audits, such as by the BOP's Program Review Division. According to the current National Safety Administrator, regional safety staff function as "subject matter experts" and visit institutions at their request or when authorized by the Regional Administrator.

The BOP Program Review Division is responsible for periodically auditing BOP programs. Program Review Division inspections typically are performed every two to three years. We determined, however, that the guidelines that the Program Review Division uses for its inspections do not address health, safety, and environmental compliance issues in UNICOR operations. Although the Program Review Division has inspection guidelines for UNICOR, they primarily address inventory and accounting issues. Moreover, the Program Review Division's safety guidelines do not require inspectors to evaluate UNICOR operations, though they may opt to do so. UNICOR safety inspections are not mandatory under the Program Review Division's current inspection protocols, according to the Program Review Division's Assistant Director.

B. Institution Oversight Duties

According to the BOP's National Safety Policy, each BOP institution's Chief Executive Officer – usually a Warden – is ultimately responsible for ensuring the institution's compliance with applicable health, safety, and environmental requirements. This includes any UNICOR operations. Each facility has a Safety Manager who is responsible for advising the Warden about safety matters, including occupational safety and environmental compliance issues. At some larger prisons, Safety Managers have one or more staff members to help them with their duties, which include performing monthly inspections, responding to inquiries from BOP and UNICOR staff, and providing training. Safety Managers typically report to an Associate Warden.

Safety inspection results typically are memorialized in a memorandum to institution managers, including the Warden, with repeat violations highlighted. These results also may be addressed at meetings of institution "safety committees," which include various managers and union representatives who meet at specified intervals to review issues as diverse as pest control and accidents.

The qualifications of BOP safety staff vary. All have completed at least some specialized training on occupational safety and health issues, including a "basic training" curriculum followed by a series of courses on assorted topics.

In addition, some Safety Managers have college degrees in industrial hygiene-related fields.

UNICOR managers who supervise inmates, such as Factory Managers, are responsible under BOP policies and OSHA regulations for ensuring that the inmates use safe work methods, receive warnings about any hazardous materials that they work with, and wear appropriate personal protective equipment. Institution safety staff are responsible for providing guidance and training on these issues, and for inspecting UNICOR operations to ensure compliance with regulatory and policy requirements.

In addition to their routine supervisory powers, BOP safety staff members are authorized under the National Safety Policy to stop any work that poses an "imminent danger" to workers, which is defined as a danger that could "reasonably and immediately be expected to cause death or serious physical harm." Program Statement 1600.09, Chapter 1, Section C. If safety staff members stop work for that reason, it can be restarted only after the Safety Manager's re-inspection and written approval.

The National Safety Administrator told us there are no written policies or procedures that require UNICOR or BOP managers to disseminate safety information – either good or bad – found at one institution to another institution. Similarly, he said there is no national collection of injury or industrial hygiene data that would permit safety staff to identify trends across institutions.

In 2007, UNICOR hired a Certified Industrial Hygienist to help improve the compliance performance and safety of its factories.[28] During the OIG's investigation, he was the only hygienist within UNICOR and the BOP, though UNICOR currently is attempting to recruit another hygienist. As with the BOP Headquarters and regional safety staff, UNICOR's hygienist functions as a technical consultant who responds to questions from UNICOR factories and assists with inspections when requested.

C. External Audits and Inspections

Inspections by regulatory agencies at UNICOR's e-waste operations have been infrequent. Although both OSHA and the EPA have the authority to inspect BOP institutions, OSHA did not conduct on-site inspections at UNICOR e-waste operations until 2004 and the EPA did not conduct any inspections until 2007. At two e-waste factories – FCIs Texarkana and Marianna – we

[28] Certified Industrial Hygienists are scientists who evaluate workplace conditions that may cause worker illnesses or injuries. They use environmental monitoring and analytical methods to detect worker exposures to occupational hazards, and employ engineering controls, work practice controls, and other methods to limit potential health hazards.

found that no regulatory agencies had ever performed a compliance inspection prior to the initiation of our investigation. By contrast, UNICOR's e-waste operations at FCI Ft. Dix were subject to regular inspections by the New Jersey Department of Environmental Protection (NJDEP) once regulators there became aware of UNICOR's recycling activities.

Accrediting agencies also inspect BOP facilities. The American Correctional Association evaluates each federal prison approximately every three years, including for compliance with health and safety standards, among other things. The Joint Commission, formerly known as the Joint Commission on the Accreditation of Health Organizations, also inspects BOP health care facilities, including the delivery of various services such as mental health treatment and chronic disease management.

In addition, UNICOR's contracts with some of its e-waste suppliers, such as the Defense Reutilization and Marketing Service, authorized inspections of e-waste factories.

V. Health, Safety, and Environmental Requirements

Numerous health, safety, and environmental laws and policies apply to UNICOR's e-waste operations. Below we describe various OSHA regulations, environmental regulations, and BOP policies. We also describe requirements of the National Fire Alarm Code.

A. OSHA Health and Safety Regulations

We identified six general categories of OSHA health and safety regulations that are relevant to our investigation: hazard communication, personal protective equipment and respiratory protection, abatement of unsafe or unhealthful working conditions in federal agencies, cadmium and lead standards, noise, and "general duty" requirements. We also discuss OSHA guidance regarding the identification of "willful violations," and the status of inmates as "employees" under OSHA's regulations.

1. Hazard Communication

OSHA's hazard communication regulations require employers to notify their employees of hazardous chemicals in their work areas, which is accomplished in part through labeling, the provision of material safety data sheets, and employee information and training. 29 C.F.R. § 1910.1200(h)(2)(ii). The timing of the notification is important. OSHA requires employers to provide their employees with "effective information and training on hazardous chemicals in their work area at the time of their initial assignment, and whenever a new physical or health hazard the employees have not previously

been trained about is introduced into their work area." 29 C.F.R. § 1910.1200(h)(1).

2. Personal Protective Equipment and Respiratory Protection

In addition to warning employees about chemical hazards, employers must furnish necessary personal protective equipment (PPE) to them, including respirators. To determine the PPE that is required, the employer must "assess the workplace to determine if hazards are present, or are likely to be present, which necessitate the use of [PPE]." 29 C.F.R. § 1910.132(d)(1). The employer is also required to verify that a hazard assessment has been performed and to execute a written certification that identifies the workplace evaluated. Id. at (d)(2). If hazards are identified or likely to be present, the employer then must select the PPE that will protect employees from the hazards, communicate the selection decisions to each affected employee, and ensure that the employees use the PPE. Id. at (d)(1).

Employers must follow a similar process with respect to respiratory protection. Under OSHA's respiratory protection standard, the employer must evaluate respiratory hazards in the workplace and select and provide an appropriate respirator for the hazards that are identified. 29 C.F.R. § 1910.134 (d)(1). Prior to furnishing a required respirator to an employee, the employer must provide a medical evaluation to determine the employee's ability to use a respirator. Id. at (e).

3. Abatement of Unsafe or Unhealthful Working Conditions in Federal Agencies

OSHA regulations specify basic elements for federal agencies' occupational safety and health programs, including responsibilities such as inspections, training, and recordkeeping. 29 C.F.R. § 1960. Under these regulations, agencies are required to ensure the prompt abatement of unsafe and unhealthful working conditions. 29 C.F.R. § 1960.30(a).

4. Cadmium and Lead Standards

OSHA has established regulations governing the exposure that is allowed to particular chemicals, including the toxic metals cadmium and lead. The cadmium and lead standards specify numerous requirements that employers must follow to limit employee exposures, such as implementation of hygiene practices and the use of PPE. Many requirements in these standards are triggered when the concentration of the metals in the air exceeds a specified level.

In order to regulate occupational exposures to air contaminants, and physical hazards, such as noise, OSHA establishes permissible exposure limits

(PELs). PELs are generally specified as time-weighted average concentrations that cannot be exceeded over an 8-hour work day. In addition to PELs, OSHA establishes action levels that typically are approximately half of the PEL. Exceeding a PEL requires more remedial measures, such as drafting a written compliance program, while exceeding an action level requires a response such as performing additional monitoring. The OSHA PELs for cadmium and lead are 5 and 50 ug/m^3 (micrograms per cubic meter) respectively, and 2.5 and 30 ug/m^3 for the action levels.[29]

Contaminants may also be found on surfaces. Federal standards or other definitive criteria have not been developed for acceptable levels of cadmium or lead surface contamination or dust concentrations in industrial areas where activities are performed involving materials that contain cadmium or lead. Several recommendations or guidelines, primarily for lead, provide points of reference to subjectively evaluate the significance of surface contamination, and range from 40 to 1,100 µg/ft^2.[30]

Both the cadmium and lead standards specify air exposure monitoring requirements to determine if any employee "may be exposed" above the applicable action level. 29 C.F.R. § 1910.1027(d)(1); 1910.1025(d)(1). Initial monitoring is required under the cadmium standard unless the employer has other monitoring results or objective data obtained in conditions that "closely resemble those currently prevailing" in the workplace showing that "exposure

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[29] As NIOSH has stated, compliance with occupational exposure limits is not a guarantee against adverse health effects in all employees. According to NIOSH: "[N]ot all workers will be protected from adverse health effects even if their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition, and/or a hypersensitivity (allergy). In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the worker to produce adverse health effects even if the occupational exposures are controlled at the level set by the exposure limit. Also, some substances can be absorbed by direct contact with the skin and mucous membranes in addition to being inhaled, which contributes to the individual's overall exposure." Attachment 3 to FOH's comprehensive report on FCI Elkton's e-waste operations. See http://www.justice.gov/oig/reports/BOP/index.htm.

[30] For example, the Department of Housing and Urban Development has established clean-up levels for lead on surfaces following lead abatement. These levels range from 40 to 800 µg/ft^2 depending on the type of surface. Generally, these levels apply to occupied living areas where children reside and are not limited to industrial operations. According to FOH, recommended lead decontamination levels vary from 40 to 1,100 µg/ft. OSHA's Compliance Directive for the Interim Standard for Lead in Construction, CPL 2-2.58, recommends use of a decontamination guideline of 200 ug/ft^2 for evaluating the cleanliness of change areas, storage facilities, and eating areas. We apply this guideline in discussions of wipe sample test results in this report. Additional discussion of these guidance levels is contained in FOH's comprehensive report on FCI Elkton's e-waste operations. See http://www.justice.gov/oig/reports/BOP/index.htm.

to cadmium will not exceed the action level under the expected [work] conditions." 29 C.F.R. § 1910.1027(d)(2). The lead standard requires initial monitoring in circumstances where "the possibility of any employee exposure at or above the action level" is present. 29 C.F.R. § 1910.1025(d)(4).

If exceedances of the cadmium or lead action level or PEL are found, further monitoring must be conducted within at least 6 months. 29 C.F.R. § 1910.1027(d)(3); 1910.1025(d)(6). Under the cadmium standard, if the initial monitoring does not reveal exposures above the action level, monitoring may be discontinued provided that the results are confirmed by a second monitoring taken at least seven days later. Id. Otherwise, monitoring is required semi-annually.

Changes in production, processes, or raw materials that "may result" in additional exposures, or when the employer has reason to suspect that a change might result in exposures, necessitate additional monitoring. 29 C.F.R. § 1910.1027(d)(4); 1910.1025(d)(7). Employees must be informed of the results of any monitoring within 15 days after they are received by the employer. 29 C.F.R. § 1910.1027(d)(5); 1910.1025(d)(8).

If monitoring identifies exceedances of the PEL, the employer is required to implement engineering and work practice controls to reduce the exposures. 29 C.F.R. § 1910.1027(f)(1); 1910.1025(e)(1). In general and whenever feasible, OSHA requires the use of engineering and work practice controls as the primary means to correct overexposures, rather than through use of PPE or respiratory protection. Rotation of employees is also not a permissible method to achieve compliance. 29 C.F.R. § 1910.1027(f)(5). Where the PEL is exceeded, the employer must establish and implement a written compliance program. 29 C.F.R. § 1910.1027(f)(2); 1910.1025(e)(3).

The cadmium standard further requires employers to establish designated "regulated areas" wherever an employee's exposure to airborne concentrations of cadmium is or can reasonably be expected to be in excess of the PEL. 29 C.F.R. § 1910.1027(e). The areas must be demarcated from the rest of the workplace in a way that alerts employees to their boundaries, and employees who enter the areas must be provided respirators and prohibited from eating, drinking, or applying cosmetics. Lunchroom facilities also must be readily accessible to employees, and tables for eating must be "maintained free of cadmium." 29 C.F.R. § 1910.1027(j)(4)(i).

If monitoring shows exceedances of the PEL, the employer is required to provide, at no cost to the employee, appropriate PPE, such as respirators, coveralls, gloves, head coverings, boots, and face shields. 29 C.F.R. § 1910.1027(g) and (i); 1910.1025(f) and (g). Removal of contaminated clothing at the completion of the work shift must occur in designated "change rooms," and the employer must ensure that clothing contaminated with cadmium is

placed in impermeable bags or containers that prevent dispersion of cadmium dust. 29 C.F.R. § 1910.1027(i)(2). Employers further are required to prohibit the removal of cadmium or lead from protective clothing or equipment by blowing, shaking or other means that disperses the contaminated dust into the air. 29 C.F.R. § 1910.1027(i)(3); 1910.1025(g)(2)(viii).

The cadmium and lead standards also specify housekeeping requirements. Employers are required to maintain all surfaces "as free as practicable" of accumulations of cadmium and lead. 29 C.F.R. § 1910.1027(k); 1910.1025(h). Surfaces where these metals are found cannot be cleaned with compressed air, and dry sweeping may be used only where vacuuming has been tried and found not to be effective. 29 C.F.R. § 1910.1027(k)(6); 1910.1025(h)(2).

Medical surveillance is required under the cadmium and lead standards for all employees who are or may be exposed at or above the action level for 30 or more days per year for cadmium, and for more than 30 days per year for lead. 29 C.F.R. § 1910.1027(l)(1);1910.1025(j)(1). Medical examinations and biological monitoring are required under both standards. 29 C.F.R. § 1910.1027(l)(2)&(4);1910.1025(j)(2)&(3). The results of the examinations and testing must be shared with the employees who were examined or tested. Under the cadmium standard, results must be shared within 2 weeks of receipt. 29 C.F.R. § 1910.1027(l)(15). In addition, OSHA regulations require employers, upon request, to provide their employees with access to their medical records. 29 C.F.R. § 1910.1020.

5. Noise

OSHA requires implementation of a hearing conservation program whenever employee noise exposures equal or exceed an 8-hour time-weighted average sound level of 85 decibels. 29 C.F.R. § 1910.95(c)(1). If administrative or engineering controls fail to reduce sound levels, personal protective equipment must be provided. 29 C.F.R. § 1910.95(b)(1).

6. "General Duty" Requirements and Heat Stress

The OSHA "General Duty Clause" requires employers to provide a place of employment which is "free from recognized hazards that are causing or are likely to cause death or serious physical harm." 29 U.S.C. § 654. This provision addresses employer obligations to control worker exposure to hazards even if they are not covered by specific OSHA standards.

For example, OSHA has used the General Duty Clause to cite employers that have allowed employees to be exposed to potential serious physical harm from excessively hot work environments. The guidelines that OSHA uses to determine overexposures to heat stress were developed by the American Conference of Government Industrial Hygienists and are known as "Threshold

Limit Values." Factors normally taken into consideration in evaluating heat exposure include the temperature, the work rate of the worker, the clothing and personal protective equipment worn, and the work load.

The table below identifies heat threshold limit values for various work rates and regimens.[31]

TABLE 2.2
Permissible Heat Exposure Threshold Limit Values

Work Rate	Work Load		
	Light	Moderate	Heavy
Continuous Work	86° F	80° F	77° F
75% Work – 25 % Rest	87° F	82° F	78° F
50% Work – 50% Rest	89° F	85° F	82° F
25% Work – 75% Rest	90° F	88° F	86° F

7. Willful OSHA Violations

OSHA's Field Operations Manual for Compliance Officers provides guidance on the identification of "willful violations" under the Occupational Safety and Health Act, 29 U.S.C. § 651 et seq. According to the Manual, "[a] willful violation exists under the Act where an employer has demonstrated either an intentional disregard for the requirements of the Act or a plain indifference to employee safety and health." For example, an employer who knows that a workplace condition or practice poses a serious hazard to the safety and health of employees and makes little effort to determine the extent of the problem or to take corrective action, commits a plain indifference violation. See OSHA's Field Operations Manual, CPL 02-00-148, 4-28. This determination applies even if the employer was not aware of any legal requirement to abate the hazard.

8. The Status of Federal Inmates as "Employees"

OSHA's longstanding interpretation of its regulation governing federal agency health and safety programs (29 C.F.R. § 1960) is that inmates fall within the definition of "employee" under 29 C.F.R. § 1960.2(g) for purposes of occupational safety and health. Coverage for inmates is limited, however. According to OSHA, "[t]he definition of employee with regard to the

[31] The temperatures presented are Wet Bulb Globe Temperatures.

occupational safety and health program does not mean that prisoners are to be treated as employees for any other purpose. The occupational safety and health program is intended to deal with hazardous working conditions, and it is OSHA's opinion that where prisoners are employed in work similar to that outside prisons, such as farming, laundries, and machine operations, all the protections available to anyone else in similar situations should apply, including the right to file a report of hazards with appropriate safety and health officials." 45 Fed. Reg. 69796, 69797 (October 21, 1980).

B. National Fire Alarm Code

We describe requirements of the National Fire Alarm Code, 2002 edition (Code), which is published by the National Fire Protection Association (NFPA) and applies to all BOP facilities. Our investigation determined that in 2002 staff at FCI Elkton disabled the fire alarm duct detectors in an e-waste recycling factory in order to prevent fire alarms that were triggered by airborne dust from glass breaking operations. The duct detectors, which sample ventilation air, remained disabled for over 3 years. BOP fire policies require compliance with NFPA guidelines.

Under the Code, duct detectors should be inspected semi-annually to ensure that the device will sample the airstream. Code 10.3; 10.4.2.2. The owner of the system should be notified of impairments, and any defects and malfunctions corrected. Code 4.6.1;10.2.1.2. If a defect is not corrected at the conclusion of the inspection, the owner should be informed of the defect in writing within 24 hours. Code 10.2.1.2.

C. Environmental Regulations

Numerous federal and state environmental regulations apply to e-waste recycling activities. In this section we briefly describe several federal requirements that are relevant to UNICOR's recycling operations, primarily hazardous waste regulations under the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. § 6901 et seq. We also discuss requirements of the federal Clean Water Act (CWA), 33 U.S.C. § 1251 et seq., and the Clean Air Act (CAA), 42 U.S.C. § 7401 et seq.

RCRA authorizes the EPA to regulate "hazardous waste" from "cradle-to-grave," including its generation, transportation, treatment, storage, and disposal. RCRA defines "hazardous waste" to be a "solid waste" that "because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause or contribute to mortality or illness, or pose a substantial threat to human health or the environment if improperly handled." 42 U.S.C. § 6903(5). A "solid waste" is any "discarded material" that is not excluded under the regulations. 40 C.F.R. § 261.2(a)(1).

RCRA's regulatory requirements for generators of hazardous waste vary depending on the amount of waste produced. Generators which produce more than 1,000 kg of hazardous waste per month ("large quantity generators") must comply with numerous regulatory requirements. In contrast, generators who produce 100 kilograms or less per month of hazardous waste are considered to be "Conditionally Exempt Small Quantity Generators" and are subject to fewer regulatory requirements. This exemption is not available to generators that fail to determine whether their wastes are hazardous, however. 40 C.F.R. § 261.5(g); 262.11. Unless exempt, generators must properly package, label, mark, and placard the waste container in accordance with 40 C.F.R. §§ 262.30-33 when shipping hazardous waste off-site, and prepare and maintain a copy of a shipping manifest, 40 C.F.R. §§ 262.20-23.

Prior to 2007, many used, broken CRTs in operations like UNICOR's were subject to federal hazardous waste management standards due to the toxicity of the lead contained in them. See generally 40 C.F.R. § 261.24; see also 71 Fed. Reg. 42928, 42930-31 (July 26, 2006). However, beginning in 2007 EPA regulations excluded used, broken CRTs sent for recycling from the definition of "solid waste." 40 C.F.R. § 261.39(a); 71 Fed. Reg. 42928. The CRT exemption is conditioned on the CRT not being disposed of, and the new regulations require that used, broken CRTs be handled in particular ways in order to avoid disposals that cause environmental contamination. For example, the EPA regulations provide that broken CRTs must be either stored in a building or placed in a container that is "constructed, filled, and closed to minimize releases to the environment of CRT glass (including fine solid materials)." 40 C.F.R. § 261.39(a)(1).

In addition to RCRA, other environmental statutes can apply to e-waste recycling activities. For example, recycling activities may involve stormwater discharges that require a permit issued under the CWA.[32] Recyclables that are left outdoors can leach contaminants into stormwater runoff that is discharged into local surface waters such as streams and rivers.[33]

Air regulations may also apply if the recycling involves the venting of pollutant emissions to the atmosphere. The CAA imposes various permitting requirements depending on the nature of the emission and its source. As with the CWA, the CAA allows exemptions for certain emissions from regulation, such as those that are very small. 40 C.F.R. § 71.3.

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[32] U.S. Environmental Protection Agency, *Industrial Stormwater – Sector N: Scrap Recycling and Waste Recycling Facilities*, Fact Sheet EPA-833-F-06-029 (December 2006).

[33] The EPA's stormwater regulations specify that facilities involved in recycling are considered to be engaging in "industrial activity," and are required to obtain a permit unless otherwise shown to be exempt, such as by demonstrating that their industrial materials are not exposed to stormwater. 40 C.F.R. § 122.26 (b)(14).

D. BOP Health and Safety Policies

In addition, the BOP has its own health, safety, and environmental policies at both the Headquarters and institution levels. The BOP's National Safety Policy states that it is "[t]he policy of the Bureau of Prisons and UNICOR is to provide a safe and healthful environment for all employees and inmates." The National Safety Policy specifies various requirements to achieve this goal. For example, it mandates the establishment of a "hazardous materials communication program" that requires managers who oversee operations that use hazardous materials to train staff and inmates about their dangers. Safety inspections also are required at BOP institutions, including UNICOR factories, and inmate injuries must be reported and documented. The policy further specifies requirements for personal protective equipment and that a hazard assessment be completed to determine which equipment is necessary. UNICOR operations are the subject of a separate chapter in the policy, which includes discussion of protective equipment and hazardous waste issues, among others.

Institutions can also develop their own local safety, health, and environmental policies. The National Safety Policy directs institutions to create supplemental policies on numerous topics, including respiratory protection, hazard communications, and environmental concerns. The BOP institutions with e-waste operations had such supplemental policies; although, as described in Chapter Five, FOH found inconsistencies in the various policies that applied to e-waste recycling operations.

CHAPTER THREE
FACTUAL OVERVIEW: EVOLUTION OF UNICOR'S E-WASTE RECYCLING PROGRAM (1996-2009)

This Chapter describes the development of UNICOR's e-waste recycling program from its inception in 1996 through 2009. Section I provides an overview of our factual findings that apply to all of UNICOR's e-waste recycling operations. Section II contains our findings regarding the evolution of UNICOR's e-waste operations at each BOP institution that performed recycling during our investigation.

I. Program-Wide Overview of UNICOR's E-Waste Operations

Between 1997 and 2007, UNICOR established e-waste recycling operations at 10 BOP institutions. During these operations, CRTs containing hazardous metals were broken at seven of these facilities. This glass breaking activity raised most of the health and safety issues that are the focus of our report.

Generally, we found that UNICOR's e-waste recycling practices evolved over time and that health and safety improvements occurred after 2002 when testing at USP Atwater revealed significant problems with the safety of glass breaking operations. As explained in greater detail in Chapter Four, staff and inmate exposures to heavy metals were likely most common at UNICOR recycling facilities prior to 2003.

A. Initial Planning and the FCI Marianna Pilot Project (1996-1997)

UNICOR's interest in e-waste recycling started in 1996 after personnel from UNICOR's Product Support Center (PSC) identified potential business opportunities involving computer recycling.[34] A UNICOR Headquarters Program Manager, Pauline Quinn, had requested that the PSC complete a feasibility study on recycling household waste such as cans and paper at BOP institutions, but PSC staff did not favor the idea because they did not believe it would be profitable. As an alternative, PSC Industrial Specialist Maria Lancaster and Senior Industrial Engineer James Unger proposed evaluating whether UNICOR could recycle computers profitably, including reconditioning

[34] A congressionally-mandated market study of UNICOR recommended in 1991 that UNICOR increase sales of services to the federal government. The Recycling Business Group's former General Manager, Lawrence Novicky, told the OIG that this study influenced UNICOR's decision to provide recycling services.

them for use in schools. In July 1996, Unger contacted several recyclers to learn about computer recycling practices.

After completing these limited inquiries, Lancaster and Unger performed market research and evaluated regulatory requirements. They told the OIG that they did not receive guidance on how to conduct this work and that UNICOR lacked policies that required the completion of health, safety, and environmental assessments on newly proposed operations. Unger said that health and safety issues typically were addressed by the Safety Manager at each institution.

One health and safety concern that came to the PSC's attention early in its assessment was the lead content of computer monitor glass and potential regulatory issues associated with the handling of broken monitor glass. Memoranda prepared by the PSC in 1996 referred to monitor glass as "hazardous" and stated that precautions were necessary to avoid improper disposal of it. Unger said that he conferred with legal counsel about requirements related to the handling of monitor glass. Quinn told the OIG that lead was a concern with computer monitors "from day one" that UNICOR was involved in e-waste recycling.

To fully evaluate the economic feasibility of e-waste recycling, the PSC recommended that UNICOR conduct a pilot project for 6 months at a single BOP institution. PSC staff proposed the project to FCI Marianna in Florida, which already had a small e-waste recycling operation in place. The purpose of the pilot project was to develop operating procedures, verify that PSC's cost and revenue projections were accurate, and build relationships with new suppliers and vendors of computer equipment and recyclable materials.

With the support of an Associate Warden at FCI Marianna, the pilot project started in late fall 1996 at the female prison camp adjacent to the main prison at Marianna. Under the supervision of a UNICOR foreman, 15 inmates processed approximately 2.5 semi-trailer truckloads of e-waste per week. Inmates disassembled computers and prepared monitors for resale to vendors. CRTs were not intentionally broken during this process. Lancaster said that the pilot project was a success and that UNICOR opted to proceed with the e-waste recycling project. By November 1997, UNICOR had expanded recycling to a second BOP institution, FCI Elkton in Ohio, and was continuing to further develop e-waste operations at its FCI Marianna factory.

Lancaster and Unger told the OIG that in 1997 the PSC decided, as part of its assessment of the feasibility of computer recycling, to further evaluate hazards associated with the handling and processing of computer monitors because their preliminary research had identified potential problems with lead that is embedded in monitor glass. In April 1997, the PSC contracted with a private consulting firm to perform industrial hygiene testing during monitor

disassembly (removing the plastic framing and other components) and breakage of monitor glass to determine the applicability of OSHA's lead standard, 29 C.F.R. § 1910.1025. According to Lancaster and Unger, the purpose of the testing was to assess any hazards during disassembly and in the event that monitor glass was accidentally broken. They told us that the testing was not designed to evaluate sequential breaking of CRTs because they did not expect UNICOR to purposefully break CRTs after disassembling the monitors.

The testing was performed at PSC offices on April 28, 1997, by an industrial hygienist who lacked certification from the American Board of Industrial Hygiene.[35] During the testing, Lancaster wore an air monitoring pump and manually disassembled approximately five monitors, which included smashing the CRTs by dropping them on the floor and hitting the glass with a hammer. The hygienist collected air samples next to each monitor as it was disassembled, which took roughly 20 minutes for each monitor, and during the breaking and cleanup of the broken glass.

The PSC received the testing results in May 1997. In a report to UNICOR, the hygienist concluded that "over exposures to lead and other metals during the dismantling of the [computer monitors] will be negligible. . . . These data and our observations indicate that lead exposure at levels of regulatory concern are [sic] not possible." With regard to air monitoring results, the hygienist stated that "general exposure to airborne contaminants are [sic] not expected to approach regulatory levels even under the most extreme circumstances." The report stated that its findings were not limited to the accidental breakage of a CRT, and instead were biased in favor of over-exposure given that the testing was based on the assumption that UNICOR employees would break CRTs and dry sweep the floor for 8 hours.[36]

In his interview with the OIG, however, the hygienist stated that he believed his report had no applicability to an operation where UNICOR would be breaking upwards of 1,000 CRTs per day (such as UNICOR later established at some facilities) because that size of an operation far exceeded what he understood a "worst case scenario" would be for UNICOR's handling of computer monitors. He stated that even if UNICOR were breaking only 100 CRTs a day, he would have wanted to conduct retesting. Similarly, Lancaster

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[35] The American Board of Industrial Hygiene is the certifying organization for Certified Industrial Hygienists. Award of the Certified Industrial Hygienist certificate requires that candidates meet rigorous education and experience requirements, pass an examination, and recertify every five years by fulfilling continuing education requirements. More than 6,500 industrial hygienists worldwide currently hold the Certified Industrial Hygienist designation.

[36] NIOSH and FOH found significant deficiencies in the quality of this report. These findings are discussed further in Chapter Four.

and Unger stated that they did not expect UNICOR to break large numbers of CRTs and that the testing was not designed to evaluate such a scenario. However, we found no evidence that the limitation the hygienist placed on his conclusion was clearly communicated to or understood by UNICOR staff outside of the PSC at the time.

PSC staff told the OIG that based on the research that they conducted through 1998, they recommended that UNICOR proceed with the development of e-waste recycling but not break computer monitor glass. Sharon Eubanks, a product development manager at the PSC and the supervisor of Lancaster and Unger, told the OIG that due to concerns with lead contamination and lack of expertise in UNICOR and the BOP to properly manage the glass after it was broken, the PSC recommended that UNICOR avoid glass breaking altogether. She further stated that she believed that UNICOR Headquarters as well as the recycling Factory Managers and Superintendents of Industries at each institution with recycling operations were aware of PSC's recommendation not to break glass.

We received conflicting information from UNICOR officials regarding whether they were aware of PSC's concerns about computer monitor recycling. Quinn and Dan Parker, the head of UNICOR's Research, Activation, and Corporate Support branch, told the OIG that they recalled that Eubanks had concerns about the safety of recycling computer monitors. As discussed above, Quinn also told us that lead contamination and exposures were a concern from "day one" of the recycling program. However, former Recycling Business Group General Manager Novicky told the OIG that he had no discussions with PSC staff about concerns regarding lead and that he never received a warning not to break glass. UNICOR's former Chief Operating Officer, Steve Schwalb, also said that he was not aware that the PSC had raised objections about glass breaking and that he did not know that it had retained a hygienist to assess the safety of monitor disassembly.

The contemporaneous documents that UNICOR and the BOP provided to the OIG do not reflect any recommendation by the PSC that UNICOR not break glass. Indeed, at least one PSC document appears to contemplate that UNICOR would break glass. In late 1998, the PSC produced a manual on "Computer Demanufacturing" that presented the findings of its research and included instructions on computer recycling procedures, potential suppliers of e-waste, clean-up procedures for broken CRTs, and the reports of the industrial hygienist that the PSC had retained to evaluate monitor disassembly and glass breaking. Under the heading "Lead in Computers," the manual restated the hygienist's conclusion that exposure to lead and other metals during the dismantling of monitors was "negligible" and that airborne contamination was not expected to approach regulatory levels. In addition, it specified procedures for the "CRT Processing Area," including "[b]reak CRT in

appropriate gaylord box (SAFETY EQUIPMENT MUST BE WORN)." The manual did not contain a recommendation that UNICOR avoid glass breaking.

By approximately February 1998, UNICOR had initiated glass breaking operations at FCI Elkton. These operations were expanded to two locations at FCI Elkton, and by 2000, inmates were processing more than 1,000 monitors per day. As detailed below, UNICOR's computer recycling activities by 2002 included the breaking of large quantities of CRT glass at multiple facilities. PSC staff told the OIG that managers at UNICOR's Recycling Business Group did not consult with them about later changes in its recycling operations and that its initial recycling instructions should have been revised to account for those changes. However, as detailed below, Lancaster became aware of changes with glass breaking operations at FCI Elkton in 2001. We found no evidence that the PSC objected to UNICOR's glass breaking operations at that time.

B. Establishment of Full Scale E-Waste Recycling Operations at BOP facilities

Following the implementation of the Product Support Center's pilot project at FCI Marianna, UNICOR began establishing permanent e-waste recycling operations at BOP institutions across the country. According to former UNICOR Chief Operating Officer Schwalb, he wanted to create "the preeminent computer recycling program in the country" that would be fully compliant with applicable health, safety, and environmental requirements. He said that he explained this goal to Novicky when Novicky became the General Manager of the Recycling Business Group in 2000.

As detailed in Section II, UNICOR established the operations identified in the table below:

TABLE 3.1
Starting Dates of E-Waste Recycling and
Glass Breaking Operations at BOP Facilities

Facility	State	Start of E-Waste Recycling	Start of Glass Breaking Operations
FCI Marianna	Florida	1997	2005*
FCI Elkton	Ohio	1997	1998
FCI Dublin	California	1998**	n/a
FCI Ft. Dix	New Jersey	1998	2003*
FCI Texarkana	Texas	2001	2001
USP Atwater	California	2002	2002
FCI La Tuna	Texas	2002**	2002
USP Lewisburg	Pennsylvania	2003	2003
FCC Tucson	Arizona	2005	n/a
USP Leavenworth	Kansas	2007	n/a

*Some staff at FCI Marianna reported breaking CRTs inside semi-trailers prior to this date; other staff disputed this account. At FCI Ft. Dix, the removal of electron guns from CRTs, which involves breakage of glass, started in 1999.

**Recycling ceased at FCI Dublin in 2000, and at FCI La Tuna in 2003.

Detailed facts about the evolution of operations at each facility are provided in Section II of this Chapter.

C. Early Health and Safety Practices

We found that UNICOR Headquarters initially provided limited guidance regarding the design and operation of recycling facilities and associated health and safety issues. UNICOR documents revealed that by late 2000, UNICOR Headquarters officials, including Novicky, were aware that CRTs contained toxic metals and that the glass breaking activities that were then underway at FCI Elkton resulted in the release of visible dust into the factory air. For example, minutes of a factory manager's meeting in November 2000 discussed the need for air testing due to hazards associated with processing CRTs. However, despite repeated requests between 1998 and 2000 from BOP safety staff and UNICOR Headquarters Program Manager Quinn for testing by qualified personnel, until mid-2002, UNICOR and the BOP had conducted just two tests for contamination, only one of which was in a recycling factory (FCI Elkton), using staff and contractors who lacked industrial hygienist

certifications. These tests did not report any violations of applicable OSHA air quality standards.

As detailed in Section II, our review found that UNICOR adopted few health and safety protections relating to glass breaking during the first 4 years that this activity took place. Between 1998 and 2002, UNICOR conducted glass breaking activities at FCI Elkton, FCI Texarkana, USP Atwater, FCI La Tuna, FCI Ft. Dix, and, according to some staff at FCI Marianna, that institution as well.[37] During this time, UNICOR used crude methods and equipment for breaking CRT monitors that resulted in the release of large amounts of cadmium and lead laden dust into the factory air, and into the outside environment at FCI Elkton. We found that UNICOR adopted these methods without providing adequate health and safety training to workers, including warnings about the presence of hazardous chemicals in its recycling areas, and without providing sufficient respiratory protection. UNICOR also lacked adequate written operating procedures and failed to implement sufficient measures to protect the environment.[38] For example, staff and inmates reported that e-waste routinely was put into the trash, and items such as broken glass often were left outdoors exposed to the elements.

We also found that prior to 2002, UNICOR and the BOP did not conduct adequate fact finding to determine if the glass breaking operations they intended to implement were potentially hazardous. As mentioned above, the limited air monitoring that UNICOR and the BOP conducted prior to June 2002 was not sufficient to test the larger glass breaking operations that were later implemented, and this limitation on the findings was not clearly communicated throughout BOP and UNICOR. One UNICOR staff member stated that visits that UNICOR staff made to private recyclers prior to 2002 revealed that they broke CRT glass "in the open" without ventilation controls, and that UNICOR considered their practices to be the "industry standard." UNICOR officials were aware, however, that CRTs contained lead and that the dust from "crushing" CRT glass was hazardous. Although UNICOR was not "crushing" glass, it was

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[37] Glass breaking at FCI Ft. Dix during this period was likely limited to removal of the electron gun from CRTs.

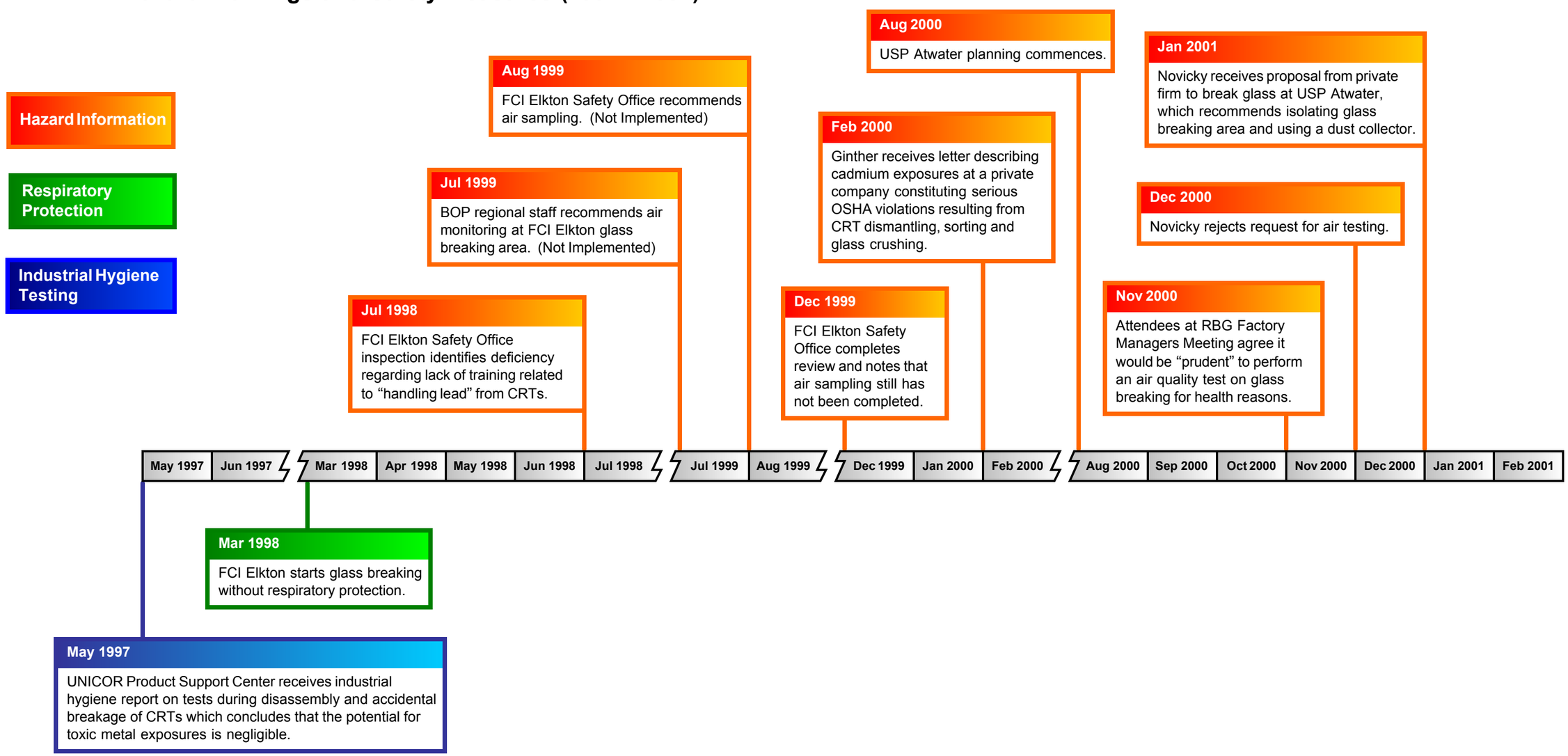
[38] According to former USP Atwater Warden Ron Tabor, the paucity of instructions was unusual for the BOP and UNICOR, which he said normally provide detailed written procedures for virtually every job. He told the OIG:

> What was so different about this particular UNICOR operation was they didn't have any paperwork. It was kind of a willy nilly, no written policy program design . . . [No] manual for recycling that you will do this, this way. . . The Bureau of Prisons is very policy oriented and you got a book on everything. Well, there was no book on recycling. That caused me a little concern. . . . They didn't have a plan. They said we're going to do this and they just [did it], by the seat of your pants.

readily apparent that large amounts of dust were being generated from its glass breaking operations.

Below we present a timeline of events concerning the warnings that UNICOR recycling managers received from 1997 through 2002 regarding the dangers of e-waste recycling. These events are summarized in greater detail in Section II below.

CHART 3.1
UNICOR Electronics Recycling Timeline of CRT Hazard Warnings and Safety Measures (1997 - 2002)



Apr 2001

Novicky and Ginther receive OSHA materials from DRMS describing the need for "metal dust control," monitoring, and hazard communication in electronics demanufacturing operations.

Apr 2001

DRMS advises UNICOR of lead hazards with CRT breakage.

Aug 2001

Novicky and Ginther visit New Jersey Department of Environmental Protection which expresses concerns about the safety of UNCOR's proposed glass breaking operations at FCI Ft. Dix.

Aug 2001

Ginther receives MSDSs for CRT panel and funnel glass which describes the need for respirator protection when glass is pulverized and warned against "generation of excess dust."

Oct 2001

RBG strategic business plan notes concern with "lead contained in the tubes" and that "specialized equipment to handle this chemical will be required."

Nov 2001

USP Atwater Safety Manager prepares memo to local UNICOR managers describing health concerns with CRTs and requests a hazard assessment. (Not Implemented)

Dec 2001

USP Atwater Production Controller by this date proposes purchase of a machine to break CRTs that contains the dust from glass breaking. UNICOR rejects for cost reasons.

Jan 2002

USP Atwater Safety Manager prepares memo restating his concerns with CRTs, notes Novicky's claim that there are no hazards to evaluate, and renews his request for a hazard assessment. (Not Implemented)

Jul 2002

USP Atwater Warden sends memo to Regional Director and UNICOR Chief Operating Officer Schwalb warning about hazards of breaking CRTs, disposing of glass-booth filters, and possible regulatory violations at other UNICOR factories.

Mar 2001 | Apr 2001 | May 2001 | Jun 2001 | Jul 2001 | Aug 2001 | Sep 2001 | Oct 2001 | Nov 2001 | Dec 2001 | Jan 2002 | Feb 2002 | Mar 2002 | Apr 2002 | May 2002 | Jun 2002 | Jul 2002 | Aug 2002 | Sep 2002 | Oct 2002 | Nov 2002

Aug 2001

Testing performed by the FCI Elkton Safety Office revealed the presence of cadmium and lead, but below regulatory levels.

Sep 2001

FCI Elkton offers respirators to glass breakers.

Dec 2001

FCI Texarkana starts glass breaking without respirators.

Apr 2002

USP Atwater starts glass breaking without respirators.

Jun 2002

Atwater testing results obtained by the Safety Manager show exceedances for cadmium.

Aug 2002

UNICOR requires respirators for glass breakers.

Aug 2002

USP Atwater testing results obtained by UNICOR show exceedances for cadmium and lead.

Nov 2002

USP Atwater testing results obtained by UNICOR show exceedances for cadmium and lead.

Nov 2002

FCI Texarkana testing results obtained by UNICOR show no exceedances.

D. Incremental Improvements Following the Discovery of Toxic Metal Contamination at USP Atwater in 2002

Glass breaking operations began at USP Atwater in California in April 2002. In June 2002, Leroy Smith, the Safety Manager at USP Atwater, acting on his own initiative, retained contractors who conducted testing that revealed significant amounts of airborne cadmium and lead resulting from glass breaking operations. Because the results showed that the concentration of cadmium in the air far exceeded OSHA's Permissible Exposure Limit (PEL), Smith directed glass breaking operations to cease.[39] Testing of filters in the glass breaking area also revealed that they constituted "hazardous waste" under applicable environmental regulations.

In the wake of the information from USP Atwater, UNICOR began taking more action to address health and safety concerns at its e-waste recycling facilities. Improvements in procedures and equipment were introduced at the individual UNICOR facilities, such as requiring the use of respirators and forbidding the consumption of food and drink in glass breaking areas. In June 2003, the Recycling Business Group issued a 14-page policy on CRT processing that covered issues including permitting, engineering controls, safety equipment, respiratory protection, and cleaning requirements. It also instituted medical surveillance of its recycling staff and inmates who worked in glass breaking operations. Mandatory biological testing included evaluations for cadmium and lead exposures. Standard operating procedures for e-waste recycling activities were developed by 2004 and addressed issues such as permitting, training, procedures for handling e-waste, and safety.

Training and hazard communication also improved markedly between 2003 and 2008. In 2005, UNICOR developed an "Inmate Pre-Industrial Manual" that described hazards found in recycling factories and safety procedures. These materials were supplemented by training held at each institution that addressed a wide variety of safety issues, including OSHA regulations, lifting procedures, and eye protection.

Our review of UNICOR documents and e-mail communications between 2003 and 2008 also revealed numerous instances where UNICOR managers encouraged improved safety and hazard communication practices. For example, in 2005 a UNICOR Program Manager, Carol Minnick, wrote an e-mail to UNICOR recycling staff that emphasized the importance of training and information sharing, and stated that test results should be shared with staff and inmates and explained in group meetings. In 2006, one of the goals that senior UNICOR leadership established for the General Manager of the Recycling

[39] The testing also showed high levels of lead, but not enough over 8 hours to exceed the PEL. The FOH report on USP Atwater describes these results in greater detail.

Business Group, Novicky, was to "[p]romptly implement all recommendations resulting from visits by environmental/health/safety agencies." Novicky also at times sent communications that encouraged improved environmental compliance.

Beginning in 2003, UNICOR also sought and obtained certification of its operations from recognized standard setting organizations. All of UNICOR's e-waste factories have obtained ISO 9001 certifications, which signifies that they have developed and support quality management systems.[40] In addition, six of the factories have obtained certification from the International Association of Electronics Recyclers (IAER). The IAER certification includes an assessment of health, safety, and environmental management issues. As of 2009, the Recycling Business Group was also seeking additional certifications, including the Recycling Industry Operating Standard (RIOS) from the Institute of Scrap Recycling Industries.

More recently, in March 2009, UNICOR hired a new General Manager of the Recycling Business Group, Robert Tonetti, who has significant expertise in environmental issues related to e-waste recycling. Prior to joining UNICOR in 2009, Tonetti was a senior environmental scientist in EPA's Office of Solid Waste and spent 32 years with the Agency. In 2004, he wrote the EPA guidelines on the safe reuse and recycling of used electronics. Tonetti informed the OIG that before joining UNICOR, he had visited approximately 60 electronics recyclers in the U.S., Canada, and Europe, including 5 UNICOR factories that he visited in 2005 and 2006. Tonetti stated that in his view UNICOR's factories were now among the best electronics recyclers in the country with respect to worker protection, health monitoring, and training, among other aspects.

However, despite these efforts to improve safety practices over time, our investigation found that UNICOR significantly delayed correcting known deficiencies at some of its recycling factories after 2003. As detailed for each individual facility in Section II, these deficiencies included failures to upgrade equipment and procedures in the glass breaking areas, to warn workers of hazards in the recycling factories, to identify and clean up legacy contamination, to prevent contamination of an employee dining area, to properly characterize and handle hazardous waste, to abide by UNICOR safety policies and inspection recommendations, and to prevent inmate injuries from glass breaking.

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[40] The International Organization for Standardization publishes standards for products and services. The ISO 9001 standard addresses "quality management," and specifies requirements for management systems in organizations that must consistently produce products that meet particular quality specifications.

E. Actions to Conceal Health and Environmental Issues

During our investigation we identified repeated attempts by UNICOR officials to downplay or even conceal the health and environmental problems caused by its glass breaking activities in communications with suppliers, vendors, and regulatory authorities. These actions occurred at various times, including during the period of our review.

For example, UNICOR staff and inmates told the OIG it was common prior to inspections and industrial hygiene testing to clean all recycling areas extensively and to slow or stop the pace of glass breaking during such events, thereby rendering the work conditions unrepresentative of normal conditions. In addition, we found that UNICOR officials submitted a deceptive video depicting its glass breaking operations to New Jersey state regulators in order to obtain a permit for its operations at FCI Ft. Dix. We also determined that in 2007, UNICOR officials submitted misleading and inaccurate information to the EPA in response to an information request regarding air emissions at FCI Elkton in Ohio. These events are described in detail in Chapter Five.

Our review of UNICOR's reports to its Board of Directors also revealed that important health and safety information was sometimes omitted and that the impression created by the reports about the safety of its recycling operations was more optimistic than the facts warranted. Our assessment of these reports is provided in Chapter Five.

F. UNICOR's Decision to Suspend Glass Breaking Operations Nationwide

As noted above, in May 2009, UNICOR ceased glass breaking operations at all of its recycling factories. According to Tonetti, the General Manager of the Recycling Business Group, he completed an economic evaluation of glass breaking operations shortly after he joined UNICOR in March 2009 and determined that substantial savings could be obtained by stopping those operations. He told the OIG that UNICOR does not plan to resume glass breaking operations in the future. However, UNICOR still accepts CRTs for disassembling and recycling. For approximately 6 months, UNICOR shipped bare monitor tubes to a recycling facility in Mexico as well as to a vendor that also shipped them to the same facility. Tonetti told the OIG that UNICOR made the decision to send the tubes to Mexico based on economic, environmental, health, and safety considerations. Currently, UNICOR dismantles computer monitors and televisions and sends the monitor tubes to two firms that have 2-year contracts with UNICOR to handle the tubes. According to Tonetti, these firms decide whether to ship the tubes or broken glass abroad for processing.

II. E-Waste Recycling Operations at Individual BOP Facilities

In this section we describe the establishment and evolution of UNICOR's recycling operations at each BOP facility that was involved in e-waste recycling.[41] Because glass breaking activity raised most of the health and safety issues that are the focus of our report, we discuss the institutions in chronological order of when they began preparations for glass breaking operations, and we describe the glass breaking operations at each facility in detail. We also describe other recycling operations in those institutions, as well as the Recycling Business Group's knowledge of hazards and the information shared with staff and inmates about them.

A. FCI Elkton

UNICOR started e-waste recycling operations at FCI Elkton in Ohio in November 1997 at a UNICOR warehouse located outside the main prison compound. E-waste operations ceased there in 2008 after the OIG identified significant cadmium and lead contamination in areas where e-waste recycling previously occurred.

Before closing its e-waste operations, FCI Elkton historically was one of UNICOR's largest recycling factories. It typically employed approximately 7 staff members and between 150 to 250 inmates that recycled up to 13 million pounds of electronics per year, or roughly 20 percent of all the electronics recycled by the Recycling Business Group. Events at FCI Elkton are of particular importance to this review because FCI Elkton was the first e-waste factory to conduct large-scale glass breaking operations.

1. Initiation of Glass Breaking Operations and Early Warnings about E-Waste Hazards

Early recycling operations at FCI Elkton focused on the disassembly of computers and peripherals such as printers. According to UNICOR staff, within months after these recycling operations began, large quantities of monitors that UNICOR could not sell began to accumulate at the warehouse. UNICOR decided by approximately February 1998 to initiate glass breaking operations at the warehouse as a way to reduce its backlog of monitors to be recycled.

UNICOR staff and visitors at FCI Elkton told the OIG that the warehouse frequently was overwhelmed with excess product, including monitors, and that

[41] We do not describe testing results for each of UNICOR's e-waste factories in this chapter. These results are summarized in FOH's reports on each of the BOP institutions that had e-waste operations, and can be found at: http://www.justice.gov/oig/reports/BOP/index.htm.

on some days as many as 10 semi-trailers would be delivered for unloading. As a result, UNICOR began storing e-waste outdoors and, after FCI Elkton began glass breaking operations, the outdoor storage included boxes of broken monitor glass. The Warehouse Foreman at the time, Bruce Ginther, attempted to address this problem by diverting shipments of e-waste from federal agencies directly to UNICOR customers, including to persons he considered friends, rather than to FCI Elkton for recycling, and at times he did not charge for these loads other than to assess trucking costs.[42] However, the U.S. General Services Administration Office of Inspector General (GSA OIG) investigated Ginther's conduct and determined that he had lied to UNICOR suppliers and to its agents about the destination of the e-waste, and had accepted small gifts from some vendors. Ginther's conduct is discussed more fully in Chapter Five.[43]

UNICOR staff told the OIG that CRTs were broken inside the warehouse and at times outdoors on the loading dock. Initially inmates were instructed to break the monitors by placing them in a gaylord box and striking them with a hammer. UNICOR later acquired a slatted table with rollers that allowed the inmates to slide the CRTs while striking them over gaylord boxes of panel and funnel glass, thereby obtaining better separation of the two types of glass. A photograph of such a work area appears below.

[42] Our investigation also determined that Ginther concealed from inspectors that FCI Elkton was receiving more e-waste than it could process. Staff at FCI Elkton told the OIG that it was common practice for Ginther to order that excess material that could not be stored at UNICOR's warehouse or factory be moved away from the institution during inspections so that the inspectors could not see it. One staff member said that various vendors would agree to store the material temporarily, and that material would be hidden prior to inspections by the BOP's Program Review Division, visits by "dignitaries," and suppliers, such as DRMS. Investigation by the FBI corroborated the accounts of FCI Elkton staff.

[43] The DOJ Public Integrity Section of the Criminal Division determined not to initiate any action against Ginther in July 2003. BOP subsequently issued Ginther a letter of reprimand for his conduct, the mildest form of formal discipline in the BOP.

PHOTOGRAPH 3.1
UNICOR Glass Breaking Table, 2002

UNICOR customers who came to the warehouse to purchase items told the OIG that inmates used sledgehammers on the loading dock to break up televisions, and that broken glass from this work as well as from the inside of the semi-trailers, where CRTs often broke during shipping, was placed in the trash. One UNICOR customer stated that inmates would throw electronics and television tubes in a trash dumpster that was sent to a local landfill, especially tubes from console televisions.

Neither the BOP Safety Office at FCI Elkton nor regional or Headquarters safety personnel assessed potential hazards with glass breaking operations before they began. The Safety Manager at FCI Elkton, Dan Martin, told the OIG that UNICOR did not ask him to evaluate glass breaking operations before they started, and that he discovered that UNICOR was breaking monitor glass during a routine inspection. He said that he repeatedly asked UNICOR to conduct testing but that his requests were ignored. In July 1998, Martin prepared an inspection report and identified as a "deficiency" the lack of training for UNICOR staff and inmates who "handle lead" from computer monitors. However, training on lead hazards from CRTs was not provided until several years later.

In January 1999, UNICOR began shipping its broken CRT glass to a private company to process. By that time, UNICOR had expanded its glass breaking operations from the warehouse to the UNICOR factory at the FCI and, according to UNICOR staff, was breaking approximately 1,000 to 2,000 monitors per day. As with glass breaking operations at the warehouse, this activity initially was conducted "in the open" inside the factory without

engineering controls such as ventilation or other measures to adequately contain the resulting dust and debris. UNICOR staff told the OIG that the glass breaking operations generated a lot of dust that was visible in the air throughout the UNICOR warehouse and the FCI Factory.

Over time local and regional BOP safety staff began to raise concerns about the glass breaking operations which were not acted upon. In July 1999, an industrial hygienist from the BOP's Mid-Atlantic Regional Headquarters performed a "staff assistance visit" at FCI Elkton and recommended that air monitoring be conducted where CRTs were being broken because the area contained "lead and dust." These recommendations were provided to the Regional Director and Safety Administrator. However, despite two additional reports from Safety Manager Martin in August and December 1999 that noted that the testing had not been performed, the testing was not completed.

Ginther, who was then the Assistant Factory Manager for UNICOR's recycling operations at FCI Elkton, also obtained information from another recycler in early 2000 that raised safety concerns about CRT glass recycling. Our review of UNICOR files, including Ginther's e-mail account, revealed that in February 2000, Ginther received a copy of correspondence between the State of Wisconsin and a processor of computer monitor glass summarizing testing results which showed that an employee engaged in "crushing" of monitor glass at a recycling facility was exposed to cadmium dust at approximately 48 times the OSHA Permissible Exposure Limit (PEL), and another employee involved in "dismantling and sorting" was overexposed at 1.5 times the PEL. The State stated that "[t]hese overexposures would be considered 'serious violations' by OSHA" and that respiratory protection was required. The correspondence also noted that most of the cadmium exposures occurred when the monitors' panel glass was being crushed.

Numerous UNICOR and BOP staff, including the FCI Elkton Safety Manager and Assistant Safety Manager, the Factory Manager, Superintendent of Industries, and Novicky, told the OIG that Ginther never disclosed the contents of the Wisconsin letter to them, and that their approach to the glass breaking operations would have been different if they had known about it. The Assistant Safety Manager stated that had he been aware of potential cadmium exceedances he would have sought assistance from an industrial hygienist because he lacked the necessary training to properly evaluate the situation. Following his resignation from the BOP in 2009, Ginther declined the OIG's request for an interview in our administrative case.[44]

[44] Ginther was interviewed by DOJ criminal investigators, including OIG agents, pursuant to a proffer agreement.

UNICOR Headquarters and recycling Factory Managers also discussed the potential dangers from disassembling CRTs. In late November 2000, Novicky, Ginther, UNICOR Headquarters Program Manager Quinn, and recycling staff from all the BOP institutions then engaged in e-waste recycling – FCIs Ft. Dix, Elkton, and Marianna – met for a Factory Managers' conference at FCI Elkton. Minutes from this meeting state that "[a] discussion resulted about whether an air quality test should be done for health reasons, especially given [that] Elkton 'demanufactures' CRTs. Most agreed that would be prudent. [A former Associate Warden at FCI Marianna] suggested the BOP hygienist is available for such." However, following the meeting and without conferring with safety professionals, Novicky decided that additional testing was not warranted and did not seek assistance from an industrial hygienist.

2. Problems with Glass Breaking Debris and Additional Warnings about E-Waste Hazards

By 2001, operations at the FCI Elkton recycling factory focused on dismantling monitors and breaking CRTs. UNICOR staff told the OIG that CRTs initially were broken in the middle of the factory with no ventilation of the resulting dust other than through the factory's general air handling system. The BOP employed two HVAC technicians at FCI Elkton who told the OIG that the dust from the recycling factory was so dense that it began to interfere with the air handling units on the roof of the factory and resulted in the dust being emitted directly to the outdoors. One HVAC technician stated that there was a period when no filters were kept in the air handling units because staff could not replace the filters fast enough. According to the HVAC technicians, the filters that they removed were disposed of in the trash.

Due to problems with the dust conditions in the recycling factory, the HVAC technicians stated that they received a request to install a fan in the ceiling of the UNICOR recycling factory to blow the airborne debris outdoors. Both of the HVAC technicians stated that they told their supervisor Alan Ferguson that they were unwilling to participate in the project because they believed an evaluation was necessary. The technicians said that they instead recommended bringing in an engineer as well an industrial hygienist to evaluate what should be done with the factory's dust problems. As explained below, this recommendation was not followed and a fan was later installed along with a paint booth by the Assistant Safety Manager.

UNICOR received additional warnings in 2001 about potential e-waste hazards from the Defense Reutilization Marketing Service (DRMS), which supplied e-waste to UNICOR from the Department of Defense. In April and May 2001, UNICOR was seeking to renew an agreement with DRMS to recycle e-waste and was providing detailed information to DRMS about its FCI Elkton operations. Before DRMS would agree to furnish its e-waste to UNICOR, it sought assurances that UNICOR was complying with applicable health, safety,

and environmental laws and regulations. To assist UNICOR in obtaining DRMS's authorization to receive its e-waste, a senior DRMS representative provided Assistant Factory Manager Ginther and Novicky with materials that described OSHA requirements, the importance of implementing "dust and particulate control" when disassembling electronics, and special hazards related to metal contamination, including cadmium and lead.

Although the OSHA materials contained no discussion relating to hazards associated with breaking CRTs, DRMS's industrial hygienist told the OIG that he orally advised UNICOR staff about lead hazards associated with breaking CRTs. The OSHA materials also described the need to establish a monitoring program for hazardous materials, the procedures to perform air sampling, and the elements of a hazard communication program. According to UNICOR Program Manager Quinn, she spoke with DRMS personnel repeatedly about the hazards of electronics recycling.

To provide DRMS with the information it was seeking about recycling operations at FCI Elkton, UNICOR staff consulted with the BOP Assistant Safety Manager about noise, air, and wipe testing results that DRMS wanted. In April, the Assistant Safety Manager informed Ginther and Factory Manager Frank Shannon in an e-mail that he did not expect lead to be a concern with monitor glass because "as long we don't grind up the glass . . . there is no hazard. Lead will not be released from the glass . . . ." He told the OIG that he relied on a material safety data sheet that he obtained from a glass recycler for this information.

DRMS also sought industrial hygiene testing information from UNICOR. One of its representatives told the OIG that the breaking of monitor glass at the time was "one of our primary focus areas for compliance." He said that DRMS attempted to ensure that UNICOR was verifying that dust from UNICOR's CRT operations did not exceed OSHA regulatory levels and that UNICOR was treating its broken monitor glass as a hazardous waste when disposing of it. He stated that these issues were part of DRMS's compliance evaluation and believed that they would have been discussed with UNICOR. DRMS's industrial hygienist confirmed that he discussed these issues with representatives of the Recycling Business Group.

However, UNICOR did not pay for an industrial hygienist to perform an assessment. Safety Manager Martin told the OIG that UNICOR refused to pay for the testing and that the BOP Safety Office at FCI Elkton conducted it even though he did not believe that his staff was qualified to perform an evaluation on UNICOR's operations. He stated that no one on his staff was an industrial hygienist but that he felt obligated "to do the best we could do" given that no one else was willing to perform the testing. The Safety Manager said he did not use Safety Office funding to obtain a qualified contractor to complete the

testing because it would have depleted his budget and he felt the testing was UNICOR's responsibility.[45]

FCI Elkton's Assistant Safety Manager provided air and wipe sample testing results to DRMS in August 2001. The samples showed that the cadmium and lead in the air did not exceed OSHA occupational exposure limits. After seeking advice from a BOP industrial hygienist on calculations that are necessary to interpret the results, the Assistant Safety Manager advised Ginther that the wipe samples showed "no problem" and that there was no need for respiratory protection or implementation of a lead compliance plan. UNICOR repeatedly relied upon these testing results through mid-2002 to justify its view that its recycling practices at FCI Elkton and elsewhere should not result in violations of OSHA air quality standards for cadmium and lead. However, those tests results were later criticized by the industrial hygienist at BOP headquarters and by experts on the OIG technical team.[46]

Ginther also obtained CRT material safety data sheets in August 2001 from the same glass recycler that the Assistant Safety Manager had communicated with previously and that described dust-related hazards. One of the sheets warned against generating "excessive dust" and stated that a toxic dust respirator was necessary "if the material has been pulverized." It also stated that ventilation should be sufficient to avoid exceedances of OSHA PELs for lead and that glass can cause lead poisoning "when in dust form."[47]

UNICOR's handling of the broken monitor glass during this period was also problematic. UNICOR staff told the OIG that boxes of broken monitor glass often were stored outdoors and frequently broke when the boxes became

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[45] The Safety Manager position in BOP institutions is funded by the BOP. UNICOR's budget is based on revenues from sales of its products and services.

[46] In July 2002 (after tests at USP Atwater revealed more significant hazards, discussed in Section II.B.2 below), the BOP industrial hygienist at Headquarters discounted the FCI Elkton test results in e-mail communications with the Safety Manager at FCI La Tuna and characterized them as "not complete." In addition, experts who examined those tests in later years criticized them. NIOSH and FOH also noted deficiencies with the reporting from this testing. NIOSH found that it contained "no information regarding the type of sample (personal sample versus area sample), sample volume, location, the work being performed, PPE, or exposure control methods." In short, we found, and the experts we consulted with concurred, that it was not appropriate to rely on the testing because important facts were not recorded when the air and wipe samples in question were taken.

[47] The material safety data sheets did not explicitly state that breaking CRTs (to the extent that this is distinct from "pulverizing" it) is an activity that creates significant quantities of hazardous dust requiring major protective procedures. However, as noted above, it was readily apparent to persons in the FCI Elkton factory that glass breaking as practiced in that facility generated significant amounts of visible dust. As explained in Chapter Four, FOH studies on the particle sizes of the dust generated from glass breaking shows that some material is pulverized by glass breaking.

wet, depositing their contents onto the surrounding soil. These conditions continued into 2004, according to UNICOR e-mails and Steve Heffner, a Factory Manager who was hired in 2003.

UNICOR also stored broken glass in large open top "roll-offs," or dumpsters, similar to those used for construction debris, that were left outdoors uncovered. UNICOR staff and a vendor at the warehouse said that rainwater would accumulate in the roll-offs and leak into storm drains that led to a nearby creek. They also described how dust and debris were dispersed by the wind when gaylord boxes of broken glass were dumped into the roll-offs. A vendor said that after dumping the glass in this fashion, which occurred every day that he visited the warehouse over a 3-year period, UNICOR staff would use a hose to wash the debris down the storm drain. This person said that he expressed concerns to Ginther about this practice because of the storm drain's connection to a creek.

A UNICOR staff member also told the OIG that the forklift driver who emptied the gaylord boxes was not given protective equipment and that he repeatedly asked without success to be relieved of this work because of the amount of dust that covered him after he dumped the boxes of glass. The Safety Manager and UNICOR staff also stated that cuts from glass breaking operations were commonplace.

Despite the existence of the information above, staff at FCI Elkton who worked in the e-waste recycling operations told the OIG that they were not advised by Ginther, Novicky, or local safety personnel that there were potential health and safety risks associated with e-waste recycling, including hazards from CRTs. To the contrary, they said that Ginther repeatedly assured them that there were no health risks related to computer disassembly and glass breaking operations. They also stated that they did not receive any training about hazards from CRTs until nearly five years after recycling operations started.

3. Installation of UNICOR's First Glass Breaking Booth

In approximately late September 2001, the Assistant Safety Manager at FCI Elkton started installation of a paint booth to contain the airborne glass breaking debris. He told the OIG that he was receiving complaints from inmates about the dust in the air and that he felt that something needed to be done about the ventilation. The booth connected to a large vent pipe that exhausted through the recycling factory roof. OIG interviews of UNICOR and Safety Office staff at FCI Elkton determined that no assessment was made of environmental requirements (such as permit requirements) related to emissions from the paint booth in 2001, and neither an industrial hygienist nor a ventilation engineer was consulted before the paint booth was installed.

The paint booth in the recycling factory appears in the photographs below:

PHOTOGRAPH 3.2
FCI Elkton Glass Breaking Area, November 2001

PHOTOGRAPH 3.3
FCI Elkton Glass Breaking Area, November 2001

In October 2001, Maria Lancaster of the Product Support Center visited FCI Elkton to evaluate the recycling operations. Lancaster sent an e-mail to Ginther and Recycling Business Group Program Manager Carol Minnick (later forwarded to Novicky) stating that recent testing was fine "for OSHA purposes" but that FCI Elkton should check its compliance with EPA regulations or any state or local regulations. She told the OIG that after seeing the paint booth she advised Ginther that he needed to check to make sure it was in compliance with EPA air requirements and should test its filters to determine whether they constituted hazardous waste.

The Assistant Safety Manager at FCI Elkton also told the OIG that shortly after the paint booth was installed he informed Ginther that it needed to have filters and that the filters should be tested to determine if they constitute hazardous waste. Our investigation determined, however, that UNICOR did not follow Lancaster's or the Assistant Safety Manager's recommendations concerning the testing of glass booth filters. The filters were not evaluated until 2005, when they were found to be hazardous. Testing also was not conducted on the filters for the factory's ventilation system until 2007, when those filters also were determined to be hazardous.

UNICOR and BOP staff told the OIG that the ventilation system in the new paint booth was only partially successful in removing the airborne dust and debris from the recycling factory and that it created new problems. Staff and inmates at FCI Elkton began to complain that the debris that was being blown onto the roof of the recycling factory started to rain down on the loading dock of the factory and on the prison yard where inmates frequently assembled. The HVAC technicians also stated that the debris on the roof was being brought back into the recycling factory and other parts of the institution through air intake ducts that were located on the roof. A General Foreman at FCI Elkton who supervised the HVAC technicians told the OIG that the technicians took him on the roof to see the debris and that he was "shocked" by what he saw and that he prohibited them from going back on the roof.

UNICOR continued sending the debris from the glass breaking operations through an exhaust pipe on the roof of the UNICOR factory until approximately February 2003. This activity continued despite multiple written requests from Safety Manager Martin to former UNICOR Superintendent of Industries Adam Norberg and Factory Manager Shannon requesting that filters be installed that would prevent "particles from the glass recycling dust exhaust system [from] being introduced into the outside environment."

Another problem that continued after installation of the paint booth in the recycling factory was the build-up of dust on fire alarm duct detectors or smoke sensors located on the factory's air ventilation ducts. The electronics technicians who serviced the fire alarm system said that the dust in the recycling factory frequently caused the fire alarms to activate. One of the

technicians, Roger Hammond, told the OIG that he participated in meetings with UNICOR and BOP managers where the problems with the dust in the recycling factory and fire alarm system were discussed and that UNICOR did not like the proposals that the BOP staff generated to address the problems due to their cost. Hammond told the OIG that he eventually was instructed by Alan Ferguson, former General Foreman and Facility Manager at FCI Elkton, to prevent the duct detectors from activating. He complied by taping the detectors so that they could not sample air. The detectors remained taped off for more than 3 years, when they were inspected and repaired by technicians in September 2005 following Hammond's transfer to a different BOP institution.

4. Delays in Upgrades to the Glass Breaking Booth

As detailed below in parts II.B and II.D of this Section, UNICOR experienced significant problems with glass breaking operations at USP Atwater and FCI La Tuna during 2002, which resulted in suspending operations at both institutions in July 2002. In response to these events, in late July 2002, Carol Minnick, a Program Manager for the Recycling Business Group, e-mailed Superintendent of Industries Norberg and Factory Manager Shannon stating that they needed to make several procedural changes at FCI Elkton concerning worker safety, including modifying the ventilation system for the glass breaking operations, ensuring that workers in the "glass processing area" wore respirators, and prohibiting food and drink in that area.

The latter two requirements were subsequently included in UNICOR Headquarters' first written safety procedures for glass breaking, which were issued to all recycling Factory Managers and Production Controllers on August 13, 2002. Minnick sent Norberg and Shannon another e-mail in September 2002, which was copied to Novicky, stating that she had not received a response to her earlier e-mail and inquiring whether they had made a decision on a "filter system."

Our investigation determined that although UNICOR authorized the expenditure of funds for improvements to the FCI Elkton recycling factory's ventilation system in early July 2002, UNICOR staff at FCI Elkton failed to order new equipment for a glass booth until 6 months later, in January 2003. Construction of the improvements was not completed until April 2003. In the interim 10 months (except for a few weeks in February and March), the glass breaking operations continued at the FCI Elkton recycling factory using the paint booth that the Assistant Safety Manager had installed in the fall of 2001. Emissions from the paint booth were not halted and became a concern to Martin, the Safety Manager, who cited UNICOR in his monthly safety inspection reports in October and November 2002, and January 2003, for exhausting debris from the glass breaking operations outdoors. Norberg,

Shannon, and the Wardens at FCI Elkton are identified on these reports as recipients.

UNICOR staff also delayed implementation of the recycling policies UNICOR Headquarters issued in August 2002. For example, during an inspection that the Recycling Business Group conducted in February 2003 at FCI Elkton, UNICOR Program Manager Minnick observed that none of the inmates in the glass breaking area had coveralls, only one of the inmates was wearing a respirator, other inmates were wearing only "thin dust collection masks," and an inmate was consuming a beverage. According to a report prepared by Minnick, when she asked Shannon about providing better respiratory protection to the inmates, he responded that the "higher grade" dust masks were twice the price and required special handling precautions due to their expense, and therefore had not been purchased.[48]

5. Installation of a New Glass Booth

In June 2003, UNICOR opened a new glass booth that was enclosed with walls and a ceiling. Detailed information about testing performed on this booth is provided in FOH's report on e-waste recycling at FCI Elkton. Although the booth improved the capture of airborne dust and debris, its ventilation system required modifications to comply with OSHA's lead standard. The booth remained operational until 2008 when UNICOR ceased glass breaking operations at FCI Elkton. A photograph of the booth appears below.

[48] Shannon was placed on a performance improvement plan following Minnick's inspection.

PHOTOGRAPH 3.4
Glass Breaking Booth, FCI Elkton, 2007

B. USP Atwater

UNICOR began planning in August 2000 for an e-waste recycling factory at USP Atwater in California. The new plant opened in April 2002, and within weeks inmates began disassembling and breaking CRTs. Since that time UNICOR typically has employed 5 to 8 staff members and up to 150 inmates at USP Atwater. The volume of e-waste received has generally varied between 2 and 6 million pounds annually.

Because problems at USP Atwater in 2002 led to significant changes the following year in the Recycling Business Group's policies and procedures, we describe events at Atwater in detail below.

1. Planning for Glass Breaking Operations

After planning for the new USP Atwater recycling factory began in 2000, UNICOR officials held at least nine "activation" meetings before the factory opened to discuss operational details. The activation meetings largely focused on operational details, such as the size of the factory, the placement of closets and drains, and the number of employees that would need to be hired, and included only limited discussions about future glass breaking activities. For example, the minutes from the second planning meeting for the activation of the recycling factory, held in September 2000, show that UNICOR and USP Atwater officials discussed "[t]he issue of handling hazardous materials related

to computer monitors." However, UNICOR officials did little to follow through on these concerns. Environmental and health issues were not mentioned in the minutes of the final four planning meetings held between March 2001 and April 2002.

As described in Section II.A, while the planning for USP Atwater's recycling operations was underway between August 2000 and March 2002, UNICOR staff obtained information revealing health and safety issues associated with glass breaking operations at FCI Elkton. These included Ginther's receipt of a copy of correspondence between the State of Wisconsin and a processor of computer monitor glass in February 2000 that showed exceedances of the OSHA cadmium standard resulting from the dust of crushed CRT glass, and warnings from DRMS about handling e-waste and CRTs. We found no evidence that this information was shared with safety or executive BOP staff at USP Atwater before its e-waste operations started, or that the 2001 FCI Elkton testing results were shared. In addition, as described in Section II.C, UNICOR started glass breaking operations at FCI Texarkana in December 2001. The Factory Manager at FCI Texarkana, Eric Fabian, told the OIG that he understood that there were no safety issues with glass breaking and that he asked about it during a tour of FCI Elkton in September 2001 after seeing debris in the air. He said that he was told by staff who participated in the tour, which included Novicky, that the airborne dust and debris had been tested and was "fine." We found no evidence that safety information was coordinated among UNICOR Headquarters, FCIs Elkton and Texarkana, and USP Atwater.

The USP Atwater employee with the most training in health, safety, and environmental issues – Safety Manager Leroy Smith – did not attend any of the Atwater recycling factory activation meetings. In fact, Smith said, he was not included in the general planning process for the recycling factory until November 2001, well after most of the planning was complete, and after UNICOR had formally notified state and local environmental agencies in October 2001 that the Atwater facility would be "handling" CRTs.

Once Smith became involved, he tried to alert officials to possible problems. In November 2001, Smith sent a memorandum to Factory Manager Barry Harlow and Associate Warden Samuel Randolph, warning that CRTs "contain lead, cadmium, and other harmful metals" and that recycling them "may cause a health concern to staff and inmate workers." Smith recommended conducting an "environmental risk/health assessment" before breaking any CRTs.

Two months later, in January 2002, Smith sent a "reminder" memorandum to the same officials. In the memorandum, Smith noted that according to Associate Warden Randolph, Novicky had decided that an environmental assessment was unnecessary since there were "no hazards"

associated with CRT recycling. Smith's memorandum "strongly" urged the completion of an environmental risk and health assessment, if only "to ensure there is documented analytical data to support" Novicky's claim that CRT recycling was safe. Smith told us that in response to his two memoranda, Randolph and Novicky told him that there was no reason to be concerned, that Novicky was not willing to pay for "testing that was not necessary," and that, in any case, it was not Smith's concern.

Smith sent a third request in March 2002 to Randolph, shortly before the factory opened, asking for a hazardous waste analysis of the contents of CRTs. This request, which was more limited than the previous requests for a full environmental and health assessment, also was not acted upon. A "second reminder," sent in May 2002, was ignored as well. Novicky told the OIG that he was aware that Smith "had a lot of concerns" before the glass breaking operations started at USP Atwater, but that he had never seen Smith's memoranda and wished he had.

However, Smith was not the only official who was alarmed about the risks associated with recycling CRTs who Novicky and Randolph ignored before the factory opened. In 2001, the UNICOR Production Controller at USP Atwater suggested buying a machine that would completely enclose the CRTs before crushing them, thus containing any toxic metals released during the destruction. The Production Controller told the OIG that in 2001 "everybody knew what was in those monitors" and that they contained cadmium and lead. She stated that she tried to "sell" the machine to Randolph and Novicky by arguing that it would be safer and ultimately cheaper because it would contain all the toxic debris from the CRTs. She told us Novicky and other UNICOR officials refused to buy the machine because, at approximately $100,000, it was deemed "too expensive."

At about the same time that the Production Controller was promoting the glass breaking machine, Novicky was holding discussions with a private company that wanted to help set up and operate the USP Atwater recycling facility. The company's proposal noted that a CRT disassembly area was needed that would be "sealed off" with rubber curtains and include a dust collection machine. Although those discussions ultimately were terminated, UNICOR documents show that the private company told UNICOR that it would be necessary to "make sure that the OSHA coordinator is up to speed on the required training and protection of the workers involved in the different operations" before opening any recycling facility.

2. Start of Glass Breaking Operations and Initial Problems

After the new factory at USP Atwater opened in early April 2002, inmates initially broke CRTs in a work area on the factory floor, not inside an enclosed space. Starting on approximately May 1, 2002, UNICOR moved its glass breaking operations into a glass breaking booth that was located in a mezzanine area with walls on three sides and an opening to the factory on the fourth. The booth, which was designed and sold as a paint booth but then set up and modified for glass breaking by a UNICOR employee and several inmates, had fans at the rear that drew air from the front of the booth towards the back and then through two filters before exhausting it back into the main factory.[49]

PHOTOGRAPH 3.5
Glass Breaking Booth at USP Atwater, 2002

Procedures to handle the CRTs were crude. Inmates told the OIG that they would hold two CRTs over a large box and smash them together, allowing the pieces to drop into the box, or smash the CRTs onto other hard objects. These practices were later criticized by the BOP's industrial hygienist, Brett Sachs, because they generated excessive dust and debris. Other inmates said they used hammers to break the tubes in the boxes. Along with performing

[49] An inmate told us that inmates had asked the Factory Manager about venting the exhaust to the outdoors, but had been told that it could not be done because "it would cost too much" and would require BOP approval "to cut holes in the wall and redesign the building."

other disassembly activities, the inmates broke approximately 500 CRTs per day.[50] Protective equipment furnished to the inmates who performed this work included gloves, Kevlar sleeves (to protect their arms), safety glasses, ear plugs, and dust masks. Respirators were not provided.

Soon after glass breaking began, UNICOR staff and inmates started noticing dust and particles in the factory air that appeared to have come from the broken CRTs. They described the dust conditions in the USP Atwater recycling factory in consistent terms, using words to describe the air such as "filthy," "foggy and dark," and "like a foggy mist" or "haze." Dust from the handling of the filters from the glass booth was another serious problem. Initially, dirty filters were re-used after they had been vacuumed by inmates wearing dust masks (but not respirators approved for toxic metals). During the cleaning, "dust would be flying everywhere" one inmate told us, and the dust from the vacuums would be thrown into the regular trash. After the filters got too dirty, they, too, would be thrown into the regular trash.

In a May 1, 2002, memorandum, Safety Manager Smith expressed his concern to USP Atwater and BOP supervisors regarding the hazardous metals content of the used glass breaking booth filters and the procedures for handling them during replacement, and recommended that an outside lab analyze them.

On May 9, 2002, Smith repeated a request he already had made several times earlier for a full environmental and health risk assessment of the glass breaking operations. Short of that, "as a precautionary measure," Smith asked UNICOR to provide respirators to anyone breaking glass. According to Smith, both of these requests were denied. Smith told the OIG that he participated in a conference call with Novicky and Associate Warden Randolph to discuss inmate safety and that Novicky refused to purchase respirators due to their cost, and that Randolph refused his initial requests for filter testing after he conferred with the Recycling Business Group.

Despite the concerns Smith expressed about the glass breaking operations, we found that UNICOR personnel repeatedly reassured USP Atwater staff and inmates that their work environment was safe. For example, staff said that Randolph regularly told them that there was no reason for concern. Randolph later told us that he made those assurances even though he had been concerned about the safety of the glass breaking process, because he had been assured by Novicky that there "ain't nothing wrong with it" and that UNICOR "had not conducted any exposure assessment tests because there were no hazards to assess." Novicky told the OIG that based on UNICOR's

[50] This number was reduced to 450 after USP Atwater obtained an air permit exemption in 2003.

prior testing, he did not believe that there was a problem with UNICOR's glass breaking operations.

In response to concerns over the excessive dust, on June 20, 2002, over 2 months after glass breaking began, Smith used money from the Safety Department budget to hire a consulting firm to test the quality of the air in the factory.[51] The results, which came back on June 27, showed that the air inside the glass breaking booth was contaminated with cadmium at levels that greatly exceeded the applicable OSHA standard.[52] Smith, invoking his powers as a safety officer, shut down the glass breaking booth the next morning.

In a memorandum to his supervisors, Smith wrote that the booth could be re-opened only after new safety measures had been implemented, including blood tests of all staff and inmates for cadmium and lead exposure and the purchase of respirators with cartridges that filter out toxic metals. In early July 2002, Smith further advised his supervisors that tests of the used filters, conducted at the expense of the USP Atwater Safety Department, found concentrations of lead, barium, and cadmium that made them hazardous wastes under EPA guidelines. Smith stated that the filters would have to be handled as hazardous waste, with appropriate training, personal protective equipment, and handling procedures.[53]

On July 11, 2002, at UNICOR's request, the BOP made its industrial hygienist, Brett Sachs, available to assist with problems at USP Atwater. Sachs began by helping UNICOR and Atwater officials to analyze the air quality tests and understand what changes were needed. However, Sachs was never deeply involved in solving USP Atwater's contamination problems. Instead, he told us he was generally "on the fringes" of the issue and was consulted only from time to time to answer specific questions or conduct specific tests.

In addition, Smith said that Novicky and Randolph prevented him from obtaining information about recycling operations at other BOP institutions. BOP e-mails show that on July 10, Randolph informed Novicky in an e-mail that Smith was asking questions about the other e-waste factories. Randolph informed Novicky that he had spoken with the Warden and obtained

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[51] Smith said that because UNICOR executives had refused to pay for the tests using UNICOR money, Smith instead got permission from the Warden to use approximately $2,500 from the Safety Department's budget.

[52] The testing also revealed significant lead contamination, including possible exceedances of the PEL, provided certain conditions were met. See FOH's report on USP Atwater for additional information on testing results.

[53] The former Production Controller at Atwater told us that disposing of the filters as hazardous waste was expensive. The Production Controller advised Ginther in March 2003 that USP Atwater would spend $40,000 to $50,000 in the upcoming year on hazardous waste disposal, an issue that Minnick promptly brought to Novicky's attention.

assurances from him that Smith should only be concerned with events at USP Atwater. Smith also told the OIG that after he halted glass breaking operations at USP Atwater, Novicky told him in a conference call that he needed to "back away" from issues regarding UNICOR's glass breaking operations because he did not have the ability to address those issues appropriately, and that Recycling Business Group Program Managers and the BOP's National Safety Administrator, Steve Tussey, adopted a similar approach to his efforts. When we asked Novicky about this, he told us that he did not want Smith telling other Safety Managers that UNICOR was running unsafe operations until UNICOR had more documentation.

As described below, as a result Smith limited his communications with other safety staff. However, Smith said he requested that Novicky provide him with any UNICOR hazard assessments that showed that there were no health and safety concerns with glass breaking operations elsewhere but that Novicky refused to cooperate with him.

In mid-July, the USP Atwater Warden, Ron Tabor, sent a 5-page memorandum to the BOP's Western Regional Director and UNICOR's Chief Operating Officer, Steve Schwalb, describing the recent test results and outlining his concerns with the e-waste recycling program. He warned that there were at least four similar UNICOR glass breaking operations that had not had risk assessments performed.[54] He urged UNICOR leaders to pay for and develop a plan that would allow USP Atwater and the other recycling facilities to operate safely. Tabor told us that he wrote the memorandum to keep the Regional Director informed.

Approximately a month later, Smith sent a memorandum to BOP Safety Managers at three other institutions outlining the problems he had found at USP Atwater.[55] The memorandum, dated August 12, 2002, warned among other things that inmates and staff were being exposed to dangerous levels of toxic metals and that the filters that collected those metals should be treated as hazardous wastes. Smith also suggested that UNICOR should be required to fund safety initiatives. Smith told the OIG that with the exception of a phone call to the Safety Department at FCI Elkton, he refrained from contacting other institutions until he obtained approval from the USP Atwater Warden to send his memo to other Safety Managers. He said that he delayed

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[54] At that time, in addition to the glass breaking operations underway at FCIs Elkton, Atwater, and Texarkana, FCI La Tuna had initiated glass breaking operations, beginning in June 2002. In addition, planning was underway for additional glass breaking sites at FCI Ft. Dix and USP Lewisburg. The operations at FCIs La Tuna and Ft. Dix and USP Lewisburg are discussed in Sections II.D, II.E, and II.G.

[55] According to Smith, he sent this memorandum at the instruction of the USP Atwater Warden. Smith said that he sent the memorandum to safety staff at FCIs Elkton and Ft. Dix and USP Lewisburg, although the memorandum was addressed to "All Safety Managers."

these communications due to the "threats" he received from Novicky and others about contacting institutions with glass breaking operations.

We found no evidence that the memoranda prepared by Smith and Tabor led UNICOR headquarters to address the health and safety issues associated with CRT recycling by developing the suggested UNICOR-funded safety program.[56] Instead, UNICOR managers responded with incremental, ad hoc adjustments.[57] Novicky sent a memorandum to all recycling facilities on August 13, 2002, that for the first time identified rudimentary procedures for all glass breaking operations but did not require implementation of the UNICOR-funded safety program recommended by Tabor and Smith. Instead, Novicky prescribed adjustments to the factories' existing practices, such as requiring inmates in glass breaking areas to wear respirators, gloves, and coveralls, as well as forbidding food, drink, and cigarettes in those areas. As described below, this approach led to needless delays in fully protecting staff and inmates at all UNICOR e-waste recycling facilities.

Another UNICOR employee also told us he expressed concerns to Novicky about health hazards associated with glass breaking operations during 2002 and 2003. Coleman Daggett, a Recycling Business Group Program Manager at UNICOR Headquarters who initially was assigned responsibilities related to glass breaking operations and environmental compliance, told the OIG that he complained repeatedly to Novicky that the glass breaking operations that he inspected, including USP Atwater's, were not safe due to the heavy particulate matter and lack of adequate ventilation. Dagget said that Novicky became "visually upset" in response to his complaints. He said that after he complained for the third time Novicky reassigned his glass breaking duties to the Recycling Business Group's other Program Manager, Carol Minnick. Novicky told the OIG that he did not recall such a disagreement with Daggett,

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[56] Smith also later wrote to BOP and UNICOR executives about his concerns. We believe that Smith's decision to elevate his concerns to senior managers was appropriate. For In September 2004 he notified Director Lappin of hazards associated with breaking CRTs and recommended that qualified professionals complete health and environmental assessments at UNICOR's e-waste factories. The BOP's Health Services Division sent its industrial hygienist to USP Atwater that month to address problems that Smith had identified. Moreover, Director Lappin later recommended that the OIG investigate UNICOR's e-waste recycling program after learning that Smith's complaints may not have been adequately addressed by a BOP internal investigation.

[57] At some point, UNICOR officials apparently contacted an environmental consulting firm with expertise in the necessary areas, for help with the problems at USP Atwater. Documents found in UNICOR files show that in August 2002 the firm drafted a "compliance plan" that proposed new UNICOR policies and procedures designed to "keep exposures to hazardous chemicals . . . at the lowest practical levels." Although this plan was developed especially for USP Atwater, no USP Atwater or UNICOR official we interviewed said they remembered seeing the proposed plan, and there is no indication that it was ever used to improve safety in the recycling factory.

and that he reassigned glass breaking duties from Daggett to Minnick because Minnick had more BOP experience.

3. Attempts to Resolve Problems with Glass Breaking

During the 18 months following the adverse testing results in June 2002, Atwater officials repeatedly modified the design of and equipment in the USP Atwater glass booth, as well as the techniques used for breaking the glass, in an attempt to restart operations and break CRTs safely. For example, documents show that in September 2002 the booth was enlarged and plastic curtains and additional fans were installed to help direct air flow towards the back. Industrial hygienist Sachs made his first visit to a UNICOR recycling factory that month, touring USP Atwater and making recommendations to improve the booth's design. He later told the OIG that the glass breaking booth he saw at USP Atwater was a "Mickey Mouse hodgepodge." Additional modifications were made in November 2002.

During the same time frame, in an additional attempt to reduce the dust, UNICOR instructed the workers to break the CRTs using a few strategically-placed taps with a small hammer. One UNICOR employee told us that UNICOR stopped using the small dust masks and instead gave inmates who were breaking glass respirators with high-efficiency particulate air (HEPA) filters that did a better job of filtering the air they breathed.[58] (This change was consistent with the instructions issued by Novicky in August 2002, as discussed above).

Although these and other changes led to some reduction in the generation of dust, tests throughout 2002 and 2003 showed that the air quality inside the glass booth still failed to meet OSHA standards. Moreover, these tests were conducted in conditions that were not likely to detect the full scope of contamination that occurred during routine glass breaking operations. Staff and inmates told us that work was slowed while the testing was performed. As a result, while computer disassembly continued during these years, glass breaking was stopped after each test showing excessive contamination, and the glass breaking re-opened some time later after some remedial modifications had been made.

Smith said that the booth was not closed as often as it should have been. More than once, Smith said, he would order the booth closed but find several days or weeks later that it had been re-opened without his permission.

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[58] Besides these modifications, other proposed changes were rejected. Smith stated in a July 2002 memorandum to his file that he had asked Randolph and Novicky that HEPA filters be installed in the booth because the exhaust system discharged the air back into the factory, but that they refused because of the cost of the HEPA filters. These filters were not used at USP Atwater until sometime after June 2003.

Novicky told the OIG that he would instruct Associate Warden Samuel Randolph to restart operations in order to perform testing following a modification to the glass booth. Randolph disputed this, stating that Novicky would order him to restart operations to keep up with production and prevent a backlog from developing.

During the times the booth was operating, UNICOR staff was also not consistently diligent in their efforts to operate it safely. For example, documents reveal that in January 2003 the glass booth was operated for an indeterminate length of time – possibly as long as 7 days – without any filters on the exhaust fan. Because the air in the glass booth was sent directly into the factory, the factory air was more contaminated during that period than normal. According to Smith and memoranda that he prepared at the time, when he was alerted about the problem he promptly ordered the booth shut down until the filters could be installed, but Randolph overrode his instructions.

Events at USP Atwater resulted in the Recycling Business Group issuing revised glass breaking procedures in June 2003. The new 14-page policy replaced the single page of instructions that the Recycling Business Group issued in August 2002, and provided guidance on numerous issues including ventilation, personal protective equipment, medical surveillance, cleaning procedures, and permitting.

Inmate injuries from broken glass were also a problem when the booth was operating. One staff member said that in the first few months of glass breaking at USP Atwater one to three inmates a week would have to seek medical attention due to serious glass cuts. Another UNICOR employee told us that the cotton gloves initially purchased for the workers were not thick enough, nor were the thin leather gloves that replaced them. The Kevlar sleeves that were designed to protect the workers' arms did not work well either, he said. Eventually, according to the employee, UNICOR bought better gloves and sleeves and modified the techniques for breaking the CRTs, which resulted in fewer cuts to the inmates.

In addition to insufficient protective equipment, inadequate tools also contributed to inmate injuries. In October 2002, the Assistant Director of the Health Services Division wrote to Warden Tabor at Atwater stating that BOP industrial hygienist Sachs had learned from a recent inspection that "numerous cuts and scrapes have been reported on the production lines" at USP Atwater and that inmates were using tools incorrectly and lacked tools to properly perform their duties. Sachs recommended that appropriate tools be provided to the inmates in the USP Atwater recycling factory in order to limit injuries. However, in April 2004, Program Manager Minnick inspected USP Atwater's recycling operations and determined that inmates still lacked appropriate tools. In her trip report to Novicky, Minnick cited Sach's earlier

observations. Minnick's site visit was followed in October 2005 by an inspection from OSHA, which also noted that inmates lacked access to proper tools for certain disassembly operations.

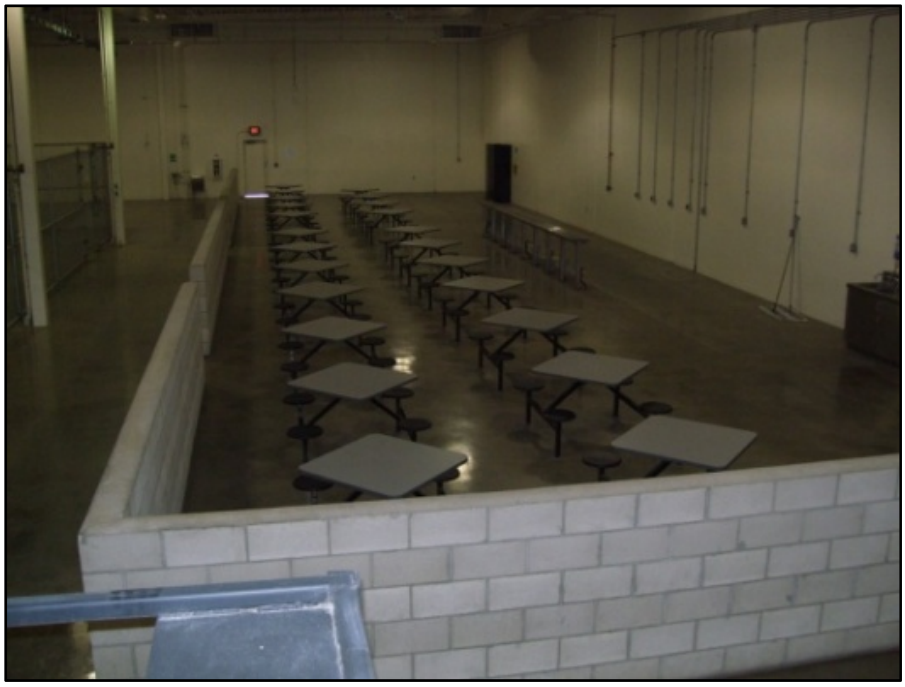
Safety Managers at FCIs Ft. Dix and Texarkana and USP Lewisburg told us that information about inmate injuries was not shared between recycling factories and that they were not informed before starting glass breaking operations about problems with cuts and what gloves and protective gear were being utilized elsewhere to protect inmates. These managers told the OIG that they would have wanted to know what was being done at other institutions but were not aware of the problem.

Another concern associated with USP Atwater's glass breaking activities was potential dust contamination of food in the recycling factory's inmate dining area. Inmates complained that their food was exposed to dust by the time they ate it. In May 2003, Smith wrote to the Factory Manager, Nicole Taft, stating that he believed that testing needed to be performed. Wipe sampling was not conducted on tables in the dining area until October 2004 by the BOP industrial hygienist, who reported in December that the wipes showed detectable levels of several toxic metals, including cadmium. After citing the applicable OSHA regulation which provides that "[n]o employee shall be allowed to consume food or beverages in a toilet room nor in any area exposed to toxic material," the hygienist recommended that the food service area be isolated from the recycling factory "with doors, walls, and ceiling surfaces," and a separate ventilation system installed.[59] Even after receiving this recommendation in early December, UNICOR did not stop feeding inmates in the unprotected dining area. Novicky informed Taft on January 5, 2005, that he wanted to remove the dining area from the UNICOR factory "expeditiously." However, dining service was not halted until March 1, 2005. The Factory Manager told the OIG that planning was underway in the interim concerning the movement of the UNICOR inmates from the factory to the institution dining hall.

A photograph of the former inmate dining area appears below.

[59] 29 C.F.R. 1910.141(g)(2). Single air samples were collected in January and February 2004 by a contractor, which showed small amounts of lead. FOH determined that these limited tests were inadequate to draw conclusions about the safety of the dining area. See FOH Report on USP Atwater.

PHOTOGRAPH 3.6
Former Dining Area Inside the UNICOR Factory at USP Atwater, 2007



In addition to problems with toxic metal contamination, storage of the monitors created hazards for staff and inmates. For example, even though the glass booth was closed at times, computers and TVs kept arriving. As a result, USP Atwater started to overflow with unbroken CRTs and TV screens. UNICOR staff told the OIG that the boxes of monitors were stacked to the rafters in the factory and created a safety hazard due to the risk that the boxes would fall over. By March 2003, documents show, USP Atwater officials had run out of room inside and had taken 65 large cardboard boxes full of CRTs, plus another 2,500 televisions, and stored them outside.

On November 1, 2003, a fire started in one of those outside boxes and quickly spread. Substantial damage was done to the equipment that was stored outside, and the water used to extinguish the blaze spread into the surrounding area and a nearby drainage ditch. When officials learned that the water was contaminated with hazardous metals, UNICOR had to pay approximately $185,000 to have a private company clean up the resulting contaminated soil, according to the Production Controller.

In September 2004, Safety Manager Smith provided numerous allegations of misconduct to the Director of the BOP and the Office of Special Counsel regarding UNICOR's e-waste program, including that staff and inmates had been endangered by glass breaking operations at USP Atwater. On November 15, 2004, the Office of Special Counsel requested an investigation of Smith's allegations after concluding that a substantial likelihood existed that

the actions taken by employees of the BOP and UNICOR violated laws, rules, or regulations; amounted to an abuse of authority; or created a substantial and specific danger to public health and safety. The BOP's Office of Internal Affairs conducted an investigation and found that Novicky committed "Inattention to Duty" by failing to ensure that sufficient research on CRT recycling was conducted before recycling operations started at USP Atwater. That investigation further determined that Novicky was inattentive to his duties when, after testing at USP Atwater showed exceedances of OSHA occupational exposure limits, he failed to stop all CRT recycling long enough to guarantee that additional exposures would not occur.[60] The BOP also found that Randolph endangered staff and inmates when he failed to immediately suspend operations in the glass booth after learning that it lacked filters.

UNICOR eventually decided to cease glass breaking operations at USP Atwater in March 2005. By that time, UNICOR had moved the glass booth from the main factory into a room on an adjacent loading dock and vented the air from the booth to the outdoors. Even then, the glass booth was used only sporadically because air testing continued to show unacceptably high levels of contamination inside the booth.

C. FCI Texarkana

Recycling operations at FCI Texarkana in Texas began in October 2001 with two recycling technicians and approximately 15 inmates. E-waste was received at a warehouse outside the main prison compound and processed there, as well as in the basement of the UNICOR factory inside the FCI. UNICOR's e-waste program at FCI Texarkana quickly expanded and employed approximately 6 staff members and between 80 to 150 inmates that recycled roughly 6 to 8 million pounds of electronics annually.

According to the recycling Factory Manager, Eric Fabian, before opening the new recycling factory, UNICOR staff from FCI Texarkana travelled to FCI Elkton in September 2001 to observe recycling practices there. Fabian told the OIG that the glass breaking operation at FCI Elkton "caught my attention" because of the visible debris in the air and that the inside of the recycling factory looked like a "flurry day." Fabian said that along with other staff from

[60] The BOP issued a written reprimand to Novicky in 2006 for Inattention to Duty related to the activation of the USP Atwater glass booth and for his failure to order a shut-down of the booth after he learned that it was operating without filters in early 2003, as described below. The letter subsequently was removed from Novicky's personnel file, however, pursuant to a settlement between Novicky and the BOP in 2007 that resolved a complaint that Novicky filed with the Equal Employment Opportunity Commission alleging age discrimination. Novicky told the OIG that he felt he was "being targeted as a scapegoat for the [BOP's] investigation and consequently I didn't agree with their findings."

FCI Texarkana he asked whether the factory was safe, and was told that air samples had been taken and there was not a problem.

Fabian stated that when he returned to FCI Texarkana he worked with his staff to design procedures to eliminate the airborne particles resulting from breaking CRTs. He said that he did not receive much assistance from UNICOR Headquarters in designing the new factory and setting up operations. Fabian recalled a visit from Ginther and staff from FCI Marianna, but he said that decisions about the initial layout of the work areas were made locally. He noted that UNICOR did not have written procedures to assist staff until 2003.

In December 2001, UNICOR began glass breaking operations in the basement of the UNICOR factory at the FCI. According to the recycling technician who oversaw those operations, the inmates at times broke more than 1,000 monitors per day. To limit the amount of visible debris in the air, Fabian said that he installed a dust collection hood over the area where the monitors were broken, and connected it to the ventilation system for the furniture factory on the floor above the recycling operations. Staff told the OIG that the ventilation system in the recycling factory lacked filters and the dust from the glass breaking was collected in a box outside of the furniture factory and placed in the trash.[61] Fabian told the OIG that no one informed him that the dust from glass breaking could be hazardous.

UNICOR staff and inmates told the OIG that despite UNICOR's efforts to exhaust the glass breaking debris, large quantities of dust were generated from breaking the monitor glass and were released into the factory. One UNICOR staff member said that the area where monitors were broken "most days was like a snowstorm," and that containment of the dust was difficult because fans used to cool the workers would blow the debris through the factory and staff and inmates would track it around as they walked. Inmates who worked at tables disassembling computers adjacent to the glass breaking area told the OIG that UNICOR's efforts to contain the debris were not successful and that their work areas often were covered in dust.

FCI Texarkana inmates who broke glass were not initially provided respirators. Fabian stated that inmates were given paper dust masks, not respirators, though the recycling technician who oversaw glass breaking said that he did not distribute dust masks until approximately six months after the glass breaking started. Respirator fit testing, or evaluating the respirator's seal on the user, was conducted by September 2002, according to Fabian, and inmates breaking glass had respirators by October 2002, when industrial

[61] A former Associate Warden at USP Atwater who visited FCI Texarkana told the OIG that the debris from the glass breaking operation was mixed with sawdust from the furniture factory. He said that the sawdust was being sold to a particle board manufacturer.

hygiene testing was first performed on Texarkana's recycling operations.[62] This was consistent with the first set of glass breaking procedures sent out by UNICOR Headquarters in August 2002 in the wake of the June 2002 USP Atwater test results. UNICOR records do not reflect whether glass breaking at FCI Texarkana was suspended prior to inmates receiving their respirators.

The Safety Manager at FCI Texarkana, Louis Gabriel, stated that UNICOR did not inform him of any hazards associated with e-waste recycling, including the breaking of CRTs. UNICOR staff and inmates also told the OIG that they did not receive training on possible hazards from glass breaking operations during 2001 and 2002. Gabriel told the OIG that "[w]e really didn't have a whole lot of information at the start of this" but that he had learned from Fabian that the (August 2001) testing results at FCI Elkton had established that the dust from glass breaking did not pose a hazard. He stated that over time, however, he became concerned with the dust conditions resulting from the glass breaking operations and insisted that UNICOR perform testing.

Fabian told the OIG that he became dissatisfied with the working conditions at the UNICOR factory at the FCI in the spring of 2002 and decided to relocate the glass breaking booth to a barn at a prison camp adjacent to the FCI in approximately May of that year. UNICOR staff told the OIG that the barn was extremely dirty and that the dust from the glass breaking operation was exhausted directly outdoors using a large fan that was built into the wall. Inmates were furnished the same protective equipment that they had at the FCI and therefore lacked respirators. Fabian and other UNICOR staff said that glass that was processed at the barn kept getting rejected by UNICOR's glass recycler due to contamination and mixing of panel and funnel glass, and that UNICOR decided to bring the glass breaking back to the FCI where it could be better supervised.

In approximately September 2002, UNICOR returned its glass breaking operations to the basement of the FCI. Fabian stated that he had his staff construct a new glass breaking booth from plywood, screen, and plastic before restarting the glass breaking operation because he wanted to better control the debris from the broken glass. He said that he designed the new glass breaking booth with assistance from his two recycling technicians.

UNICOR staff told the OIG that the new glass breaking booth was an improvement, but the recycling technician who oversaw it stated that debris was still exiting the glass breaking area and "was everywhere" in the factory. Fabian told the OIG that he never consulted with an engineering firm about the

[62] UNICOR documents show that inmates who broke glass wore dust masks as of August 2002.

design of the glass breaking booth. He stated that he was not aware that there were hazards that warranted seeking such advice. He also stated that he did not recall anyone from UNICOR Headquarters sharing with him adverse testing results from other factories, such as USP Atwater.

Safety Manager Gabriel said that by late September 2002 he informed Fabian that he was prepared to shut down the glass breaking operations if testing was not performed. Gabriel stated that UNICOR agreed to perform the testing and that the Warden was supportive. Fabian also told the OIG that Gabriel insisted that the testing be conducted.

Gabriel also told the OIG that UNICOR never notified him of the testing results at USP Atwater in 2002 and 2003 showing exceedances of OSHA occupational exposure limits for cadmium and lead. He said he felt it would have been helpful to him as the Safety Manager to know about the tests. We found that medical surveillance was not instituted at FCI Texarkana until more than six months following the first USP Atwater test results in June 2002, even though inmates had been breaking glass without respirators since December 2001.

As noted above, in May 2003 the Recycling Business Group distributed new glass breaking procedures that addressed permitting, engineering controls, safety equipment, respiratory protection, cleaning requirements, and medical surveillance of recycling staff and inmates. After receiving the new policy, Fabian made repeated requests to Program Manager Minnick to upgrade the glass breaking booth, stating that it was "not up to standard." However, the Recycling Business Group delayed the upgrade even though Minnick acknowledged in an e-mail to Novicky 6 months following Fabian's first request that "Texarkana is currently operating a glass operation with no 'booth' (per se) that is similar to the other locations."

UNICOR Headquarters eventually authorized approximately $19,000 in funding to replace FCI Texarkana's glass breaking area. The new "booth" opened at the camp warehouse in June 2004, and eventually included a 7-zone design that separated the glass breaking area from areas where inmates change clothes and deliver CRTs to the glass breakers. The FCI Texarkana glass booth is depicted in Diagram 2.3. Fabian told the OIG that he kept glass breaking operations running following his requests for an upgrade in the summer of 2003 because UNICOR Headquarters instructed him to do so.

Our investigation also determined that as late as 2008, Fabian and Gabriel were not aware that filters from glass breaking operations at other UNICOR facilities were handled as hazardous waste. Testing performed by UNICOR in 2009 on FCI Texarkana's filters confirmed that they exceeded

toxicity-characteristic regulatory levels, making them hazardous waste.[63] As detailed above, UNICOR became aware in July 2002 that such filters at USP Atwater failed EPA hazardous waste tests. In addition, we found that dust from the glass breaking area at FCI Texarkana that was collected by the former furniture factory ventilation system until 2004 was placed in the trash or possibly sent to a particle board manufacturer.

E-waste recycling operations continue at FCI Texarkana, although glass breaking was halted in May 2009 as it was at other UNICOR e-waste factories.

D. FCI La Tuna

UNICOR started recycling activities at FCI La Tuna in Texas in June 2002. Similar to other UNICOR recycling operations, e-waste was received at a warehouse outside of the main prison compound where camp inmates sorted it and prepared it for disassembly. Computers, monitors, and other e-waste were sent inside the FCI to the UNICOR factory for disassembly. Some e-waste was also disassembled at the warehouse. UNICOR employed approximately 125 inmates that were supervised by 4 staff members as well as a Factory Manager.

Before recycling operations began, the Safety Manager at FCI La Tuna, Vincent Talley, communicated with a UNICOR supervisor about the prospect of initiating glass breaking operations. Talley told the OIG that the UNICOR supervisor contacted him and requested information about respiratory protection and potential hazards. UNICOR e-mail shows that Talley informed the supervisor in April 2002 that "[b]efore any breaking of monitors occurs we need more information from UNICOR on the procedures and process that are going to occur to ensure the employees and inmates [have] protection." Talley told the OIG that UNICOR wanted to initiate the glass breaking operations soon, but that by late April 2002 UNICOR had placed its glass breaking proposal "on hold" pending resolution of his safety concerns.

Talley told the OIG that after conferring with Brett Sachs, the BOP's industrial hygienist at BOP Headquarters, he believed that it was necessary to consult with an industrial hygienist who could conduct testing at the factory, and that he expected UNICOR to provide assistance with the testing. He said that while UNICOR "probably" provided some information to him, it was not sufficient for him to determine the safety of the proposed glass breaking operations and that he did not recall UNICOR ever bringing a hygienist to the institution to conduct testing. Talley told the OIG he had no recollection of UNICOR personnel sharing the June 2002 testing results from USP Atwater

[63] After evaluating the volume of FCI Texarkana's hazardous wastes for periods where records were available, EPA found that FCI Texarkana currently was conditionally exempt from hazardous waste regulation. Since 2004, FCI Texarkana disposed of its used glass booth filters with a commercial waste company.

with him, and that he would have expected UNICOR to notify him if it was aware of significant problems with its glass breaking operations at other institutions.

According to Talley, by late June 2002, UNICOR decided to initiate glass breaking operations at the UNICOR factory at FCI La Tuna. UNICOR staff said that the glass breaking area was set up by the UNICOR Factory Manager and included a paint booth and two tables where the monitors were broken. The broken glass was collected in gaylord boxes and sent to the warehouse before being shipped to UNICOR's glass recycler in Ohio. A UNICOR staff member stated that the boxes were initially stored outdoors at the warehouse and that the practice was discontinued because the Safety Office objected to the runoff coming from the boxes following rain storms.

Inmates who worked in the glass breaking area stated that the ventilation was not adequate to control the resulting dust and debris, which spread throughout the recycling factory. They also said that they lacked proper respiratory protection and were provided only paper dust masks. One inmate stated that after breaking glass with a paper dust mask for approximately 2 weeks, he was fit tested for a respirator and broke glass for another 2 weeks before the operations were permanently stopped.

By mid-July 2002, Talley instructed UNICOR to halt the glass breaking operation due to safety concerns. Afterwards, UNICOR made adjustments to the design of the glass breaking area, including the installation of a ventilation duct to the outdoors. However, glass breaking did not resume at FCI La Tuna. Before allowing these operations to continue, the FCI La Tuna Safety Office required UNICOR to establish that the inmates were medically cleared for respirator use, a base-line lead study had been completed, area and personal air monitoring performed, and glass samples tested. UNICOR did not satisfy these conditions and the glass breaking operation therefore remained shut down.

UNICOR continued disassembly operations at FCI La Tuna after glass breaking ceased. However, by December 2003, UNICOR decided to cease all recycling at the institution due to financial losses. FCI La Tuna's existing inventory of e-waste was then sent to FCI Texarkana for processing.

E. FCI Ft. Dix

UNICOR opened an e-waste recycling factory at FCI Ft. Dix in New Jersey in 1999. UNICOR's current Factory Manager at FCI Ft. Dix, Corey Saunders, told the OIG that e-waste recycling at Ft. Dix during 1999 and 2000 focused on refurbishing computers that could be resold and disassembling the others into their component parts. Computer monitors that could not be resold were sent to FCI Elkton for processing. Saunders said that 30-50 inmates typically were

assigned to recycling and were overseen by 3 UNICOR staff members. Since 2002, UNICOR's e-waste program at FCI Ft. Dix has expanded and typically has employed approximately 5 staff members and between 90 to 120 inmates that recycle 4 to 5 million pounds of electronics per year.

UNICOR failed to obtain authorization for its early e-waste recycling activities from the New Jersey Department of Environmental Protection (NJDEP) even though it was informed in 1999 that this approval was necessary. We discuss this issue further in Chapter Five.

In 2001, UNICOR decided to open a glass breaking operation at FCI Ft. Dix comparable to its FCI Elkton operation. Factory Manager Saunders told the OIG that Novicky informed him that it would be necessary to break CRTs. Saunders said he felt that the operation was "shoved down my throat." The Safety Manager at FCI Ft. Dix also told the OIG that he expressed concerns to Saunders about the safety of the proposed glass breaking operations. He stated that UNICOR Headquarters was adamant about FCI Ft. Dix processing CRTs, and "whether we had any issues with it or not, they said it was going to happen anyway."

The Safety Manager stated that he proposed building three rooms – a "clean room" for inmates to remove and put on their prison uniforms, a changing room for glass breaking uniforms, and a room for the glass breaking. He said that Saunders supported his approach but that they were unsuccessful in getting approval for it from UNICOR. According to Saunders, UNICOR Headquarters instead wanted him to use a paint booth from another institution and "retrofit" it for glass breaking, which he did. He said that he designed the glass breaking area with the assistance of a recycling technician.

Saunders also said that Novicky and Minnick wanted him to start breaking glass immediately but that he resisted and explained that he would first need to consult with NJDEP. He said that his intention to contact NJDEP "created a whole firestorm within itself" but that he insisted it was necessary before FCI Ft. Dix proceeded with glass breaking.

In August 2001, Novicky and Ginther travelled to New Jersey to meet with regulators to learn about permitting requirements. According to a representative of NJDEP who attended the meeting, Paula Steele, the State was concerned about the safety of UNICOR's proposal to break monitor glass manually with hammers due in part to fears that it would result in uncontrolled releases of lead laden dust from the broken CRTs. UNICOR thereafter attempted to arrange for a representative of NJDEP to visit FCI Elkton in Ohio in November 2001 to observe how UNICOR processed CRTs. However, Steele advised UNICOR Program Manager Carol Minnick that she would not be able to travel to FCI Elkton due to a lack of funding but that she was willing to review a video of the glass breaking, or in the alternative still

photos, provided that "a very detailed description of the process" was also furnished. Steele told the OIG that she expected the video to be a "true representation" of UNICOR's glass breaking process.

We determined, however, that the video that UNICOR provided to NJDEP with its permit application was deceptive and failed to accurately represent UNICOR's glass breaking procedures. We also found that the Recycling Business Group rejected the first video that staff at FCI Elkton made for NJDEP in part because it showed too much glass breaking dust and debris in the air. We discuss these issues further in Chapter Five.

Saunders told the OIG that at the time that he was trying to bring the glass breaking operations on-line he was not aware of problems with the operations at other institutions. He stated that he was not informed about the testing results at USP Atwater in the summer of 2002 or that safety managers at USP Atwater and FCI La Tuna had identified problems with UNICOR's processing of CRTs and had shut down the operations as a result. The former Safety Manager at FCI Ft. Dix also told the OIG that he was not informed by UNICOR of safety issues with USP Atwater's glass breaking operations and was not advised that lacerations were a problem. Saunders stated that whatever safety initiatives were carried out in the recycling program at FCI Ft. Dix was because of the local staff and not UNICOR Headquarters. He also stated that training during the first few years of the recycling program was non-existent and "there was nothing in writing."

According to Saunders, due to lengthy delays associated with permitting requirements imposed by NJDEP and local regulators, UNICOR did not open an enclosed glass breaking booth at FCI Ft. Dix until 2003. Following its evaluation of UNICOR's permit application materials submitted in early 2002, NJDEP issued UNICOR a Certification of Authority to Operate ("Certificate of Authority") in May 2002 granting UNICOR permission to disassemble e-waste.[64] Saunders proceeded to design and install the new glass breaking booth, which was completed by October 2002.

Saunders obtained an air permit for the glass breaking operations in February 2003, and an amendment to the Certificate of Authority in March 2003 that authorized FCI Ft. Dix to process CRTs. Saunders told the OIG that glass was not broken at FCI Ft. Dix until the operation was "verifiably permitted" by regulators and that for much of the first year glass was not being broken because he was completing testing on the glass booth's safety. UNICOR

[64] Following receipt of its Certificate of Authority, UNICOR renewed it until obtaining a recycling permit in August 2005.

documents show that FCI Ft. Dix started making shipments of broken glass to glass recyclers starting in June 2003.[65]

Respirators and other personal protective equipment were provided to FCI Ft. Dix inmate glass breakers starting in 2003, as required by UNICOR's August 2002 and June 2003 glass breaking procedures. Staff at FCI Ft. Dix also provided detailed training to inmates on proper use of respirators, fit checks, and cleaning and storage of the respirators. However, we found no evidence that a hazard assessment was completed on glass breaking involving electron gun removal from CRTs that was performed at FCI Ft. Dix prior to the construction of a glass breaking booth. Moreover, inmates were not provided respirators for this work.

FCI Ft. Dix stopped glass breaking operations in approximately September 2004, after an inmate who worked in the glass breaking area was seriously cut while breaking monitors. According to a UNICOR staff member, the severity of the inmate's injury, a laceration on the inmate's forearm that exposed muscle and required approximately a dozen stitches, combined with the refusal of custodial staff to authorize thicker gloves for the inmates who broke glass, convinced local UNICOR managers that glass breaking should not continue. Saunders told the OIG that the permitting and testing costs associated with glass breaking, such as air emissions testing, had become prohibitively expensive.

F. FCI Marianna

The success of the Product Support Center's pilot project discussed at the beginning of this chapter led UNICOR to locate a permanent recycling operation at FCI Marianna in Florida. Starting in mid-1997, the pilot project concluded and approximately 15-20 female inmates began disassembling electronic equipment and computers at the prison camp at FCI Marianna full-time under the supervision of a UNICOR Factory Manager and Factory Foreman.

Since then the location of the recycling operations changed numerous times and included rented buildings off prison grounds between 1998 and

[65] Although glass breaking operations involving processing of the entire CRT did not begin until 2003, a former UNICOR Assistant Factory Manager, Ryan Upton, said that during the time that he worked in the e-waste factory from 1999 through 2001, inmates were instructed to remove the electron gun on the CRTs, which involved striking the CRT with a hammer and breaking the glass seal that holds the gun in place. Upton said that during removal of the electron gun dust would be released from inside the CRT and that the funnel glass adjacent to the gun would at times shatter. He said that the dust was visible in the air when this work was performed and that he obtained dust masks for the inmates to wear. Upton estimated that FCI Ft. Dix received 10,000 to 15,000 monitors a month for disassembly or refurbishing when he worked there.

2003. Recycling currently is performed at a factory inside the FCI and at a warehouse in the female prison camp. During 2008 and 2009, Marianna was UNICOR's largest e-waste factory, employing approximately 6 staff members, between 225 and 270 inmates, and receiving roughly 8 to 9 million pounds of e-waste each year.

UNICOR sought to establish glass breaking operations at FCI Marianna in 2003 but was initially unsuccessful in persuading the Marianna Warden to permit this work.[66] UNICOR documents show that General Manager Novicky wanted to open a glass breaking area at FCI Marianna in order to avoid the cost of shipping monitors to FCI Texarkana (which as described earlier had initiated glass breaking operations in late 2001) and because the FCI Texarkana factory's capacity to process additional glass was limited. In February 2004, the FCI Marianna Warden responded to Novicky that due to environmental concerns and other considerations, she did not want glass breaking operations at FCI Marianna.[67]

By early 2005, UNICOR succeeded in persuading the FCI Marianna Warden to authorize glass breaking operations. By this time UNICOR had been breaking CRTs in large quantities at other BOP facilities (FCI Elkton, FCI Texarkana, USP Atwater, USP Lewisburg, and FCI Ft. Dix) for several years. However, Factory Manager Blake Turner said that UNICOR Headquarters never notified him of health and safety problems at other institutions, including those related to glass breaking, and that he would have expected to receive such information. After describing to us the lack of guidance, information sharing, and safety instruction from UNICOR Headquarters, as well as the absence of standard operating procedures for the first six years that UNICOR was performing e-waste recycling, he said that the recycling program "was not being handled properly from the get go."

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[66] Prior to 2002, computer monitors that arrived at FCI Marianna were resold or later sent to FCI Elkton for further processing. Witnesses disagreed about whether glass breaking occurred at FCI Marianna before that time. Some UNICOR staff and inmates stated that CRTs were broken inside semi-trailers. UNICOR staff said that they used hammers to break the CRTs in gaylord boxes to reduce the space that they took inside the trailers and to increase shipping weight, and that UNICOR did not provide any respiratory protection for this work. Other UNICOR recycling staff told the OIG that they never witnessed glass breaking inside semi-trailers. NIOSH also reported that some staff members refuted the allegations and stated that monitor glass was not broken inside semi-trailers. We were not able to locate documents that corroborated either view.

[67] Witnesses told us that successive Wardens at FCI Marianna had resisted glass breaking operations due to risks of birth defects in the female inmate population. According to EPA, exposure to lead during pregnancy produces toxic effects on the human fetus, including increased risk of preterm delivery, low birth weight, and impaired mental development. See http://www.epa.gov/ttn/atw/hlthef/lead.html, citing Agency for Toxic Substances and Disease Registry (ATSDR). Public Health Service, U.S. Department of Health and Human Services, *Case Studies in Environmental Medicine, Lead Toxicity*, Atlanta, GA, (1992).

Turner told the OIG that staff and inmates constructed the glass breaking area at the female prison camp. He said that UNICOR did not seek the advice of a professional engineer or industrial hygienist but that staff from other UNICOR recycling factories came to Marianna to assist.[68]

A photograph of the glass breaking area appears below.

PHOTOGRAPH 3.7
Glass Booth at FCI Marianna, 2007

Prior to initiating glass breaking operations in 2005, consistent with the May 2003 glass breaking procedures issued by the Recycling Business Group, UNICOR provided staff and inmates with training and furnished warnings about the potential hazards from this work. UNICOR also obtained advice from the Florida Department of Environmental Protection on permitting issues. Inmates who broke glass were provided respiratory and eye protection and wore tyvek suits, which are disposable suits that protect against chemicals, paint, and other contaminants.

Turner told the OIG that an inmate was seriously cut from broken glass after the glass breaking operation started. He stated that he was not aware

[68] Turner stated, however, that an inmate with experience in industrial hygiene assisted with the set-up of the new glass breaking area. He said that the inmate proposed creating a "clean room" and "changing area," but that these ideas were rejected by UNICOR Headquarters, as had occurred at FCI Ft. Dix.

whether similar injuries occurred at other UNICOR glass breaking operations. As a result of injuries, glass breaking operations at FCI Marianna were temporarily suspended in 2006.

In May 2008, UNICOR closed its glass breaking operation at FCI Marianna. Novicky said that economic considerations factored into the decision to cease glass breaking at FCI Marianna.

G. USP Lewisburg

Planning for an e-waste factory at USP Lewisburg in Pennsylvania started in early 2002. UNICOR RBG General Manager Novicky was attempting to identify another institution in the Northeastern United States, in addition to FCIs Elkton and Ft. Dix, where a recycling factory could be located that could help process the increasing volumes of e-waste that UNICOR was receiving from DRMS and other sources. He was especially concerned with obtaining additional capacity at USP Lewisburg to recycle CRTs, and requested that Lewisburg staff visit FCI Elkton to observe its recycling operations.

In approximately February 2002, Associate Warden Gerald Pace travelled to FCI Elkton with other personnel from USP Lewisburg, including Michael Rackley, the future Production Controller and Industrial Specialist. Pace said that he was not impressed with the sanitation of the FCI Elkton recycling operations, especially the glass breaking, and did not want to replicate FCI Elkton's glass breaking procedures at USP Lewisburg. Rackley said that the FCI Elkton recycling factory was "fairly cloudy" from the airborne debris from the glass breaking.

Rackley and a newly hired recycling technician, Fred Waddell, told the OIG that they received little guidance from UNICOR Headquarters concerning the setup of the new factory at USP Lewisburg. Rackley said that he believed that staff at UNICOR Headquarters lacked knowledge about how recycling factories operate. He said that as he was supervising set up of the new factory, no one from UNICOR warned him of potential hazards from recycling e-waste. Rackley said that he was not aware that BOP safety personnel had expressed concerns about the FCI Elkton and USP Atwater glass breaking operations and stated that he would have wanted to know about their concerns. He said that he also should have been told about the correspondence that Ginther received in 2000 that concerned serious violations of the OSHA cadmium standard related to processing CRT glass, and that he was not told about the June 2002 USP Atwater test results.

The recycling factory at USP Lewisburg opened in August 2002, although recycling operations did not start until April 2003 after a permit was obtained from the Pennsylvania Department of Environmental Protection. Prior to

receiving the permit, USP Lewisburg resold electronic items that were functional.

All recycling was performed in facilities at a prison camp adjacent to the penitentiary, including warehousing and disassembly of e-waste. Two staff members, Rackley and Waddell, oversaw approximately 50 inmates. Since 2003, UNICOR's e-waste program at USP Lewisburg expanded and typically has employed three staff members and an Industrial Specialist, Rackley, from the Recycling Business Group who is stationed at USP Lewisburg. Inmate employment generally has fluctuated between 60 to 90 inmates that recycle 4 to 7 million pounds of electronics per year.

Glass breaking operations did not start at USP Lewisburg until October 2003, more than a year after the recycling factory opened. Rackley told the OIG that prior to that time UNICOR Headquarters wanted him to install a glass breaking area like the ones that were in use at FCI Elkton and USP Atwater and that relied on a metal hood to trap the airborne particles from the broken glass. Rackley stated that his reaction to the pictures that UNICOR Headquarters provided him of the other institutions' glass breaking areas was that they seemed to be "cobbled together [Rube] Goldberg operation[s]." He said that he conferred with Waddell and that he decided to consult an engineer who could assist with development of a design for USP Lewisburg's glass breaking area. The engineer rejected use of a collection hood and instead recommended that UNICOR purchase HEPA filtration devices such as the ones pictured below.

PHOTOGRAPH 3.8
Inside Glass Booth at FCI Texarkana, 2008

After receiving the engineer's recommendation, Rackley also conferred with the BOP's industrial hygienist about the proposed HEPA filtration system as well as acquiring powered air purifying respirators for inmates who would be working in the glass breaking area. Other UNICOR recycling factories were using half or full mask respirators. Novicky agreed to use of the HEPA system, provided that testing at USP Lewisburg confirmed its effectiveness. All UNICOR glass breaking operations eventually adopted use of the HEPA system and powered air purifying respirators that USP Lewisburg acquired.

E-waste recycling operations are continuing at USP Lewisburg. However, glass breaking ceased in May 2009 when UNICOR decided it would no longer allow this activity at its factories because it was not cost effective.

H. FCI Dublin

UNICOR operated a small electronics recycling facility at FCI Dublin in California for about two years, from mid-1998 until late 2000.[69] The facility, which was in the corner of a warehouse, was used to receive and store supplies for other UNICOR factories and employed approximately seven inmates and one staff member.

[69] UNICOR documents also indicate the recycling may have occurred at FCI Dublin for a brief period in approximately 1994-1995.

Although the facility recycled small computers and other small electronic equipment, most of the work involved taking apart and recycling large "mainframe" computers that were no longer needed by the military. As at other UNICOR recycling facilities, commodities such as copper, metal, and plastic were retrieved from the computers and resold to recyclers.

Unlike some other UNICOR facilities, FCI Dublin never broke any CRTs. Instead, they were boxed and sent intact to a private recycler. According to former UNICOR Program Manager, Pauline Quinn, Dublin's e-waste operations were so small that she did not perform routine oversight of activities there.

I. FCC Tucson

In July 2004, UNICOR authorized development of an e-waste recycling factory at FCC Tucson in Arizona to address the increasing volume of computers and other electronics UNICOR was receiving from the West Coast and Southwestern United States.[70] The new recycling factory obtained its first load of e-waste in February 2005.

The layout UNICOR selected for its recycling operations at FCC Tucson resembled the design used at most other BOP institutions. Incoming material was received at a warehouse located at a prison camp within the FCC where it was screened and sorted. It was then sent to a recycling factory at the FCI for disassembly. Approximately 25 inmates initially were assigned to the recycling program in 2005 and were overseen by a Production Controller and 4 recycling technicians. By 2008, the number of inmates increased to approximately 80 and 25 inmates respectively at the FCI and minimum security camp.

In a noteworthy departure from past practice, before initiating recycling operations at FCC Tucson, UNICOR Headquarters furnished local staff with the Recycling Business Group's standard operating procedures and required that the local staff document necessary training, perform air and wipe sampling, and complete medical testing. UNICOR also sought and received guidance from the Arizona Department of Environmental Quality on state regulations related to CRT processing. Inmates told the OIG that they received training on cadmium and lead hazards prior to starting their work for UNICOR.

In addition to computer disassembly, UNICOR initially intended to establish a glass breaking area at FCC Tucson. In December 2004, construction began at the FCI on a room made from heavy plastic to which UNICOR added a HEPA ventilation system. A photograph of the glass breaking area appears below.

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[70] The FCC includes a maximum security prison, a medium security FCI, and a minimum security prison camp.

PHOTOGRAPH 3.9
Glass Breaking Booth, FCC Tucson, 2005

An inmate who assisted with the room's construction told the OIG that he was given photographs of the glass breaking area at FCI Texarkana and told to replicate it as best he could. He stated that he was selected for this work because he was a welder and had construction experience.

UNICOR never activated the glass breaking area, however. In December 2005, it was torn down and FCC Tucson's glass breaking equipment was shipped to FCI Texarkana. Monitors received by FCC Tucson for processing were sent to other UNICOR recycling locations.

Following UNICOR's decision in May 2009 to suspend its glass breaking operations nationwide, monitors received by UNICOR for recycling at FCC Tucson are now disassembled and the glass tubes sent to contractors for further handling.

J. USP Leavenworth

USP Leavenworth in Kansas was the latest BOP institution to open a UNICOR e-waste recycling operation. Efforts to set up the new factory started in May 2007, and included the improved initiation practices that were used at FCC Tucson, such as furnishing staff with the Recycling Business Group's standard operating procedures. Recycling operations, which are limited to disassembling e-waste, began in August 2007 with 4 staff and 45 inmates at a warehouse located at the prison camp at Leavenworth. Before starting these operations, UNICOR obtained an e-waste recycling permit from the Kansas

Department of Health and Environment – the first such permit issued by the State. Prior to UNICOR's cessation of glass breaking operations in June 2009, USP Leavenworth sent its nonfunctional monitors to FCI Texarkana for processing.

K. Other Recycling Projects

In addition to disassembling computers, monitors, and other peripheral devices such as printers, the Recycling Business Group started other recycling projects at UNICOR e-waste factories. For example, in 1999, UNICOR established a program with the Department of Defense to disassemble used military equipment ("de-mil" items) at the prison camp at FCI Marianna. The current FCI Marianna Factory Manager, Blake Turner, told the OIG that the "de-mil" operation frequently involved disassembling complex military equipment, such as avionics and submarine parts, and that the items often contained warning labels regarding hazardous chemicals. Turner said that the UNICOR staff did not know what exactly was in the de-mil items but they recycled them anyway. He stated that he did not receive any health or safety training concerning this work and that UNICOR did not conduct a hazard assessment before starting the de-mil project. In similar fashion, UNICOR started another project at FCI Marianna in 2003 to refurbish monitors, which involved sanding and repainting the plastic casing. Turner told the OIG that a hazard assessment also was not conducted on these operations before they started.

FCI Elkton also started e-waste projects that involved work other than disassembly. In August 2005, Novicky reached agreement with a private company that called for UNICOR to recover computer chips from circuit boards and to refurbish computer monitors at FCI Elkton. The chip recovery project involved heating circuit boards over pots of molten solder and then plucking the computer chips from the boards. Monitors were also refurbished by sanding and painting, as at FCI Marianna.

In September 2005, the FCI Elkton Factory Manager, Steve Heffner, requested material safety data sheets from the company and e-mailed one of its representatives along with Novicky and Ginther to explain that UNICOR was "looking into ventilation options for the solder pots" and wanted to know where the company purchased its "fume hoods." The material safety data sheet for the solder stated that it was "harmful by inhalation" and that "good ventilation/exhaustion at the workplace" was necessary in order to ensure safe handling of the solder.

The new operations started in October 2005 at a factory at the Federal Satellite Low (FSL) at Elkton where roughly 60 inmates disassembled

computers.[71] UNICOR assigned approximately a dozen inmates to remove computer chips while several others refurbished monitors at another location within the factory. Prior to beginning this work, UNICOR did not install a ventilation system at the FSL factory to remove fumes from the chip recovery project. UNICOR and the BOP also did not complete an assessment of potential hazards resulting from the new operations, including sanding of the plastic casing for the computer monitors.[72]

UNICOR staff and inmates told the OIG that the chip recovery work generated smoke and fumes, which one UNICOR staff member characterized as a "foul smelling haze" that filled the factory. He stated that he began to feel light headed when he was on duty. Inmates reported similar experiences to the OIG, and several inmates quit their jobs with UNICOR rather than work in the FSL factory, resulting in a significant loss of pay to them.

In January 2006, a Recycling Business Group inspection at FCI Elkton noted that ventilation hoods should be installed immediately in the chip recovery area at the FSL factory. The UNICOR Recycling Business Group's Superintendent of Industries at Elkton, Craig Dalton, authorized installation of a ventilation system that month that was assembled by UNICOR staff and inmates out of plastic buckets and PVC pipe. However, staff said that this system was not effective in removing the fumes from the solder pots. A photograph of a portion of this system appears below:

[71] The FSL is adjacent to the FCI and houses low and minimum security offenders.

[72] In contrast, a former Safety Manager at FCI Marianna told the OIG that he intervened with the Warden when he learned that UNICOR wanted to start a chip recovery project at FCI Marianna. He said that he did not believe that the work was safe and that the Warden refused to allow it.

PHOTOGRAPH 3.10
PVC Pipe Ventilation System for Chip Recovery Project,
FCI Elkton, 2006

Following continued complaints from staff and inmates about the poor air quality in the FSL factory, UNICOR obtained the services of an engineering firm in February 2006 to design and install a ventilation system that could remove the fumes from the chip recovery project. The parts for the new ventilation system did not arrive at FCI Elkton until the end of April, and it was not functioning until mid-May. Work continued from February to May without adequate ventilation. A photograph of the new ventilation system appears below:

PHOTOGRAPH 3.11
Ventilation System for Chip Recovery Project, FCI Elkton, 2006

In October 2006, UNICOR stopped its chip recovery and monitor refurbishment work at FCI Elkton for economic reasons. As described in Chapter Four, the OIG found in November 2007 that the FSL factory was heavily contaminated with lead dust and residue that had to be remediated at significant expense.

Shortly after the end of the chip recovery project, the Recycling Business Group started another new operation at FCI Elkton and other institutions that involved testing and repackaging customer returns of electronic and other assorted items for a wholesaler who resold them. UNICOR staff at FCI Elkton stated that they were not consulted about how the new project could be implemented and that storage facilities at the institution were quickly overrun. One staff member said that staff did not always know what was contained in the boxes that were kept at the warehouse and in storage trailers that had to be acquired to handle the overflow of boxes. The current Warden at FCI Elkton told us that he decided to terminate the project in 2007 due to safety and security concerns. He said that inmates had turned in two dart guns and a box of carving knives found among the customer returns. Dalton stated that

UNICOR did not complete a safety and security assessment on the project before it started at FCI Elkton.[73]

III. Conclusion

Our investigation found that UNICOR started e-waste recycling operations, including glass breaking, without first obtaining adequate advice about potential health and safety hazards. For example, the Health Services Division at BOP Headquarters, including its industrial hygienist, was not consulted about UNICOR's e-waste recycling operations until 2001, over three years after UNICOR started these operations, and then only in a limited fashion. Instead, UNICOR primarily relied upon local safety staff at BOP institutions, who lacked the background and training to adequately evaluate hazards associated with e-waste, as well as a 1997 consultant report that, unbeknownst to UNICOR, contained misleading conclusions about CRT recycling. Because of this approach, the information that UNICOR obtained and the conclusions it drew about the safety of its operations prior to 2002 was flawed. Moreover, testing in the recycling factories was either not conducted at all, or carried out in a cursory way that lacked reliability.

We also determined that the guidance that UNICOR Headquarters provided to its staff in the field and to BOP managers was limited and selective. Written procedures were lacking, and Factory Managers were largely left to their own ingenuity to plan and develop the new recycling factories. We found that information that came to the attention of UNICOR managers prior to 2002 that revealed hazards with e-waste recycling was not disclosed to staff and inmates, including Wardens and local safety personnel. Senior leadership of the Recycling Business Group repeatedly ignored warnings that its glass breaking operations were not safe, including from its own staff as early as 2000. Requests from the Safety Manager at Elkton for testing in 1999 were not acted upon by the BOP or UNICOR.

Events at USP Atwater in the summer of 2002 led to eventual changes in UNICOR's e-waste recycling operations that significantly improved safety. These changes included publication of detailed glass breaking procedures and improvements in training and hazard communication. However, we identified delays in instituting these improvements, which placed staff and inmates at further risk of harm, such as failing to promptly upgrade respiratory protection and institute medical surveillance at FCIs Elkton and Texarkana. Overall, we found that health, safety, and environmental considerations were consistently

[73] A similar project that UNICOR attempted at FCI Texarkana also resulted in that institution being inundated with truckloads of unscreened scrap material. Included in the items that were delivered to the institution were an air gun, ammunition, a hatchet, a grapple, and knife.

subordinated to the efforts of the Recycling Business Group to maintain its existing production and expand operations.

In the next Chapter, we describe the exposures to toxic metals that resulted from UNICOR's e-waste recycling operations, as well as the results of the OIG's investigation into safety and environmental compliance issues.

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CHAPTER FOUR
RESULTS OF THE OIG'S HEALTH, SAFETY AND ENVIRONMENTAL INVESTIGATION

This chapter describes the conclusions of the OIG and federal agencies that assisted the OIG with its evaluation of health, safety, and environmental practices in UNICOR's e-waste recycling program. The occupational health and safety experts from FOH, NIOSH, and OSHA that participated in the OIG's investigation (the OIG "technical team") made numerous findings set forth in detail in individual facility reports.[74] In this chapter we summarize those findings that apply broadly across UNICOR's e-waste recycling operations.

We first describe the OIG technical team's conclusions concerning staff and inmate exposures to toxic metals and the hazard controls employed by UNICOR to limit those exposures. We then present NIOSH's findings concerning the medical effects of the toxic metal exposures identified during our investigation and its assessment of the BOP's medical surveillance of staff and inmates. We also discuss the technical team's conclusions concerning other hazards such as injuries from recycling operations, noise, and heat, as well as environmental compliance.

I. Toxic Metal Exposures and Health and Safety Controls

As detailed below, FOH and NIOSH-HETAB determined that during the early years of UNICOR's e-waste recycling operations, from 1997 to approximately mid-2003, UNICOR did not implement adequate worker protection measures to control exposures to hazards associated with e-waste recycling activities, particularly cadmium and lead hazards.[75] UNICOR lacked proper engineering controls, work practice controls, protective equipment, and administrative controls such as hazard communication and training to mitigate toxic metals exposures that resulted primarily from glass breaking operations. As a result, UNICOR violated numerous OSHA regulations, including those dealing with cadmium, lead, hazard communication, personal protective equipment, and respiratory protection.[76] FOH and NIOSH-HETAB further

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[74] FOH prepared comprehensive assessments for each BOP institution that had an active e-waste recycling program during our investigation. These assessments provide detailed information on each UNICOR e-waste factory and incorporate the work of FOH, NIOSH, OSHA, and the EPA. They are found at: http://www.justice.gov/oig/reports/BOP/index.htm.

[75] FOH and NIOSH-HETAB assisted the OIG with assessments of exposures prior to 2003.

[76] See generally 29 C.F.R. § 1910.1025, Lead; 29 C.F.R. § 1910.1027, Cadmium; 29 C.F.R. § 1910.1200, Hazard communication; 29 C.F.R. § 1910, Subpart I, Personal protective equipment; and 29 C.F.R. § 1910.134, Respiratory protection; and 29 C.F.R. § 1910.95 Noise. (Cont'd.)

concluded that UNICOR's lax approach to worker safety resulted at times in staff and inmate exposures to unsafe levels of cadmium and lead, and that these exposures were likely repeated due to the consistently poor work procedures and conditions found in UNICOR's factories prior to 2003.

We determined that UNICOR began to institute comprehensive health and safety improvements to its e-waste recycling operations starting in approximately June 2003, primarily to control exposures to cadmium and lead. We also determined that by 2009, with limited exceptions, UNICOR's e-waste recycling operations, including glass breaking activities, were compliant with OSHA requirements and were being operated safely, though some additional improvements were recommended.

Despite this progress, our investigation found that UNICOR was at times slow to correct safety and health deficiencies and maintain cadmium and lead exposures at levels below OSHA exposure limits. While some UNICOR factories such as USP Lewisburg showed consistent cadmium and lead exposure control, other factories such as FCI Elkton showed exposures above OSHA PELs at times, particularly for cadmium. In addition, after 2003 UNICOR initiated new glass breaking operations or other hazardous recycling activities such as desoldering and chip recovery at some factories in the same deficient manner as it had during the period prior to June 2003. UNICOR failed to perform adequate hazard assessments before starting work and relied upon persons who were not fully qualified to render health and safety advice or provide technical assistance. Through individual initiatives at the local level, some factories demonstrated greater emphasis on hazard analysis and worker protection. However, the efforts at other UNICOR factories were sometimes hindered by poor technical guidance.[77]

A. Exposures to Toxic Metals from Recycling Operations

In this section, we describe UNICOR staff and inmate exposures to toxic metals. The most significant documented exposures occurred in glass breaking operations, but we found that exposures could occur during other activities, such as computer disassembly, ventilation maintenance, cleaning, and activities that disturbed residual dust contamination. We limit our discussion generally to cadmium and lead because of the 31 metals that the technical

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Medical surveillance requirements are specified in the OSHA lead, cadmium, and respiratory protection standards cited above.

[77] FOH and NIOSH-HETAB found that many reports prepared by UNICOR's consultants about UNICOR e-waste operations were either not accurate or did not provide necessary evaluations of work conditions, hazards, control measures, and compliance with OSHA standards. Moreover, until the UNICOR Certified Industrial Hygienist was hired in 2007, we found no evidence that either Recycling Business Group staff or local safety managers recognized the inadequacies in the consultant reports.

team evaluated, including arsenic, barium, and beryllium, these 2 metals were the only contaminants repeatedly found above OSHA occupational exposure limits. As described in Chapter Two, exposure to lead may result in damage to the kidneys, anemia, and high blood pressure, among other health effects. Occupational exposure to cadmium is associated with lung cancer and kidney damage.

1. Exposures from Glass Breaking

FOH and NIOSH-HETAB determined that prior to June 2003 UNICOR's routine glass breaking operations failed to comply with applicable OSHA regulations and that as a result UNICOR staff and inmates likely were repeatedly exposed to cadmium and lead in excess of OSHA occupational exposure limits.

Our evaluation of these exposures during the early years of UNICOR's recycling operations was complicated by UNICOR's failure to comply with an important aspect of OSHA's worker protection scheme that requires employer monitoring of workplace hazards. We found that UNICOR failed to conduct exposure monitoring and did not comply with recordkeeping requirements at many of its recycling factories, in violation of the OSHA lead and cadmium standards.

As noted in Chapter Three, in 2002 USP Atwater became the first institution where UNICOR and the BOP performed comprehensive industrial hygiene testing. These tests showed multiple exceedances of OSHA occupational exposure limits for cadmium and lead. Throughout 2002, consultants and a BOP industrial hygienist repeatedly found that worker exposures to cadmium during glass breaking operations were far higher than the OSHA PEL. Their reports revealed that cadmium exposures ranging from approximately 10 to 60 times higher than the PEL were not unusual. Lead exposures were also up to four times higher than the lead PEL. Because excessive levels of exposure were identified during all 2002 monitoring episodes, FOH and NIOSH-HETAB concluded that these exposures were typical of daily glass breaking exposures, which resulted from the processing of approximately 300 to 500 CRTs per day. Testing conducted in early 2003 showed that cadmium exposures at USP Atwater were reduced from 2002 levels, but were still periodically above the OSHA cadmium PEL for various workers.

As detailed in Chapter Three, large quantities of monitors were processed at FCI Elkton beginning in 1998 and at FCI Texarkana in 2001, and witnesses reported visible dust emissions in heavy concentrations that some staff and inmates described as resembling an indoor "snow storm." FOH and NIOSH-HETAB found that the extremely limited exposure monitoring conducted at

FCIs Elkton and Texarkana prior to 2003 was not properly documented and therefore not conclusive regarding exposure levels.

Reliable exposure monitoring data during glass breaking at facilities other than USP Atwater was generally not collected prior to 2003. FOH and NIOSH-HETAB concluded that while it is not possible to quantify the severity of these early exposures, there is a strong likelihood that worker exposures related to UNICOR glass breaking operations at times exceeded the OSHA PELs and action levels (OSHA occupational exposure limits) for cadmium and lead. This determination was based on UNICOR's unsafe glass breaking practices at its factories during the first 5 years of recycling operations, exposures from testing at USP Atwater prior to 2003, and the frequency of documented exceedances of OSHA exposure limits at UNICOR recycling factories after 2003 in circumstances where fewer CRTs were broken and better exposure controls were in place than previously was the case.[78] In addition, due to the consistently poor work procedures and conditions we identified, such as lack of adequate ventilation and proper hygiene, these exposures likely were not isolated events and instead occurred repeatedly.

Limited glass breaking operations also occurred at FCI Ft. Dix prior to June 2003 that involved problems with CRT dust exposure. UNICOR staff at FCI Ft. Dix told the OIG that before shipping CRTs to other institutions for processing, inmates were instructed to remove the electron gun by hitting the surrounding glass with a hammer. According to a former Assistant Factory Manager at FCI Ft. Dix, this work was performed from 1999 to 2002 and caused enough visible dust to be released from the CRT that he requested respiratory protection for the inmates who performed the work. He also stated that at times the CRT itself would shatter after being struck, potentially releasing lead and cadmium contaminants into the air. We determined that UNICOR did not conduct a hazard analysis and exposure monitoring or implement hazard controls for this activity. In addition, starting in early 2003 UNICOR periodically performed glass breaking operations at FCI Ft. Dix to test a newly constructed glass breaking booth. FOH found that the air exposure monitoring for toxic metals that was conducted on these operations in early to mid-2003 suffered from deficiencies that resulted in inaccurate results. Later monitoring in 2003 found cadmium exposures that were approximately 7 to 16 times higher than the OSHA PEL.

At FCI La Tuna, UNICOR started glass breaking operations in late June 2002. UNICOR staff and inmates both reported high levels of visible dust

[78] We found little surface wipe data available for USP Atwater, FCI Elkton, and FCI Texarkana prior to June 2003. Several wipe sample results obtained from USP Atwater in November 2002 were taken from inmate skin (arms) and clothing following a work shift. The results showed that cadmium and lead contamination was present creating a potential ingestion hazard.

emissions during glass breaking activities. UNICOR stopped work on approximately July 16, 2002, based on the Safety Manager's concerns. Although monitoring data were unavailable, these conditions created the potential for exceedances of OSHA limits similar to those found at other UNICOR facilities.[79]

After June 2003, UNICOR gradually reduced worker exposures to cadmium and lead during glass breaking operations at UNICOR's e-waste recycling factories through enhanced engineering controls, improved work practices, and other measures as described in Section I.B of this chapter. However, UNICOR consultants found airborne exposures above OSHA action levels or PELs at various factories through mid-2004 and at FCI Elkton until September 2007. For example, at FCI Ft. Dix in 2003, tests by UNICOR consultants indicated that glass breakers were exposed to airborne lead at 1.2 times the PEL and cadmium at up to 16 times the PEL. UNICOR consultants also found exceedances in glass breaking operations at FCI Texarkana in 2004, at USP Atwater in 2004, and at FCI Elkton in 2004 and 2006.

OSHA and NIOSH-DART also conducted on-site air exposure monitoring during glass breaking between 2006 and 2008 in support of the OIG investigation. OSHA conducted inspections at four UNICOR factories and did not find exceedances of OSHA occupational exposure limits, although in 2005 (before the start of the OIG's investigation) it found that glass breaking at FCI Elkton resulted in a glass breaker's exposure above the cadmium PEL and lead action level.[80] NIOSH-DART conducted on-site exposure monitoring at UNICOR factories beginning in 2007 and found that UNICOR had taken measures to reduce routine glass breaking exposures to below the OSHA action levels and PELs. However, NIOSH identified various deficiencies that merited correction, including non-compliance with the OSHA cadmium and lead standards, escape of airborne emissions that led to inmate exposures approaching the action level for cadmium outside the glass booth (FCI Marianna), carry-out of lead and cadmium dusts from some factory booths, and very high cadmium and lead exposures during exhaust filter maintenance, among others.

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[79] FOH and NIOSH-HETAB also evaluated recycling operations at FCI Marianna but received conflicting information about glass breaking activities there prior to 2003. Some BOP and UNICOR staff reported that they broke CRTs in the back of semi-trailers from approximately 1998 to mid-2001. Based on data from other factories, the lack of exposure control measures, and limited ventilation that would be present in a semi-trailer, FOH and NIOSH-HETAB concluded that cadmium and lead exposures for this method of glass breaking could have been above OSHA exposure limits if the glass was broken as described and in sufficient quantities.

[80] OSHA received complaints about UNICOR's e-waste program prior to the start of the OIG's investigation.

FOH and NIOSH-DART also arranged for particle size testing of various bulk dust samples collected from surfaces located in proximity to recycling operations in the main factory and warehouse at FCI Elkton and found that 90 percent of the particles were less than10 micrometers in diameter and that 40 percent were in the 1-2 micrometer range.[81] Particles in this range can remain airborne for relatively long periods of time, travel long distances before being deposited on surfaces, and also penetrate deeper into the pulmonary system for greater absorption into the body. Respirable particles are of particular importance for cadmium and lead exposure because of their toxicity.

In addition to air samples, UNICOR consultants and the OIG technical team performed surface wipe sampling in glass breaking booths. Their reports showed that work surfaces typically had substantial accumulations of lead. Concentrations in the range of 500 micrograms per square foot (µg/ft^2) to 2,500 µg/ft^2 were present on surfaces such as tables, and results as high as 17,000 µg/ft^{2}were found in areas that were more difficult to clean or that could be missed during cleaning, such as grooves at the back of ventilation systems. Floor samples from the FCI Elkton booth were as high as 10,200 µg/ft^2 for lead. Some bulk dust samples were also high in lead (3.5 percent in an FCI Marianna booth sample and 1.4 percent in dust shaken from the FCI Elkton exhaust system filter). Cadmium levels were generally lower, but still significant given its toxicity. These results showed that without adequate cleaning, significant concentrations of cadmium and lead could accumulate in glass breaking booths, increasing the risk of inhalation and ingestion exposures.

2. Other Exposures

The OIG technical team attempted to determine if staff and inmates working in operations other than glass breaking were exposed to excess levels of cadmium and lead.[82] One potential source of such exposure was the migration of lead and cadmium from glass breaking operations to other parts of the UNICOR facilities, such as areas where other computer disassembly operations were conducted. As detailed in Chapter Three, in many facilities

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[81] Additional discussion of the particle size testing is contained in Attachment 7 to FOH's comprehensive report on FCI Elkton's e-waste operations.

[82] NIOSH-HETAB further evaluated whether UNICOR staff members were carrying contamination out of recycling areas to their automobiles and possibly home. NIOSH-HETAB collected wipe samples from two personal vehicles and found a small amount of lead (3.3 µg-lead/100 cm^2) on the steering wheel in one vehicle. According to NIOSH-HETAB, this sampling and the results of biological monitoring suggested that take-home contamination did not pose a health threat at the time of its assessment. However, this contamination may have been higher when adequate engineering controls were not in place. For example, when at FCI Elkton NIOSH-HETAB recommended to staff with children that the family pediatrician be notified of the potential past exposures and the children's blood lead testing results be re-examined.

unenclosed glass breaking operations were located near other disassembly activities, and numerous witnesses described visible clouds of dust from glass breaking operations throughout other parts of the UNICOR factories. Due to the uncontrolled nature of glass breaking operations and the absence of engineering and work practice controls during the early years, FOH and NIOSH-HETAB concluded that exposures in these areas were likely higher than what would be expected for disassembly operations conducted in a manner that fully complied with OSHA requirements. However, the magnitude of excess risk and exposure could not be quantified, in part because UNICOR did not conduct any reliable exposure monitoring in areas other than glass breaking areas during the early years of operation.

Starting in approximately 2005, UNICOR began monitoring exposures in non-glass breaking areas at some factories on an annual basis. By this time UNICOR had begun to implement measures to control releases of toxic metals. The tests indicated that almost all levels were below the OSHA PELs and action levels for cadmium and lead. Likewise, beginning in 2007, the OIG technical team conducted testing in disassembly operations in UNICOR factories and found that all exposures were below PELs and action levels.

We also attempted to determine whether other e-waste recycling activities were themselves the source of cadmium or lead exposures. We examined whether cadmium and lead were present on or in e-waste materials at the time of their receipt by UNICOR, and whether the receiving and sorting of e-waste prior to disassembly poses a risk of personal exposure and facility contamination. Based on surface wipe data collected from 2003 to 2009, FOH concluded that contamination on outer surfaces of e-waste may be present but it is a less significant contributor than other activities. However, data from warehouse and sorting areas showed that this contamination can build up over time, requiring preventive cleaning and maintenance activities.

We examined whether disassembly activities other than glass breaking at UNICOR could cause releases of hazardous contaminants. NIOSH-DART confirmed that high levels of lead can be found on the internal surfaces of computer equipment being disassembled, such as on fan blades. Based on an evaluation of available surface wipe and bulk dust data, FOH and NIOSH-HETAB determined that disassembly and related practices caused loose cadmium and lead dusts within e-waste equipment to become dislodged and then deposited on working surfaces. UNICOR consultants and the OIG technical team found that the releases from disassembly activities other than glass breaking did not result in inhalation exposures above OSHA limits. However, they found that contamination far in excess of OSHA guidelines for clean areas could build up on surfaces from such disassembly practices, creating the potential for inhalation and ingestion exposures.

UNICOR conducted desoldering and chip recovery operations at FCI Elkton between October 2005 and October 2006. We determined that UNICOR's initial preparations for this work were inadequate, including failing to monitor for inmate exposures initially after startup. Without exposure monitoring, the OIG technical team was not able to quantify exposures during this operation. However, based on NIOSH's evaluation of blood lead levels, staff and inmate reports of haze created by fumes from the solder pots, numerous reported illnesses, and the substantial lead contamination that was found in the recycling areas where this work was performed, FOH and NIOSH-HETAB concluded that the lead exposures had the potential to be above OSHA exposure limits and were certainly higher than they would have been if UNICOR had conducted a hazard analysis and implemented proper controls at startup.[83]

The OIG technical team also found that certain maintenance activities at UNICOR facilities led to excess exposures. For example, UNICOR workers who changed out glass booth ventilation system filters were exposed to high levels of cadmium and lead. In March 2007, NIOSH-DART and FOH found that workers changing these filters were exposed to levels that exceeded both OSHA PELs and the protective capacity of the respirators used. As detailed in Section I.B below, these exposures were attributable to UNICOR's failure to adopt and implement adequate work practices, with the result that contaminants were released when employees used inappropriate methods, such as shaking and banging the filters.[84] Because UNICOR began using ventilation filters in 2002 and 2003, it is likely that these exceedances of OSHA levels occurred on numerous occasions at several facilities before the issue was identified. Based on NIOSH recommendations, UNICOR modified its work practices. Subsequent evaluations at several facilities showed exposures below OSHA limits in most cases and that exposures were well controlled through the use of respiratory protection.

The OIG technical team also determined that personnel who were present during cleaning operations were potentially exposed to excess levels of cadmium or lead. As detailed in Section I.B below, UNICOR utilized improper cleaning methods, such as dry sweeping, that led to airborne dispersal of contaminants. Although exposures from cleaning activities cannot be quantified during the period prior to regular testing, the OIG technical team concluded that if the same dry sweeping techniques were used in the past,

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[83] UNICOR also conducted some desoldering for a short period of time at FCI Texarkana on a much smaller scale than at FCI Elkton. We determined that the lead exposures during this operation were likely limited.

[84] OSHA regulations prohibit the removal of cadmium from equipment by shaking or other means that disperses cadmium into the air. 29 C.F.R. § 1910.1027(i)(3)(iii). UNICOR written procedures also prohibited the filter change techniques observed at FCI Elkton.

periodic cleaning by improper methods was a source of potential cadmium and lead exposures. Moreover, exposures during cleaning operations have occurred in more recent years.

3. Exposures from Residual Dust Contamination

FOH and NIOSH-HETAB tested for cadmium and lead surface contamination in bulk dusts taken from areas likely to contain legacy contamination from early recycling operations. High levels of contamination were found at recycling factories with prior routine glass breaking and lead desoldering operations on surfaces that were not subject to regular cleaning, such as beams, light fixtures, in cable boxes, inside general ventilation duct work, around former glass breaking areas where uncontrolled releases occurred, and in former disassembly areas. The extent of this contamination created the potential for additional exposures caused by worker contact with the affected surfaces, such as during maintenance activities, or other disturbance of the dust.

Cadmium and lead surface contamination poses an ingestion hazard to workers, such as from hand-to-mouth contact or from eating, drinking, and smoking in a contaminated workplace. Surface contamination also poses an inhalation hazard if work activities disturb the dust and re-suspend it to the air. For example, in February 2006 an HVAC contractor's work on the heating and ventilation system at the recycling factory at FCI Elkton resulted in a reverse flushing of the air ducts that filled the factory with a cloud of dust. According to a memorandum prepared by a UNICOR staff member to the Superintendent of Industries at FCI Elkton, the dust was "thick enough to considerably limit visibility in the factory," and all inmates were evacuated and work cancelled for the remainder of the day.[85]

FOH found extensive and very high levels of cadmium and lead contamination at FCI Elkton on many building surfaces, inside ductwork, on a UNICOR factory roof, and other areas.[86] In 2008, following release of the OIG's findings regarding contamination at FCI Elkton, UNICOR conducted a factory-wide surface remediation operation using a contractor. FOH also identified areas at other BOP institutions that were contaminated or likely contaminated

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[85] Other UNICOR activities that disturbed legacy contamination in recent years include the refurbishment of the USP Lewisburg factory and relocation or modifications of glass breaking booths at various factories.

[86] FOH found lead surface contamination in a recycling factory at FCI Elkton that was above 100,000 µg/ft^2 on many surfaces including 370,000 µg/ft^2 on a wall ledge and 124,000 µg/ft^2 on a steel support beam surface. In addition, FOH identified a bulk dust sample that contained 16 percent lead. FOH found that the highest cadmium surface contamination ranged from about 2,000 µg/ft^2 to a high of 12,800 µg/ft^2. This contamination can create inhalation and ingestion hazards if not abated, especially during maintenance activities.

with dust and debris from glass breaking operations but that remained unabated, including the exterior bag house and filters at FCI Ft. Dix, as well as the exterior cyclone filter that remains from the former furniture factory at FCI Texarkana.

Although exposures from surface contamination prior to June 2003 could not be quantified, FOH and NIOSH-HETAB concluded that UNICOR failed to prevent contamination build-up in work areas and that UNICOR and the BOP did not take appropriate protective measures to mitigate risks to workers from exposure to legacy contamination.

4. Conclusions Regarding Exposures

In sum, members of the OIG technical team made detailed findings regarding worker exposures to toxic metals in various settings in UNICOR's e-waste operations, including during glass breaking operations, other activities, and from contact with legacy contamination. The findings of each agency are presented more fully in their site reports contained in the online appendix to this report. The OIG technical team concluded that staff and inmates at times were exposed to unsafe levels of cadmium and lead. Moreover, due to the uniform nature of the inadequate work procedures and conditions at each institution, we believe that these exposures likely occurred repeatedly, especially prior to 2003. As detailed in the following sections, the OIG technical team found that these exposures were attributable to numerous deficiencies in UNICOR's engineering controls, work practices, and administrative controls. We assess medical issues associated with these exposures later in this chapter.

B. Assessment of UNICOR Engineering Controls and Work Practices

The OSHA lead and cadmium standards require that worker exposures be controlled at or below the OSHA PELs through the use of engineering and work practice controls. 29 C.F.R. § 1910.1025(e); 29 C.F.R. § 1910.1027(f). The OIG technical team found that deficient engineering controls and work practices contributed significantly to the exposures above these levels that were described above.

1. Engineering Controls

Engineering controls for toxic metal dusts include equipment such as local exhaust ventilation systems that capture dust at its source to prevent or reduce hazardous exposures, containment structures that keep contaminants from reaching unprotected workers, physical barriers that separate workers from hazards, and decontamination areas designed to prevent contaminants from being carried out of the work area. OSHA requires employers to implement engineering and work practice controls to reduce exposures if

monitoring identifies exceedances of the PEL. 29 C.F.R. §§ 1910.1027(f)(1); 1910.1025(e)(1). In general and whenever feasible, these controls are required by OSHA regulations as the primary means to prevent overexposures, rather than through the use of PPE, such as respiratory protection.

FOH and NIOSH-HETAB determined that UNICOR did not implement effective engineering controls for glass breaking operations prior to June 2003. We found that UNICOR largely left the design of its glass breaking booths to local factory and institution staff that lacked industrial hygiene and engineering expertise, with the result that recycling factories either did not have exhaust ventilation and containment systems when glass breaking started or used ineffective make-shift systems that were improperly designed.

For example, at USP Atwater, UNICOR started glass breaking operations without an exhaust ventilation system, but added such a system shortly after startup using a paint spray booth that had been modified by a UNICOR recycling technician with the assistance of inmates. Subsequent exposure monitoring demonstrated that this exhaust system was ineffective in limiting worker exposures to levels below the lead and cadmium PELs. At FCI Elkton, between 1998 and 2003, UNICOR performed glass breaking without the benefit of properly designed exhaust ventilation systems and containment structures. UNICOR's former RBG General Manager, Lawrence Novicky stated that generally it was up to each factory to design its own glass breaking booth. Prior to 2004, staged decontamination areas were not used at any factory.

We found that each UNICOR glass breaking booth was different. They varied in size, type of ducting, the use of auxiliary ventilation, and filter location. These differences are exemplified by the photographs of the glass breaking areas at FCI Elkton and USP Atwater taken in 2001 and 2002 (Photographs 3.2 and 3.5 in Chapter Three).

Other deficiencies we identified regarding UNICOR's approach to engineering controls included failing to adequately test glass breaking engineering controls to confirm their effectiveness prior to starting full operations. After exposures were found, UNICOR also relied upon trial-and-error approaches to safety over extended time periods before adequate engineering controls were finally installed or improved upon to effectively reduce the exposures.

Even after UNICOR began installing exhaust systems in 2003, it utilized systems that were not properly designed to control toxic metals emissions, and it delayed implementation of improvements to promptly abate unhealthful working conditions in violation of OSHA regulations. See 29 C.F.R. § 1960.30 (requiring federal agencies to "ensure the prompt abatement of unsafe and unhealthful conditions."). For instance, UNICOR used a paint booth exhaust system for USP Atwater after June 2003, used various systems including a

carpentry shop exhaust system for FCI Texarkana until adequate high-efficiency filtration units were installed after May 2004, and used a retrofitted paint spray booth at FCI Ft. Dix starting in 2003. UNICOR gradually improved these systems, along with the use of other associated engineering controls such as plastic strip curtains, but it did not consistently maintain exposures at or below the PELs through the use of engineering or work practice controls until April 2004 at FCI Ft. Dix, May 2004 at FCI Texarkana, early to mid-2004 at USP Atwater, and after June 2006 at FCI Elkton. Until exposures were successfully reduced, UNICOR was not in compliance with the OSHA cadmium and lead standards at these institutions.

We identified a noteworthy exception to these results at USP Lewisburg. UNICOR started glass breaking there in 2003 using a high-efficiency air filtration system that was designed for hazards such as toxic metals. Unlike every other UNICOR e-waste recycling factory, UNICOR managers at USP Lewisburg selected this system after consulting with a professional engineer who rejected the make-shift collection hood systems in use at other factories. UNICOR at USP Lewisburg has never recorded an exposure above the cadmium or lead PEL.[87] UNICOR later implemented the same type of air filtration system at FCIs Texarkana and Marianna. As with USP Lewisburg, these institutions have not found an exposure above the cadmium or lead PEL after these systems were installed.[88]

We also found that the quality of UNICOR's glass breaking booths varied but improved over time. UNICOR typically constructed its glass breaking booths with some combination of solid walls and plastic sheeting and plastic strip curtains for entry and egress. To reduce exposures, UNICOR improved these systems with the placement of strip curtains between the worker and the glass breaking grate. During the OIG investigation, NIOSH found that UNICOR did not design these systems with appropriate decontamination areas that typically include a 3-stage area for putting on and removing protective equipment, storing protective equipment and clothing, conducting personal and equipment decontamination, and conducting hygiene practices such as hand washing.

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[87] NIOSH-DART and FOH noted that the filtration systems at USP Lewisburg and FCI Marianna re-circulated 100 percent of the air from the glass breaking booths and no fresh air was provided. This is not a recommended practice because it did not achieve a "negative pressure" condition relative to the general factory area housing the booth. Negative pressure prevents cadmium and lead emissions in the booth from migrating outside the booth into the general factory.

[88] However, at FCI Marianna NIOSH found that inmates who delivered CRTs to the glass breaking booth ("feeders") had cadmium exposures that were near the action level indicating that airborne emissions were escaping the glass breaking booth. According to FOH, exposures above the action level at times could not be ruled out.

The quality of the decontamination or transition areas also varied greatly by factory. At FCI Marianna, UNICOR had no transition area, and inmate glass breakers put on, removed, and stored protective equipment immediately adjacent to the contaminated booth in the same room where the e-waste was stored and the feeder inmates worked by passing CRTs to the breakers. Such a system is prone to contamination of clean equipment and personnel, as well as likely to allow contaminants to be carried out.[89] As shown in Diagram 2.3, at FCI Texarkana UNICOR had a 7-zone system where decontamination areas and clean storage and locker areas were separated. Without adequate decontamination areas, the OIG technical team found that carry-out of contamination occurred from glass breaking booths to the factory areas. At USP Lewisburg, OSHA conducted an inspection in April 2007 and issued a violation to UNICOR under its lead standard (29 C.F.R. § 1910.1025) for, among other things, the carry out of contamination from the glass breaking booth to the factory area.

FOH and NIOSH-HETAB determined that UNICOR's engineering controls for its desoldering and chip recovery operations at FCI Elkton were deficient for the first 7 months of operations. Initially, UNICOR did not implement engineering controls for this work. After approximately 2 months, UNICOR installed a make-shift exhaust system from plastic piping and, after this system proved ineffective, completed installation of an improved system in May 2006. UNICOR's failure to provide engineering controls contributed to heavy lead contamination in the factory where the desoldering work occurred and required later remediation at significant expense. OSHA found UNICOR's operation violated numerous OSHA regulations, including those governing PPE and respiratory protection, hazard communication, lead exposure monitoring, and requirements that federal agencies promptly abate any unsafe work conditions.[90] If these violations had been identified during an OSHA inspection, they would have been deemed "willful" violations according to OSHA.

2. Work Practice Controls

Work practice controls are work methods and procedures that limit worker exposure to hazards, including rules and requirements that promote safe working conditions. FOH and NIOSH-HETAB concluded that prior to June 2003 UNICOR did not implement effective work practice controls to protect workers from toxic metal hazards. For example, UNICOR allowed eating and

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[89] Such contamination can present special risks if it is carried into areas where children or pregnant women are present, such as automobiles or homes.

[90] See 29 C.F.R. § 1910.132(d); 1910.134(d); 1910.1200(h); 1910.1025(d); and 29 C.F.R. § 1960.30.

drinking in recycling work areas where cadmium and lead emissions and contamination were present.

UNICOR also did not implement adequate cleaning and hygiene practices. UNICOR's work practices for changing out ventilation system filters were particularly deficient and contributed to cadmium and lead exposures. Beginning in approximately 2002, UNICOR used exhaust ventilation systems equipped with filters for some of its glass breaking operations. These exhaust systems and filters were used at USP Atwater, FCI Elkton, FCI Texarkana, FCI Ft. Dix, FCI Marianna, and USP Lewisburg. The filters collected cadmium and lead emissions and became heavily loaded with these toxic metals over time.

However, UNICOR failed to ensure that staff and inmate workers who changed the filters from these systems, as well as from general factory ventilation and other glass breaking exhaust systems, did so using appropriate methods. OSHA regulations prohibit the removal of cadmium from equipment by shaking or other means that disperses cadmium into the air. 29 C.F.R. § 1910.1027(i)(3)(iii). We determined that inmates at times removed filters in a dry condition rather than wetting the filters to limit dusts from becoming airborne, sometimes purposefully or inadvertently shook dust off the filters creating airborne dusts, and cleaned the area using dry methods or improper vacuum systems. Staff and inmates indicated that extensive dusts were released during this activity. UNICOR did not monitor exposures for the filter change activity.

Even in later years, UNICOR used improper filter changing practices at some facilities. For example, in March 2007, as part of the OIG investigation at FCI Elkton, NIOSH and FOH found that inmates used inappropriate practices to change the filters, including shaking and banging them, which created a thick cloud of dust and caused significant exceedances of OSHA's cadmium standard.

According to FOH, staff and inmates at FCI Elkton informed its inspectors that the practice of banging the filters as observed during the site visit was not an isolated occurrence. UNICOR subsequently better enforced its filter changing policy following the FOH/NIOSH inspection and instructed inmates not to strike the filters. NIOSH subsequently found that proper procedures were being utilized at other BOP facilities.

UNICOR's cleaning practices were also deficient. UNICOR periodically conducted cleaning of factory areas, typically at the end of each work shift and at the end of each week. Our investigation determined that prior to June 2003, UNICOR cleaned in a manner that did not maintain surface contamination at acceptable levels to avoid potential personal exposures. UNICOR used dry sweeping, which is prohibited by the OSHA cadmium and lead standards because it re-suspends dust into the air, creating an inhalation hazard.

UNICOR also used shop vacuums, which do not have high-efficiency particulate air (HEPA) filters to trap toxic dusts. Like dry sweeping, using shop vacuums can create airborne hazards.

The OIG technical team observed cleaning practices at recycling factories and performed exposure monitoring during cleaning of the glass breaking booth at FCI Elkton. NIOSH-DART found that cadmium exposure was above the action level at FCI Elkton during cleaning of its glass breaking booth. The technical team concluded that exposures above the PEL for this activity could not be ruled out because of the daily variability in the cleaning practices, but that appropriate respiratory protection was in use. OSHA also issued a violation to UNICOR at USP Lewisburg for dry sweeping in the disassembly area. During subsequent field work at other institutions, FOH and NIOSH also observed inmates using dry sweeping methods. As late as May 2009, a UNICOR consultant observed and recommended against dry sweeping at UNICOR's USP Leavenworth factory.

We found that by mid-2003, however, UNICOR had begun using various improved work practice controls to protect workers against cadmium and lead hazards. Following the engagement of BOP's Health Services Division in some matters involving e-waste recycling due to the events at USP Atwater, UNICOR Headquarters devoted more attention to cleaning routines and housekeeping practices in its recycling factories. For example, UNICOR adopted glass breaking procedures that specified daily and weekly cleaning routines, and inspections conducted by Recycling Business Group personnel at the factories typically devoted substantial attention to the issue.

FOH also determined that, with proper technical support, planning, hazard analysis, and oversight, UNICOR demonstrated that it was able to conduct maintenance operations in a safe and successful manner. In early 2009, UNICOR at USP Lewisburg conducted a clean-up of contaminated surfaces in the UNICOR warehouse. With assistance from an industrial hygiene consultant, UNICOR planned for and conducted this work in a highly competent manner, according to FOH.

Despite these improvements, for periods well after mid-2003, UNICOR continued to employ certain work practices that members of the OIG technical team believed were unsanitary and not compliant with OSHA cadmium and lead standards, but that have since been discontinued. For example, UNICOR did not prohibit eating and drinking in general recycling work areas, excluding glass breaking booths, until 2005. It also continued several improper cleaning practices, including dry sweeping, use of shop vacuums that are not appropriate for toxic metal dusts, and use of compressed air guns that blow deposited dusts into the air. As noted above, OSHA conducted an inspection of USP Lewisburg in April 2007 and issued a violation to UNICOR under its lead standard (29 C.F.R. § 1910.1025) for improper cleaning practices in

disassembly areas. OSHA cited UNICOR's use of improper dry sweeping and pedestal fans, as well as the carry-out of contamination from the glass breaking booth.

C. Assessment of UNICOR Personal Protective Equipment for Lead and Cadmium

Personal protective equipment controls include respiratory protection; protective clothing; and other protective equipment for the hands, head, face, eyes, ears, and feet. OSHA requires that personal protective equipment be selected and specified based on a hazard analysis of the workplace. See 29 C.F.R. Subpart I; 29 C.F.R. § 1910.132. For respiratory protection, OSHA also requires a written program to define practices regarding medical clearance; fit testing; training; record keeping; and respirator use, maintenance, and storage. 29 C.F.R. § 1910.134.

Prior to 2003, UNICOR failed to perform adequate hazard assessments in its recycling factories to identify necessary personal protective equipment. As a result, staff and inmates at times lacked personal protective equipment to effectively mitigate exposures to cadmium and lead. At the startup of glass breaking operations at many factories, including FCI's Elkton and Texarkana and USP Atwater, UNICOR either did not provide respiratory protection or provided paper dust masks that were not approved for toxic metals, thereby violating OSHA standards for respiratory protection, personal protective equipment, cadmium, and lead.

In addition, UNICOR at times did not comply with various aspects of OSHA regulations governing personal protective equipment and respiratory protection (29 C.F.R. § 1910.132, General; 29 C.F.R. § 1910.134, Respiratory protection). For example, we found that the respirators used by UNICOR at times were not sufficiently protective.[91] In late 2004, UNICOR directed all factories to use powered air purifying respirators for glass breaking operations, which was sufficient to protect against exposures found after mid-June 2003 for all routine operations.

Besides problems concerning the selection of sufficiently protective respirators, we determined that UNICOR's respiratory protection practices for glass breaking suffered from other deficiencies. We found that: (1) UNICOR's and BOP's written respiratory protection programs did not always specify the

[91] At FCI Ft. Dix, UNICOR relied upon the P-100 air purifying respirator, later changing to powered air purifying respirators in 2004. We found that the P-100 respirator and dust mask did not have an adequate protection factor for exposures that were measured at FCI Ft. Dix in November 2003. FOH and NIOSH identified similar problems at FCI Elkton in 2007 concerning inmate handling of glass booth filters.

types of respirators to be used in recycling factories, (2) UNICOR's selection of respirators was not based on a hazard analysis and UNICOR did not verify the adequacy of its respirators through exposure testing, (3) work practices regarding respiratory protection were not consistent with written procedures, (4) respirator storage and maintenance practices at some factories left respirators prone to contamination, (5) UNICOR used unauthorized respirator parts for maintenance purposes, (6) UNICOR did not consistently ensure that inmates had received medical examinations prior to using respirators, and (7) UNICOR staff at times did not change respirator cartridges with adequate frequency.

We also found that UNICOR provided dust masks for voluntary use to workers at various factories during disassembly and related operations, as well as for the FCI Elkton desoldering operation. UNICOR did not inform workers of the limitations of this type of respirator in accordance with OSHA regulations (Appendix D of the 29 C.F.R. § 1910.134). As a result, we determined that UNICOR failed to comply with the OSHA respiratory protection standard (29 C.F.R. § 1910.134). Also, we believe that, in many instances, the types of dust masks used were made out of light paper and were inferior to, for example, NIOSH-approved dust masks which would have provided workers significant additional protection against cadmium and lead dusts.

Even in 2009 after glass breaking was discontinued, UNICOR required dust masks for cleaning up accidentally-broken CRTs at facilities such as USP Leavenworth, used dust masks that were not approved for toxic metal dusts, and did not have a respiratory protection program, resulting in non-compliance with the OSHA respiratory protection standard.

UNICOR also did not adequately assess the need for respiratory protection for desoldering and chip recovery operations at FCI Elkton. A few weeks after start-up, UNICOR began to provide half face piece air purifying respirators for certain workers at the solder fountains. UNICOR as well as the BOP did not perform a hazard analysis or exposure monitoring to document the rationale to provide respirators to some but not other inmates and to verify that the type of respirators selected for use were adequately protective. Inmates reported that filters for these respirators were not changed very often and that workers provided with dust masks had to re-use previously used masks at times.

In addition to respiratory protection, we also determined that UNICOR instituted improvements to its inmate protective clothing procedures between 2003 and 2005. For example, after mid-2003 UNICOR authorized requests for use of disposable coveralls for all glass breaking operations. It also issued improved laundry procedures in 2005 that prohibited mixing of contaminated clothing with the clothing of the general inmate population.

During our field work, we observed that inmate workers breaking glass inside UNICOR glass breaking booths wore disposable coveralls, gloves, protective sleeve guards, and boots with boot covers. Eye and face protection were provided by the hoods of powered air purifying respirators. Photograph 2.5 in Chapter 2 shows a UNICOR worker dressed in this protective clothing.

For disassembly and related activities in general factory areas that did not include glass breaking, UNICOR's typical protective equipment included cloth work clothes that varied in type; gloves; safety glasses; work shoes; the voluntary use of dust masks; and the voluntary use of hearing protection, although this was required for some activities at some factories.

During our investigation, NIOSH and OSHA identified several instances where UNICOR was using deficient protective equipment practices in its recycling factories. For example, NIOSH reported that contaminated clothing was not properly isolated from clean clothing in some cases. NIOSH also found that practices for removing protective clothing were not adequate to prevent contamination of skin and clothing. OSHA found that the protective clothing worn by glass breakers at FCI Marianna was not properly sealed, which resulted in skin contamination. A UNICOR consultant had reported the same condition 10 months earlier.

D. Assessment of Administrative Controls

Administrative controls include policies, programs, and procedures that identify and control occupational hazards, define and ensure safe work practices, verify safe work conditions, and respond to and correct incidents that result in unsafe work conditions.

1. Policies, Programs, and Procedures

UNICOR's Recycling Business Group conducted e-waste recycling operations without written health and safety policies for nearly 4 years before it began to issue such procedures to its recycling factories. Some of UNICOR's factories prepared their own procedures, but certain of these procedures conflicted with each other, did not reflect actual work practices, were prepared without the benefit of a hazard analysis, or were not implemented. We determined that prior to 2003, UNICOR was not in compliance with OSHA standards governing cadmium, lead, hazard communication, and respiratory protection with regard to their requirements for written programs and procedures.

However, the Recycling Business Group made substantial efforts to improve the scope and content of its written policies and procedures starting in 2003. The Recycling Business Group later issued detailed glass breaking procedures, developed standard operating procedures (SOPs), and issued a Pre-Industrial Manual for inmate worker job orientation and general training in

safe work practices. Individual UNICOR factories also prepared various procedures and work instructions for specific operations.

In addition to policies within the Recycling Business Group, FOH examined the BOP's and UNICOR's health and safety policies that applied to the e-waste recycling program. FOH identified various omissions in these policies that have important implications for exposure control, OSHA compliance, and establishing the safe and healthful workplace that BOP policy dictates. For example, FOH found that the BOP's national health and safety policy (PS 1600.08/09 Occupational Safety and Environmental Health) does not adequately address work planning and job hazard analysis. FOH also found that UNICOR and BOP policies sometimes conflicted with each other and provided inconsistent and incomplete guidance.

We further concluded that UNICOR violated the BOP's national health and safety policy. Our investigation found that UNICOR disregarded many requirements of this policy, including control of hazardous materials, reporting and correcting unsafe and unhealthy work conditions, use of personal protective equipment, hazard training, and hazard communication, among others.

2. Training and Hazard Communication

Administrative controls also include training and hazard communication to inform workers of hazards in their workplace. OSHA requires employee communication and training under various standards including those dealing with cadmium, lead, hazard communication respiratory protection, and noise.

We determined that prior to 2003 UNICOR did not conduct hazard analyses in its recycling work areas that was necessary to fully identify the hazards associated with e-waste recycling, and thereafter failed to develop and to provide appropriate hazard communication and training programs. For example, prior to 2002, UNICOR managers repeatedly informed staff that dusts from glass breaking operations were not hazardous and failed to provide training to adequately address this hazard. We found that this was due in part to incomplete information that UNICOR obtained from a consultant in 1997, and from testing performed by the Safety Department at FCI Elkton in 2001. As explained in Chapter Three, FOH and NIOSH-HETAB concluded that the BOP's reliance on this work was misplaced. For example, the consultant's study did not evaluate UNICOR's actual work operations, which involved high volume glass breaking, and the hygienist who performed the work said it had no applicability to circumstances where as many as 1,000 CRTs a day were being broken.

Even after testing revealed toxic metal exposure problems at USP Atwater in June 2002, UNICOR failed to promptly warn staff and inmates of dangers

associated with these exposures. UNICOR did not alert recycling factories at other locations about the hazardous conditions that had been identified at USP Atwater, and failed to require that additional industrial hygiene assessments and control measures be completed for all of its recycling operations.

According to OSHA, UNICOR should have taken prompt measures to inform employees at other institutions about cadmium and lead hazards associated with its glass breaking practices and should have reevaluated and upgraded respiratory protection as necessary following receipt of the first USP Atwater testing results. Instead, for example, glass breaking continued at FCI Texarkana for more than 7 weeks without safety modifications. OSHA advised the OIG that if it had identified such conduct during one of its inspections, it would have found "willful" violations of its hazard communication and respiratory protection standards. 29 C.F.R. § 1910.1200; 29 C.F.R. § 1910.134. Staff at FCI Marianna also stated that they were not informed of hazards related to the "de-mil" project that involved disassembly of items that contained hazardous chemicals.

Starting in 2003, UNICOR developed a variety of new training policies and procedures, and improved its hazard communication. For example, the Recycling Business Group's standard operating procedures (SOPs) required a 32-hour course for all staff that included training on the BOP's health and safety policy, PS 1600.08. UNICOR factories provided various training and hazard communication to supplement UNICOR's training requirements in some cases.

FOH reviewed UNICOR's training policies and documents and identified several deficiencies, however. FOH determined that the Inmate Manual conflicted with actual work practices in some important ways, and it did not contain all required training content under the OSHA cadmium and lead standards.[92]

UNICOR's training also did not address all requirements of the OSHA hazard communication standard, 29 C.F.R. § 1910.1200, which identifies specific hazard information and training that UNICOR was required to provide to its workers regarding hazardous chemicals such as cadmium and lead.

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[92] For instance, the Inmate Manual and associated orientation training did not: (1) address the content of the standards and their appendices, including such details as exposure monitoring requirements; (2) inform employees of the specific operations that could result in exposure above the action levels; (3) provide information on respiratory protection, such as use, limitations, storage, and maintenance; (4) describe medical surveillance requirements; and (5) address contents of the compliance programs because written cadmium and lead compliance programs were not in place. The OSHA cadmium and lead standards further require that training be provided prior to job assignment; therefore, the timing of UNICOR's training was not in compliance with the standards for existing workers.

In addition to training deficiencies, UNICOR did not consistently inform inmates of cadmium and lead exposure monitoring results as required by the cadmium and lead standards, 29 C.F.R. § 1910.1027 and 29 C.F.R. § 1910.1025, and the OSHA regulation governing employee access to exposure records. 29 C.F.R. § 1910.1020. UNICOR corrected this deficiency in recent years.

3. Use of Worker Rotation and Production Rate Limits

Worker rotation practices in and out of hazardous work areas and work volume and production limits are administrative controls that can reduce exposures. However, the OSHA cadmium standard (29 C.F.R. § 1910.1027 (f)(1)(iv)) explicitly prohibits the use of worker rotation as a means to reduce exposures below the PEL.

During the OIG technical team's field work at UNICOR's recycling factories, we found that UNICOR was using worker rotation techniques to reduce exposures during glass breaking operations. At some factories, UNICOR limited glass breaking to a single 2 to 3-hour shift per day, rather than shifts of about 6 hours that had been worked in earlier years. After completing the reduced glass breaking shift, UNICOR then rotated workers from glass breaking activities to disassembly activities on the general factory floor. This rotation reduced exposures over an 8-hour period by combining a higher exposure activity, such as glass breaking, with a lower exposure activity, such as disassembly. At other factories, UNICOR performed both a morning and an afternoon glass breaking shift but rotated personnel between feeder and glass breaker duties in the morning versus afternoon shifts. This rotation reduced average exposure over an 8-hour period by combining the higher exposure activity of glass breaking with the lower exposure activity of feeding.

In reviewing UNICOR consultant, OSHA, and NIOSH exposure monitoring data, FOH and NIOSH-HETAB identified several instances where exposures would likely have been above the cadmium PEL (5 $\mu g/m^3$) or action level (2.5 $\mu g/m^3$) if the work shift were extended for a full shift. In some instances, either NIOSH or UNICOR consultants found that exposures would likely have exceeded OSHA PELs or action levels for cadmium if the work shifts were not shortened.

E. Conclusions Regarding Toxic Metals Exposures and UNICOR Controls

FOH and NIOSH-HETAB determined that some UNICOR staff members and inmates probably were repeatedly exposed to unsafe levels of cadmium and lead prior to June 2003, and that UNICOR conducted e-waste recycling operations in violation of many OSHA standards, including those dealing with cadmium, lead, personal protective equipment, hazard communication, and

respiratory protection. UNICOR's non-compliance with these standards applied to recycling operations involving glass breaking, computer disassembly, cleaning, and activities such as ventilation maintenance, among others.[93]

After June 2003 UNICOR made substantial improvements to its worker protection practices for e-waste recycling by: (1) issuing glass breaking and other operating procedures, (2) implementing better engineering and work practice controls for glass breaking in 2003 and 2004 and then gradually improving these controls over time, (3) upgrading respiratory protection for glass breaking in 2003 and standardizing the type of respirators used in late 2004, (4) improving other personal protective equipment for glass breaking, and (5) providing increased training for staff in late 2003 and 2004 and formalizing job orientation training for inmates in 2005. UNICOR also improved its exposure monitoring at its factories over time.

Even with these improvements, however UNICOR was slow to consistently control exposures below the cadmium and lead PELs and demonstrated persistent non-compliance with various OSHA standards and BOP and UNICOR health and safety policies after the June 2002 USP Atwater tests revealed exceedances for cadmium and lead. For glass breaking operations at many factories, UNICOR assembled make-shift engineering controls such as exhaust ventilation systems that were not originally designed for toxic metals dust control. With the exception of USP Lewisburg, UNICOR did not use adequate engineering or industrial hygiene support in designing, fabricating, testing, or validating these systems. For extensive periods of time at several factories, sometimes years, UNICOR did not refine these systems in a manner that provided adequate exposure control. While UNICOR's inappropriate use of worker rotation contributed to reduced exposures when calculated as 8-hour time-weighted averages, UNICOR should have in the first case reduced exposures to below the PEL through engineering and work practice controls rather than in combination with worker rotation.

Based on surface contamination testing, we also determined that UNICOR's current disassembly operations release cadmium and lead contamination that accumulates on surfaces over time. Even though various UNICOR consultants, and FOH and NIOSH-HETAB, found that these releases do not result in inhalation exposures above OSHA exposure limits during

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[93] Specific violations included: (1) failing to maintain lead and cadmium exposures at or below PELs through the use of engineering and work practice controls; (2) failing to maintain local exhaust ventilation systems; (3) failing to conduct initial and follow-up exposure monitoring; (4) using inadequate or improper cleaning, housekeeping, and hygiene practices; (5) failing to perform a hazard analysis to select protective equipment including respiratory protection; (6) failing to adopt written programs and procedures for cadmium and lead compliance and respiratory protection; and (6) omitting cadmium, lead, and hazard communication training for its workers.

normal disassembly operations, they represent a potential ingestion hazard and a possible inhalation hazard if dusts are substantially disturbed. In past years UNICOR has used improper practices for cleaning but has largely corrected these practices in recent years.

II. Medical Findings

As described in Chapter Two, cadmium and lead are both toxic to humans and can cause harm when absorbed by the body. Exposure to lead may result in damage to the kidneys, anemia, high blood pressure, and infertility. Long-term exposure effects of cadmium may include emphysema, kidney damage, and an increased risk of cancer.

In light of these dangers, the OIG sought NIOSH's assistance in evaluating the medical effects resulting from the exposure conditions described above and in the individual site reports that the OIG technical team members prepared. We also requested that NIOSH assess the BOP's and UNICOR's medical surveillance of staff and inmates. NIOSH assigned an experienced Occupational Physician and industrial hygienist from its Hazard Evaluations and Technical Assistance Branch (HETAB) to provide assistance.

Between February 2008 and February 2009, NIOSH-HETAB staff completed site visits to four BOP institutions – FCI Elkton, FCI Texarkana, FCI Marianna, and USP Atwater – including return visits to FCIs Elkton and Texarkana. While at the institutions, NIOSH's medical team toured the recycling factories and met with staff and inmates to listen to their concerns. The team also requested documents from the BOP and UNICOR and reviewed materials provided by the OIG that we collected during our investigation, including medical surveillance records, personal medical records of staff and inmates, and industrial hygiene testing reports.

After completing its assessment at each of the institutions, NIOSH-HETAB sent a letter report to the OIG describing its findings. These reports were peer reviewed within NIOSH and appear in Attachment 2. In addition, NIOSH-HETAB provided its final report on its health hazard evaluation to the OIG in December 2009, which also appears in Attachment 2. The medical team's findings address the results of its review of biological monitoring data obtained from staff and inmate medical records, UNICOR's and the BOP's medical surveillance procedures, and medical symptoms that staff and inmates described in their interviews with the medical team. The OIG requested that the BOP and UNICOR provide NIOSH's reports to all concerned staff and inmates. The following sections summarize the findings of those reports.

A. Biological Monitoring Results

NIOSH's review of available staff and inmate medical records revealed that the results of biological monitoring generally were unremarkable. NIOSH did not identify any blood or urine testing that exceeded occupational standards for cadmium and lead. However, according to NIOSH, these conclusions are subject to three qualifications.

First, because UNICOR failed to comply with OSHA biological monitoring regulations (see discussion of medical surveillance below), the biological monitoring records that NIOSH reviewed from each institution were incomplete and did not include data from periods when exposures were likely greatest. For example, UNICOR's biological monitoring for lead at FCI Elkton did not start until 2003, more than 5 years after e-waste recycling operations began there. In addition, because cadmium and lead are not retained for long periods in the bloodstream, blood testing in 2003 did not provide reliable information about early exposures. As a result, NIOSH was not able to provide staff and inmates with assurances about their cadmium and blood lead levels for the first several years of operations. Similarly, although urine cadmium results at all institutions were at acceptable levels, the number of records for inmates who worked in glass breaking operations prior to 2002 was limited. For example, only one inmate at FCI Elkton who worked in glass breaking operations prior to 2001 had urine cadmium testing performed.[94]

Second, although staff and inmate medical records did not reveal exceedances of OSHA standards for blood lead, NIOSH did identify increases in inmate blood lead levels indicating lead exposures following activation of glass breaking operations at USP Atwater, during glass breaking operations at FCI Elkton prior to installation of the glass breaking booth in 2003, and following start of the Elkton chip recovery project. Due to the initiative of Safety Manager Smith, pre-placement, baseline blood testing was performed at USP Atwater in March 2002 on 10 inmates who later worked in glass breaking operations. Testing performed in July showed that the average blood lead levels increased, indicating exposures to lead.[95] At FCI Elkton, NIOSH found that blood lead levels for inmates working in the glass breaking booth declined between 2003 and 2007. However, the medical team concluded that the testing results from 2003 indicated some bodily uptake of lead. NIOSH also evaluated the medical records of 14 inmates who worked in the Elkton chip

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[94] By the time biological monitoring for inmates started, this inmate was the only pre-2001 glass breaker who remained at FCI Elkton. The BOP did not seek to perform testing on inmates who were transferred to other institutions until 2010. The results of these tests should be available by the fall of 2010.

[95] NIOSH also found that blood cadmium levels decreased for these inmates, likely due to a reduction in smoking.

recovery project. Because UNICOR and the BOP failed to conduct blood testing until 4 months after the project ended, the medical team concluded that it could not determine the extent of lead exposures given that lead is not retained for long periods in the bloodstream. However, based on staff descriptions of the work environment and the lead levels found in one inmate, NIOSH concluded that lead exposures during the chip recovery project did occur.

Third, there is the possibility of future medical effects resulting from past cadmium and lead exposures. While NIOSH concluded that the biological monitoring data that it reviewed generally was unremarkable, due to variations in individuals' susceptibility to illness from toxic metal exposures, the results do not mean that staff and inmates who previously were exposed to these metals will not later become ill. NIOSH determined, for example, that while the blood lead levels at FCI Elkton were well below levels that would require removal from the workplace under OSHA regulations, adverse health effects, such as impaired renal function and cognition, had been reported in the medical literature at levels found in the inmates' medical records. Cadmium is also a carcinogen, but cancer may not appear for many years following exposure. According to NIOSH, even if a staff member or inmate were to develop cancer later in life, it would not be possible to link its cause to e-waste recycling operations due to confounding influences, such as smoking and the general incidence of cancer in males, which approaches 50 percent.

Overall, NIOSH concluded that UNICOR staff and inmates might have some additional collective risk of health problems because of the lack of exposure control measures and the many OSHA violations that the OIG technical team identified during its investigation. However, according to NIOSH, the amount of this additional risk and its significance to particular individuals was not possible to estimate. As described above, this result is a consequence of the lax medical surveillance practices instituted by UNICOR and the BOP. For example, the opportunity to properly assess the medical effects of early exposures to lead has been lost because testing was not performed in a timely manner. At this time it is not possible to isolate the medical effects of the exposures from many other intervening influences, making it impossible to single out the toxic metal exposures as the cause of future staff and inmate health problems.

B. Medical Surveillance

NIOSH concluded that the BOP's and UNICOR's medical surveillance of staff and inmates at FCI Elkton and USP Atwater was inadequate and failed to comply with OSHA regulations. NIOSH determined that medical examinations were not completed on inmates as required by the OSHA cadmium and lead standards, and medical records were not properly retained by the BOP. Biological monitoring also was not standardized, resulting in some staff and inmates failing to receive testing as required under OSHA regulations. At FCI

Elkton, biological monitoring for lead was not completed as required, and tests that were not appropriate for occupational exposures, such as for arsenic, were performed. Testing results were also not consistently communicated to the staff and inmates, as required by OSHA regulations. At USP Atwater, in addition to the deficiencies above, NIOSH reported that inmates did not receive medical clearance for respirator use.

Despite these problems, NIOSH concluded that the only persons currently working in e-waste recycling who required continued medical surveillance in accordance with OSHA requirements were inmates at FCI Elkton that performed glass breaking operations or the monthly change of the glass breaking booth filters, and inmates at USP Atwater that would perform the same functions in the event that glass breaking operations restart there.[96] The results of air monitoring at these institutions revealed exceedances of OSHA exposure limits that triggered the need for such surveillance.[97] NIOSH also found that some former Elkton inmates and staff may require surveillance under the OSHA cadmium standard based on the likelihood that they were exposed to cadmium prior to 2003. This also applies to all inmates and staff at any location who may have been exposed to cadmium over the action level for more than 30 days. NIOSH recommended that UNICOR or the BOP retain a board-certified, residency-trained Occupational Medicine Physician to oversee future medical surveillance activities.

The BOP requested FOH to provide these services. In December 2008, an occupational physician at FOH advised the Warden at FCI Elkton that a medical examination including various laboratory work should be provided to UNICOR staff who previously worked in e-waste recycling.[98] The physician also visited FCI Elkton in April 2009 to meet with concerned staff. In December 2009, the BOP advised the OIG that medical testing had been completed on staff members at FCI Elkton and that all results were normal. In addition, medical testing to determine the individuals to be included in a medical surveillance program was planned for other institutions where UNICOR previously conducted glass breaking operations. In 2010, based on recommendations from the FOH physician, the BOP instituted medical surveillance for inmates who previously worked in recycling at FCIs Elkton and

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[96] At the time that NIOSH made these conclusions, UNICOR was still breaking glass at FCI Elkton.

[97] According to NIOSH, UNICOR should voluntarily follow the more protective guidelines for lead exposure and blood lead levels set forth by an expert panel [Kosnett et al. 2007]. These guidelines were endorsed by the California Department of Public Health and the Council of State and Territorial Epidemiologists in 2009, and therefore were not included in the initial NIOSH letters sent to Elkton and Texarkana, but they should be applied to all UNICOR facilities where exposure to lead occurs.

[98] E-waste recycling operations were suspended at FCI Elkton in May 2008.

Texarkana, institutions where glass breaking occurred prior to 2003 and medical surveillance was not performed.

C. Staff and Inmate Health Complaints

In addition to assessing UNICOR's and the BOP's medical surveillance procedures and examining biological monitoring results, NIOSH also evaluated adverse health symptoms that staff and inmates reported in their interviews and attributed to their work in UNICOR's e-waste factories, including memory loss, fatigue, hypertension, anemia, chest pain, effects from radiation exposure, and bipolar disorder, among others. Several staff also reported problems with skin lesions, and one staff member was alleged to have died from toxic metal exposures related to UNICOR's e-waste recycling operations, according to relatives. In all, more than 50 staff and inmates provided complaints to the OIG or NIOSH.[99]

After considering available evidence, including medical records and information obtained during interviews, NIOSH concluded that none of the reported health problems could be linked to recycling work.[100] NIOSH made this determination after providing photos of the skin lesions in question to an Occupational Dermatologist for evaluation, and examining the medical records of the deceased BOP employee, among other information. NIOSH relied on its expertise regarding the health effects of radiation, lead, and cadmium to determine if the reported symptoms or illnesses were likely due to exposures resulting from e-waste recycling. NIOSH also examined detailed medical records for several individuals and found that non-occupational illnesses were documented in the records while occupational illnesses were not. With regard to the deceased employee, NIOSH found that the employee had a medical problem that was not related to work exposures, and that evidence of such exposures was not otherwise documented by the employee's health care providers in the medical or death records.

III. Other Hazards and Injuries

In addition to hazards from toxic metals, we identified various other hazards in UNICOR e-waste recycling operations, including physical hazards resulting in injuries such as cuts from broken glass or other sharp objects and tools; noise hazards from equipment, powered hand tools, and various disassembly operations; heat hazards from conducting physically taxing work

[99] In addition, as of June 2010, five lawsuits have been filed in various jurisdictions related to exposures from UNICOR's e-waste operations. Of these, two have been dismissed.

[100] This conclusion does not encompass temporary discomfort from dust or fumes during the work shift, which was reported at multiple institutions and was caused by recycling activities.

in high heat while wearing protective equipment; and other exposure hazards, such as dust from the sanding of plastics. We found that UNICOR failed to implement an effective hazard analysis program to identify, evaluate, and control these hazards.

During our field work at UNICOR recycling factories with the OIG technical team, we further determined that UNICOR violated the OSHA noise standard (29 C.F.R. § 1910.95), and OSHA regulations concerning injury reporting and record keeping (29 C.F.R. § 1904).

Below we present information on injuries, noise exposure, and heat exposure in UNICOR's e-waste recycling factories.

A. Injuries

Our interviews and review of inmate injury records revealed that inmates who worked in glass breaking operations frequently were cut by the broken glass. For example, staff and inmates at USP Atwater told the OIG that inmates were being cut "constantly" in the first few months of glass breaking in 2002 and being sent to the infirmary. The former Safety Manager at FCI Elkton also stated that inmate cuts from glass breaking were commonplace and were a concern to him. At FCI Ft. Dix, glass breaking operations were stopped permanently in 2004 after an inmate severely lacerated his forearm, exposing muscle and requiring approximately a dozen stitches.

Some inmates also stated that they injured their hands because they lacked access to proper tools to disassemble the e-waste, which was confirmed by some of UNICOR's own inspections. For example, in April 2004, UNICOR inspected the recycling operations at USP Atwater and found that inmates at both the factory and warehouse lacked access to proper tools and consequently were having to use undue force to disassemble the e-waste. The UNICOR inspector noted that the same problem had been identified by the BOP industrial hygienist two years earlier.

UNICOR and the BOP did not share injury information between factories, and lessons learned to prevent lacerations during glass breaking operations were not disseminated. As a result, successive factories that started glass breaking operations repeated errors in failing to initially provide adequate personal protective equipment for inmate glass breakers, such as specialized gloves and Kevlar sleeves for their arms. For example, unlike other UNICOR recycling factories, inmates at FCI Ft. Dix who broke glass did not have access to Kevlar sleeves as late as 2004 and, according to UNICOR staff, after UNICOR purchased heavier gloves the custodial staff prohibited the inmates from using them. The local Safety Manager also told the OIG that he was not aware that inmate cuts from glass breaking were a problem at other institutions and that he would have wanted to know more about those incidents.

Our investigation further determined that the BOP does not collect or retain the data needed to identify injury trends in UNICOR operations. The frequency of glass breaking injuries therefore was not apparent to the BOP's Health Services Division, which oversees the BOP's safety programs. The BOP's National Safety Administrator, Ron Day, told the OIG that the BOP currently does not require the collection and evaluation of injury, environmental, and fire protection information from its institutions for trends. He said that local safety managers with similar UNICOR operations, such as automotive, textiles, and recycling, typically do not confer with each other on conference calls to discuss common problems and issues. He stated that it would be valuable to have a system to collect injury data and to share information but that nothing was currently in place.

During our investigation, we also learned that the BOP was violating OSHA regulations by failing to record inmate injuries on an injury and illness log that OSHA requires and inspects periodically. 29 C.F.R. § 1904 (describing requirements of OSHA Form 300 log). While the BOP identified staff injuries on this log, it omitted inmates' injuries. In one instance, the BOP received inaccurate advice from an OSHA regional office about this requirement. After consultations between OSHA and the BOP on the scope of BOP's obligations concerning inmates under the OSHA regulation governing federal agency occupational safety and health programs, 29 C.F.R. § 1960, the BOP concurred that inmates should be included on the OSHA Form 300 log.[101]

B. Noise Exposure

The OSHA noise standard (29 C.F.R. § 1910.95) establishes an action level for noise exposure at 85 decibels (dBA) and a PEL of 90 dBA. OSHA requires that employers implement a hearing conservation program when noise exposures are at or above the OSHA action level as an 8-hour time-weighted average. A hearing conservation program requires audiometric testing, training in noise control, availability of hearing protection, noise monitoring, and other elements. OSHA requires that employers ensure that workers use hearing protection when exposures exceed the PEL, or when exposures exceed the action level and an employee has not yet had a baseline audiogram or has experienced initial signs of hearing loss.

We determined that UNICOR and local safety staff often did not identify noise sources and conduct adequate noise surveys of UNICOR recycling operations. Based on FOH and NIOSH noise monitoring and from review of

[101] This requirement is based upon inmates' status as "employees" with respect to occupational health and safety programs. OSHA's longstanding interpretation of its regulation governing federal agencies, 29 C.F.R. § 1960, is that inmates fall within the definition of "employee" under the regulation, 29 C.F.R. § 1960.2(g), for the limited purpose of occupational safety and health.

recent noise testing results obtained by UNICOR and BOP consultants and safety personnel, FOH found noise exposures above the OSHA action level or PEL at various UNICOR factories during glass breaking operations, baling operations, hand-held power tool use, sander use, pallet manufacturing, and other activities. UNICOR generally made hearing protection available, but did not adequately enforce its use across all factories. Except for FCI Texarkana, UNICOR has not implemented a hearing conservation program as required by the OSHA noise standard (29 C.F.R. 1910.95) at factories with documented exposures above the action level.

C. Heat Exposure

OSHA does not have a specific standard that regulates heat exposure, but the American Conference of Governmental Industrial Hygienists (ACGIH) has adopted "Threshold Limit Values" that are generally accepted as reasonable guidelines for the control of heat exposure. NIOSH has also adopted "Recommended Exposure Limits" for heat exposure. Although OSHA does not have a heat exposure standard, it can enforce worker protection measures under its "General Duty Clause." 29 U.S.C. § 654.

During the OIG technical team's field work at FCI Marianna in Florida, UNICOR staff and inmates reported that past UNICOR operations had excessive heat exposures in buildings that UNICOR rented between 1998 and 2002. They described the heat condition in one of these buildings as "unbearable," "horrible," and "like an oven." The OIG technical team found that UNICOR glass breaking operations at the female prison camp were especially susceptible to heat stress conditions.

During an inspection in November 2006, OSHA recommended a heat stress evaluation, which the BOP and UNICOR did not perform. In August 2007, NIOSH and FOH conducted a heat hazard evaluation and found that glass breakers and feeders were exposed to heat above exposure limits established in the ACGIH Threshold Limit Values and the NIOSH Recommended Exposure Limits. Due to the seriousness of the exposures, FOH issued an interim report in September 2007. FOH reported that inmates performing glass breaking were at particular risk because they performed physical activities in a hot, humid, and unventilated room and wore protective clothing that increased the risk of heat stress. In addition, FOH and NIOSH testing revealed that heat exposure is a hazard for operations other than glass breaking, and various warehouse activities and factory disassembly operations exceeded the ACGIH Threshold Limit Values and NIOSH Recommended Exposure Limits.

The BOP and UNICOR did not have a heat stress program at the time of our inspections at FCI Marianna in 2007. FOH and NIOSH advised the BOP and UNICOR in September 2007 of the need to develop a program including

engineering controls, medical surveillance, personal protective equipment, training, acclimation, and work and rest regimens. FOH and NIOSH also recommended that the BOP adopt the ACGIH Threshold Limit Values for heat exposure as its standard for exposure limits and controls.

In response, the BOP developed two policies for heat exposure, an operational requirements document and a heat stress procedure. FOH reviewed these policies in May 2008 and found them to be largely inadequate. BOP then developed a revised policy in September 2008 entitled "Heat Stress Program" that included substantial improvements over the previous policies.[102]

During later field work, FOH found that no UNICOR factory had conducted a heat exposure assessment even though inmates had the potential for excessive exposure to heat. However, some factory managers were aware of the heat issue and described measures to mitigate heat exposure.

D. Plastic Sanding

As part of e-waste recycling operations at FCIs Elkton, Marianna, and Texarkana, UNICOR sanded the plastic casing around computer monitors in preparation for painting. Hazards associated with this activity included inhalation of fine dust particles and brominated flame retardants, such as polybrominated diphenyl ethers. These substances also are found in televisions and computers. The scientific community and the public have become concerned over these substances because studies have reported that they accumulate in human tissue.

As with other operations, UNICOR did not conduct an analysis of hazards related to sanding plastic casings and failed to specify necessary hazard controls according to the results. Because UNICOR did not conduct initial exposure monitoring after startup to determine the extent of worker exposures, and discontinued those operations prior to the start of the OIG's investigation, we could not estimate staff and inmate exposures.

IV. Environmental Compliance

We also examined UNICOR's compliance with environmental requirements at its e-waste facilities. We conducted site visits, reviewed documents, and interviewed witnesses regarding environmental issues. At our request, after we received allegations of improper disposals of hazardous waste

[102] The OIG technical team's assessment of this document appears in Attachment 3.

at UNICOR's recycling factories, the EPA conducted air, water, and waste inspections at FCI Elkton in 2007 and FCI Texarkana in 2008.[103]

Our investigation determined that oversight of UNICOR's compliance with environmental regulations was inadequate, and that the e-waste recycling program was responsible for generating hazardous wastes that were unlawfully stored or disposed of at multiple BOP institutions. We also found that UNICOR at times failed to fully evaluate environmental permitting requirements before starting new operations and did not share information about environmental compliance requirements between recycling factories. Similar to the occupational exposures to cadmium and lead that we identified, most of the environmental violations we discovered occurred in the period prior to 2004, before the Recycling Business Group adopted written operating procedures. Although we did not identify major environmental harm resulting from these violations, such as extensive soil contamination or fish kills, the violations demonstrated a disregard of legal requirements and in some cases resulted in pollution to the environment. We concluded that the violations were preventable and should not have occurred.

A. UNICOR's Handling of Hazardous Wastes

As detailed in Chapter Two, generators that produce more than 1,000 kilograms of hazardous waste per month must comply with numerous regulatory requirements relating to the generation, treatment, storage, transportation, and disposal of the waste. Generators of small quantities of hazardous waste, less than 100 kilograms per month, generally are exempt from these requirements provided they make the required hazardous waste determinations.[104] According to EPA estimates, the disposal of only seven color computer monitors typically will exceed the threshold for conditionally exempt status.

Broken glass from color CRTs typically is subject to hazardous waste regulation due to lead in the glass. During much of the period of our review, broken CRT glass was subject to numerous hazardous waste requirements, including labeling and storage requirements. Effective in January 2007, EPA's

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[103] EPA's reports for these inspections can be found in the respective FOH institution reports found at: http://www.justice.gov/oig/reports/BOP/index.htm.

[104] According to EPA, hazardous waste recyclers such as UNICOR frequently generate waste in the course of their recycling activities, which is considered a new point of generation under the RCRA regulations. 40 C.F.R. § 261.5 (c) & (d) identifies the types of hazardous waste that must be counted in calculating the volume of hazardous waste generated by generators that believe they qualify for conditionally exempt small quantity generator status. Waste that is in fact recycled need not be counted, but the recycler must determine the RCRA status of waste generated by the recycling operation itself, and if found to be hazardous, this waste must be counted toward the 100 kg/month exemption limit.

CRT rule granted CRTs being recycled a conditional exclusion, provided that the recycler complied with certain requirements, which also included labeling and storage requirements. In addition, spent ventilation filters contaminated with cadmium and lead may also qualify as hazardous wastes, as do other wastes generated at UNICOR facilities such as batteries.

UNICOR failed to manage its wastes in compliance with hazardous waste regulations at several facilities. Federal environmental regulations require that a container holding hazardous waste must always be closed during storage, 40 C.F.R. § 265.173(a), and disposal of used, broken CRT glass is prohibited. 40 C.F.R. §§ 261.39; 261.2(c). According to staff, inmates, and UNICOR customers, open gaylord boxes and dumpster containers containing broken CRTs were routinely left outdoors at the UNICOR warehouse at FCI Elkton, some for months at a time, allowing for the release of dust and glass debris to the air, soil, and storm drains through wind or rainwater runoff. Staff at USP Atwater also stated that boxes of broken monitor glass were stored outdoors uncovered.[105] After conferring with the EPA, we concluded that the activities described above constitute unlawful disposals and storage of hazardous waste.

UNICOR's management of waste ventilation filters containing cadmium and lead was also deficient. Witnesses told us that at FCI Elkton, filters from the glass breaking booth, which exceeded regulatory levels (40 C.F.R. § 261.24) and had to be handled according to hazardous waste requirements, were stored in the UNICOR warehouse for more than 2 years, at times without labels. Filters from general ventilation systems in areas where glass breaking operations took place, which exceeded regulatory levels when tested in 2007, were also placed in the regular trash, along with nickel cadmium batteries, lead-based paint, light bulbs, televisions, and other items that may have qualified as hazardous wastes if disposed of. [106] When the EPA inspected FCI Elkton in 2007, it found that UNICOR was improperly storing used filters from the glass breaking booth and that the BOP had not fully characterized hazardous wastes at the institution. According to the EPA, the only waste that the BOP identified on a hazardous waste log it had maintained at FCI Elkton since 1997 was 13 gallons of solvents that were acquired in 2007.

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[105] In November 2004, a fire broke out in boxes of monitors stored outdoors at USP Atwater, which required that UNICOR undertake an environmental cleanup. UNICOR staff told us that after the Atwater fire they were instructed to better manage their CRTs and broken monitor glass.

[106] According to EPA, Ni-Cd batteries and leaded paint nearly always exceed the 40 C.F.R. 261.24 toxicity characteristic (TC) criteria. Color CRTs frequently exceed the TC value for lead (although black and white monitors do not), and fluorescent lamps manufactured before the mid-1990's generally fail the TC value for mercury, while those with later manufacture dates are less likely to fail.

We also discovered that some BOP and UNICOR institutions claimed to regulators that they were exempt from hazardous waste requirements as "conditionally exempt small quantity generators." However, this exemption is not available to generators that fail to determine whether their wastes are "hazardous" under applicable waste regulations. 40 C.F.R. §§ 261.5(g); 262.11. For example, we found that FCI Elkton claimed conditionally exempt status, but that evaluations were not adequately performed to determine the volume of hazardous wastes that were generated at that institution. FCI Texarkana also claimed to be "conditionally exempt" from hazardous waste regulation. However, our investigation determined that for several years after UNICOR initiated glass breaking operations at FCI Texarkana in 2001, the BOP and UNICOR failed to make hazardous waste determinations as required to claim conditionally exempt small quantity generator status under 40 C.F.R. 261.5.[107]

UNICOR's handling of dust and other wastes from glass breaking also potentially implicated environmental requirements pertaining to air and water. The EPA determined that UNICOR and the BOP failed to properly evaluate permitting requirements before starting recycling operations. The EPA found that UNICOR's outdoor storage of e-waste may have required a permit for stormwater, and that UNICOR had not evaluated whether its air emissions from glass breaking operations and the chip recovery project qualified for an exemption from air regulations.[108]

B. Lack of Technical Competence and Compliance Oversight

Our investigation determined that the lack of knowledge about environmental compliance responsibilities that we found at some recycling factories was due in part to poor information dissemination and the absence of written guidance from the Recycling Business Group. Personnel at the BOP institutions, including recycling technicians and local safety staff, received minimal instruction and guidance on environmental compliance responsibilities related to e-waste recycling, such as on the proper handling of glass booth filters, prior to 2004. Although we found numerous e-mails and documents as early as 2000 indicating that the leadership of the Recycling Business Group was keenly aware of regulatory developments in the states where its factories operated, we did not find corresponding attention to the education of staff and inmates on environmental compliance obligations. We did note much greater attention to environmental compliance issues at the

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[107] After evaluating the volume of FCI Texarkana's hazardous wastes in 2008, the EPA found that FCI Texarkana was a conditionally exempt small quantity generator.

[108] In addition, as detailed in Chapter Five, we found that UNICOR submitted inaccurate, incomplete, and misleading information to the EPA about these emissions.

factories located in New Jersey (FCI Ft. Dix) and California (USP Atwater), two states that were at the forefront of regulating e-waste recycling operations.

The problems resulting from the lack of environmental knowledge in the field were compounded by the absence of qualified environmental oversight of UNICOR's operations. For example, at FCI Elkton repeat inspections by BOP personnel, including the local safety office, regional safety staff, and the Headquarters Program Review Division, failed to identify the unlawful disposal of hazardous waste, lack of proper hazardous waste inventory practices, and inadequate permit assessments that the EPA identified in its inspection. The BOP's Headquarters Environmental Program Manager told the OIG that he has observed significant differences in compliance performance between UNICOR factories and believed that strong environmental oversight from BOP Headquarters is necessary to ensure compliance with environmental requirements.

We also determined that DOJ does not oversee UNICOR's or the BOP's compliance with its environmental obligations. Our interview with the Environmental Program Manager in DOJ's Justice Management Division revealed that DOJ does not require components within DOJ, such as the Bureau of Alcohol, Tobacco, Firearms and Explosives; the BOP; or the FBI, to provide adverse environmental compliance information to her, such as citations issued by environmental regulators, and that she does not otherwise regularly collect this information. She further stated that DOJ managers had not inquired with her about compliance performance within the Department, including for the BOP or UNICOR. She said that she felt "at the very least" that DOJ should have an environmental auditing program to ensure that there is an internal Headquarters review process.

The BOP recently has attempted to strengthen its oversight of its environmental compliance performance. In 2007, the BOP established a new policy that created an Environmental Management System (EMS) to improve its adherence to environmental requirements. PS 1600.10. The BOP's Environmental Management System implemented Executive Order 13423, which required federal agencies to develop Environmental Management Systems. The Health Services Division at BOP Headquarters also is attempting to hire environmental specialists who will assist with environmental audits, and is conducting site visits at institutions to certify their EMS programs.

Although compliance enforcement is identified as an important element of the BOP's Environmental Management System, we found that only a few of the "environmental responsibilities" it assigns to various offices and staff within the BOP address compliance matters. The policy directs Chief Executive Officers of BOP institutions to assign a "top manager" to serve as a point of contact for the EMS and environmental compliance, and specifies that Safety Managers should function as "EMS Coordinators" and "technical expert[s]."

However, the policy does not identify how compliance will be achieved at the local level and does not assign oversight responsibility for inspections or compliance at the Headquarters level.[109] After conferring with the EPA's Office of Enforcement and Compliance Assurance, we believe that the policy's failure to assign compliance enforcement duties above the institution level will result in insufficient oversight of UNICOR's operations. In addition, we believe the policy does not specify adequate consequences for identified non-compliance, such as whether violations of environmental laws and regulations will be considered in managers' performance evaluations.

We also found that that the Environmental Management System policy does not adequately define UNICOR's obligations within the EMS. The policy states that UNICOR will "ensure that it operates its factories, vocational training programs, and education programs in compliance with environmental laws, regulations, and requirements." It does not identify responsibilities within UNICOR to achieve this result.

We are also concerned that the demands placed on Safety Managers as environmental "technical experts" will surpass the training that they are afforded. Too often in our investigation we identified circumstances where safety staff members were requested to provide guidance on matters on which they lacked adequate expertise. We believe that local safety staff should work in close consultation with trained environmental specialists who do not have other collateral duties.

In sum, although our investigation determined that the BOP has made recent progress to improve its environmental compliance performance, we believe that vigilant oversight is needed to ensure UNICOR's adherence to environmental requirements.

V. Conclusions

Our investigation identified many deficiencies with UNICOR's e-waste recycling program. We found that UNICOR failed to follow well-established OSHA regulations concerning exposure monitoring, respiratory protection, the use of engineering controls, and medical surveillance, and often failed to warn staff and inmates about dangers in their work areas. As a consequence,

[109] The Health Services Division's Occupational Safety and Environmental Health Branch lacks compliance enforcement authority under the policy and instead is merely to develop and interpret environmental policy and training. Regional Safety Administrators are in charge of "monitoring" audit results and providing technical assistance visits to institutions. According to the BOP's Environmental Program Manager, the BOP's regional offices have had no role in environmental compliance enforcement at BOP institutions. The Program Review Division, which performs audits within the BOP, also is not mentioned in the policy.

UNICOR and BOP staff and inmates were exposed to cadmium and lead in circumstances that should have been avoided. OSHA further determined that some of the violations, had they been discovered during OSHA inspections, would be deemed "willful" because they showed "plain indifference" to worker health and safety.

UNICOR's recycling practices resulted in contamination of BOP facilities, some of which required remediation. For example, at FCI Elkton UNICOR had to retain a remediation contractor to clean extensive cadmium and lead contamination that was found by FOH and NIOSH in three recycling locations at that institution. Although the vast majority of the contamination that we identified at UNICOR's e-waste factories resulted from unsafe methods used to disassemble CRTs, including glass breaking, significant contamination can accumulate from disassembly of CPUs and other e-waste if rigorous cleaning and housekeeping practices are not adopted and strictly enforced.

NIOSH's review of staff and inmate medical records that were available at the institutions where e-waste recycling occurred revealed that the results of biological monitoring generally were unremarkable. However the records were incomplete and did not include data from periods when exposures were likely greatest. NIOSH's evaluation of adverse health symptoms that staff and inmates reported in their interviews and attributed to their work in UNICOR's e-waste factories showed that none of the reported health problems could be linked to recycling work. However, due to variations in susceptibility to adverse health effects from toxic metal exposures, some contribution to future health problems from exposures at UNICOR cannot be completely ruled out.

We also found that by 2003 UNICOR began to make significant improvements to its e-waste operations, and that by 2009 these operations incorporated safe work practices and hazard control measures, including for the manual breaking of CRT glass. However, we identified significant delays in UNICOR's implementation of necessary changes, which increased the amount of time that UNICOR's e-waste program failed to comply with health, safety, and environmental requirements.

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CHAPTER FIVE
OIG FINDINGS ON MANAGEMENT DEFICIENCIES AND THE INDIVIDUAL ACCOUNTABILITY OF UNICOR AND BOP STAFF

In this chapter we evaluate the causes for the violations of law and policies that we identified during our investigation, including management deficiencies, misconduct, and performance deficiencies by UNICOR and BOP staff. Part I discusses the numerous management deficiencies we found in the health, safety, and environmental protection programs administered by UNICOR and the BOP, including a lack of technical resources and inadequate oversight of the e-waste recycling program. Part II assesses misconduct and performance deficiencies by UNICOR and BOP staff.

I. Management Deficiencies

We identified management problems that contributed to the BOP's and UNICOR's failure to comply with health, safety, and environmental regulations and policies. We found that these deficiencies were pervasive and largely originated from faulty administrative practices at UNICOR and BOP Headquarters. They also involved lax implementation practices at UNICOR's e-waste recycling factories where improper and unsafe work practices were found during our investigation.

Members of the OIG technical team identified particular weaknesses related to: (1) the availability of technical resources, (2) hazard assessments and hazard communication, (3) oversight of UNICOR operations, and (4) health and safety management systems. UNICOR and the BOP did not dispute these findings. We also concluded that deficiencies in these areas likely are not limited to UNICOR's e-waste operations and are found in other UNICOR business lines.

A. Availability of Technical Resources

Our investigation determined that UNICOR's e-waste recycling program lacked adequate technical resources from its inception in 1997. UNICOR and the BOP often assigned staff who did not have sufficient expertise to carry out duties such as establishing appropriate engineering controls in its e-waste recycling factories, identifying and assigning adequate personal protective equipment, and ensuring the effectiveness of exposure control measures and work practices. The reliance on unqualified personnel stemmed largely from the lack of Certified Industrial Hygienists or other sufficiently trained safety specialists within the BOP and UNICOR to service 115 institutions and 103 UNICOR factories, which currently employ approximately 17,000 inmates. As of June 2010, UNICOR had a single Certified Industrial Hygienist who was the

only certified hygienist within all of the BOP. The BOP expects to have an additional hygienist on its staff by summer 2010. According to the technical team, this level of staffing is inadequate given the size and complexity of UNICOR's operations.

Although UNICOR sometimes retained outside industrial hygiene consultants, we believe this was not a substitute for sufficient personnel with appropriate professional and technical expertise. FOH and NIOSH-HETAB found that UNICOR's and the BOP's lack of internal technical resources created problems when they retained industrial hygiene consultants who provided ineffective evaluations of UNICOR's e-waste operations. For instance, FOH found numerous examples where consultant reports were inaccurate, incomplete, or misleading, including cases where exposures above occupational exposure limits were not properly reported. These deficiencies were not recognized by UNICOR or BOP staff.

In addition, according to the FOH, these reports often lacked important technical detail and did not provide insightful conclusions and recommendations. For example, the consultants would frequently report air sampling data for a factory glass breaking operation and compare the results to OSHA PELs for cadmium and lead, but would make no mention of important interpretive factors such as the quantity of CRTs broken during the sampling period, the extrapolation of exposure data over the duration of a worker's shift, whether respirators and local exhaust ventilation were being used and the extent to which such controls were judged to be effective, whether the operations complied with OSHA regulations, and what measures were necessary to ensure OSHA compliance. As a result of UNICOR's ineffective vetting of its consultants and lack of critical expert analysis of their work, UNICOR frequently did not obtain adequate information to assess and improve worker protection and comply with pertinent health and safety regulations.

Despite these limitations, we determined that the BOP's safety staff was active in the field and appropriately identified and reported upon various safety related deficiencies and requirements. For example, Safety Managers at USP Atwater and FCI La Tuna raised serious concerns regarding glass breaking when recycling operations were introduced at those institutions.

B. Hazard Assessments and Hazard Communication

OSHA hazard communication regulations require employers, including federal agencies, to provide employees with "effective information and training on hazardous chemicals in their work area at the time of their initial assignment, and whenever a new physical or health hazard the employees have not previously been trained about is introduced into their work area." 29 C.F.R. § 1910.1200(h)(1); 29 C.F.R. § 1960.16. We determined that UNICOR and the BOP do not have policies that require UNICOR to conduct assessments by

qualified personnel of its new operations, or on significant changes in existing operations, that would identify the hazards that UNICOR is required to disclose under OSHA regulations. As a result, UNICOR failed to properly assess hazards related to e-waste in its recycling factories and to warn staff and inmates in a timely fashion about the presence of toxic metals in their work areas. In addition, we found that due to UNICOR's failure to conduct such assessments, it did not properly integrate hazard controls into its e-waste work processes.

According to FOH, an effective work planning and hazard analysis program involves a well-defined job hazard analysis process that is integrated with work planning and that is conducted prior to the start of work. Following completion of the hazard analysis, work instructions are then developed that integrate necessary hazard controls into the work process. Protective measures such as hazard communication training, engineering controls, and assignment of PPE should be put into place prior to the start of work. Verification of the effectiveness of work instructions and hazard control measures should also be performed at startup and during initial operations.

UNICOR did not utilize this assessment process with its e-waste operations. Instead, its recycling hazard control measures evolved slowly over periods of years through a process of "trial and error" at some factories before cadmium and lead exposures were controlled to levels below OSHA exposure limits. For instance, rather than specifying respirators at startup based on sound hazard analysis, UNICOR instead gradually upgraded respiratory protection over several years from nothing to dust masks, to half face piece air purifying respirators, to full face piece air purifying respirators, and finally in 2004 to powered air purifying respirators. Similarly, instead of implementing engineering controls specifically designed to control toxic metal dusts, UNICOR implemented make-shift systems and then gradually improved them over time.

According to FOH, UNICOR's lack of an integrated work planning and hazard analysis process resulted in inadequate worker and environmental protection and non-compliance with applicable OSHA and EPA regulations. For example, at USP Atwater, it was only at the initiative of the Safety Manager, Leroy Smith, rather than based on an established UNICOR assessment program, that exposure monitoring during glass breaking operations occurred at that institution in 2002. UNICOR eventually initiated exposure monitoring for glass breaking and disassembly operations at other factories, but because it lacked a documented program to define monitoring requirements, UNICOR's approach was inconsistent across factories. UNICOR's assessments depended heavily on the aptitude and willpower of the local Safety Manager and at times local UNICOR staff to challenge UNICOR Headquarters' assertion that its operations had been proven safe. For example, USP Lewisburg performed effective worksite monitoring and evaluation while FCI Marianna performed little exposure monitoring. While USP Atwater and FCIs Elkton and Texarkana

performed exposure monitoring, their monitoring was prone to errors and lacked data analysis, worksite evaluation, compliance evaluation, and crucial recommendations for worker protection and compliance. As a result of the lack of comprehensive evaluation, UNICOR was slow to implement corrective actions.

In sum, our investigation determined that UNICOR has not had an integrated work planning and hazard analysis program. We believe this deficiency resulted in worker exposures to cadmium and lead above exposure limits, regulatory violations, uncontrolled releases of toxic metals, and the need for expensive remedial actions. Hazard communication also was deficient, and workers were not informed of dangers from toxic metals and other hazards in their work areas.

C. Inspections and Oversight of UNICOR Operations

We found that oversight of UNICOR's e-waste recycling program was inadequate and failed to identify the many violations of health, safety, and environmental regulations and policies that we discovered during our investigation. Internal inspection oversight was provided by local and regional BOP safety staff, members of the Recycling Business Group, and the BOP's Program Review Division. The UNICOR Board of Directors also received reports of inspection activity from UNICOR staff. External oversight by regulatory agencies was extremely rare prior to 2003, and the inspections that did occur, including those from UNICOR's suppliers, were in at least some instances compromised by the concealment from inspectors of actual working conditions and problems in the recycling factories. In addition, DOJ provides no health, safety, and environmental compliance oversight of UNICOR's and the BOP's operations.

1. Internal Oversight

BOP safety staff at each institution regularly performs inspections of UNICOR operations. They sometimes are assisted with their work by safety staff from BOP regional offices, who also perform their own site evaluations at the request of institution staff. During the period of our investigation, these inspections addressed general safety issues such as fire safety, labeling, pest control, personal protective equipment, and electrical safety.

Our review of safety staff reports revealed that they at times identified problems related specifically to e-waste recycling, such as the need for baseline air sampling, enforcement of work practices and food and drink restrictions, enforcement of personal protective equipment requirements, housekeeping improvements, control of dust emissions from the glass breaking operations, and noise surveys. However, safety staff members were not provided guidance at the start of recycling operations that provided instruction in how properly to

evaluate this work. As a consequence inspection results varied and some Safety Managers identified problems that went undetected in other factories.

According to FOH, the safety inspection procedures used by the BOP and UNICOR did not result in comprehensive assessments of the recycling operations' compliance with OSHA and EPA regulations. FOH found that although safety staff members are typically knowledgeable in their field of expertise, they are not professional industrial hygienists skilled in the identification, evaluation, and control of worker exposures to chemical hazards such as toxic metals. Some safety managers also stated that their findings were sometimes ignored by UNICOR and BOP managers. We further determined that the BOP's Health Services Division, which had some expertise in industrial hygiene, had no oversight role concerning UNICOR's e-waste operations.

In addition to inspections by BOP safety staff, the Recycling Business Group conducted its own evaluations of recycling factory operations. Although the reports that resulted from these inspections at times referred to health and safety issues, they typically focused on production and cost-related considerations. FOH determined that besides failing to identify many OSHA and EPA regulatory violations, these reviews also failed to address non-routine activities such as filter changes that resulted in excessive worker exposures because they were not being properly performed. We also identified numerous examples where problems that Recycling Business Group staff identified were not promptly resolved. Overall, we determined that the Recycling Business Group reviews failed to identify the extent of e-waste recycling hazards, improper work practices, and OSHA and EPA compliance issues.

The BOP Program Review Division also conducts inspections at UNICOR factories. According to its current Assistant Director, VaNessa Adams, the mission of the Division includes preventing waste, fraud, and abuse and providing oversight of compliance with laws, regulations, and BOP policy. Program Review Division staff typically complete inspections at each BOP institution every two to three years that include evaluation of UNICOR operations.

We examined the guidelines that the Program Review Division uses to assess UNICOR factories and found that they do not address health and safety issues. Instead, they focus on matters such as production planning, scheduling, quality, cost control, and customer satisfaction. The guidelines also are not tailored to specific UNICOR product lines, such as e-waste recycling or textiles, and are written to apply generally to all UNICOR field activities. We further determined that the Division's safety and health guidelines do not specifically address UNICOR operations.

According to BOP Assistant Director Adams, Program Review Division safety inspectors will not always evaluate UNICOR operations during their field inspections. We found that this gap in data collection, combined with the insufficient guidelines for assessing health and safety issues, resulted in failure by Division staff to report significant health and safety problems in some circumstances. For example, Program Review Division inspections of UNICOR operations at FCI Elkton in 2001 and 2005 did not identify health, safety, or environmental problems in the e-waste program. The Division inspector who performed Elkton's UNICOR assessment in October 2001 told the OIG that he recalled inmates and some staff complaining about the dust from the glass breaking operations and also remembered seeing debris in the factory air that was quite noticeable. He stated that because the inspection guidelines that he relied upon did not address health and safety issues, he did not note these glass breaking problems in his report.

UNICOR relied upon the facts of the inspections that are described above to enhance the perceived compliance performance of the Recycling Business Group with auditors. For example, UNICOR provided to its lead auditing firm a report entitled *Federal Prison Industries, Inc. FY 2006 Report on Environmental Compliance and Recycling Program Issues* that summarized the status of UNICOR's compliance with OSHA and environmental requirements. The report credited the Program Review Division with conducting a "comprehensive" review of each institution's programs, including environmental programs. We identified little environmental information that the Program Review Division collects during its inspections, however. According to Adams, the Division does not perform environmental audits, though limited environmental information is collected during its inspections.

The FY 2006 report to the audit firm also cited a series of "third party" inspections and reviews that were conducted by OSHA, environmental regulators, and UNICOR consultants. The report noted that these inspections did not find compliance violations. However, the report did not mention numerous deficiencies, such as an exceedance of the permissible exposure limits for cadmium at FCI Elkton, raised by OSHA and UNICOR's own consultants and later identified by the OIG technical team. With respect to this report, FOH advised the OIG as follows:

> We find that this type of report performs a disservice to the BOP and UNICOR in that it does not provide management with the necessary and objective information to make informed decisions, establish corrective action initiatives, and allocate resources to comply with federal and state regulations, correct non-compliances, and provide for a safe and healthful work environment.

We found similar examples of incomplete disclosures in reports to UNICOR's own Board of Directors. As with the fiscal year 2006 summary, we found that many of these reports failed to identify important deficiencies and generally were overly optimistic about UNICOR's performance. For example, we determined that UNICOR's first report in December 2004, covering the period from October 2003 through September 2004, failed to disclose test results showing excessive levels of airborne cadmium (up to 16 times the PEL) and lead at FCI Ft. Dix, air samples taken at USP Atwater showing airborne cadmium levels 3 times higher than the PEL, air samples taken at FCI Elkton showing airborne cadmium levels nearly 2 times higher than the PEL, and test results from FCI Texarkana showing that airborne cadmium levels were above the PEL.[110] Instead, the report stated that "[c]urrent test results from the 4 active CRT processing factories are all below the OSHA permissible action [sic] levels for exposure to lead and cadmium." That statement was not correct, however, because no additional testing was conducted at FCI Texarkana during the fiscal year after receipt of its adverse testing results. The report also did not describe a fire that broke out on October 31, 2003, in boxes of CRTs stored outside at USP Atwater, resulting in the contamination of surrounding soil with toxic metals. We found similar deficiencies in subsequent reports.

UNICOR Chief Operating Officer Steve Schwalb told the OIG that he relied upon Novicky to prepare the part of the reports that addressed the activities of the Recycling Business Group, and that he expected the reports to be complete. He said that he did not know why the reports omitted the information identified above. Novicky did not have an explanation for why negative information was omitted from the reports and agreed that it should have been provided.

2. External Oversight

Our investigation also determined that external oversight of UNICOR's e-waste program was inadequate and did not identify most of the compliance deficiencies discovered during our investigation.

Inspections by external regulatory agencies of UNICOR's e-waste program were rare, with only limited exceptions such as NJDEP's site visits to FCI Ft. Dix after 2002. OSHA's first visit to a UNICOR e-waste factory did not occur

[110] In 2009, FOH and NIOSH reviewed the 2004 results and determined that the airborne lead levels had been miscalculated in 2004. In fact, the technical team found, airborne lead levels were below the OSHA PEL but above the OSHA action level. In 2004, however, the only information available to the Recycling Business Group was that the airborne lead levels were above both the action level and PEL. In any case, the Recycling Business Group did not report any information about those FCI Texarkana tests to the Board of Directors.

until 2004, and the EPA's first compliance inspection at an e-waste factory occurred in 2007 as part of the OIG's investigation.

We further determined that the regulatory inspections that were conducted were sometimes compromised by UNICOR's manipulation of the work conditions that inspectors were permitted to observe. This practice also occurred with industrial hygiene testing. For example, at FCI Elkton, UNICOR cleaned the glass breaking area so thoroughly prior to permitting sampling by one of its contractors in 2004 that the a wipe taken from the glass breaking booth floor showed lead levels of only 7.7µg/ft^2. In contrast, sampling by FOH and NIOSH taken during full production and without any extensive cleaning prior to sampling, revealed levels as high as 10,200µg/ft^2.

We also found that DOJ does not monitor the health, safety, and environmental compliance performance of components in the Department, including the BOP and UNICOR. According to the Program Managers in the Justice Management Division for environmental issues and health and safety issues, components within DOJ are not required to report compliance-related information to the Department, including inspection findings by regulatory agencies and penalty assessments, and the Department has no role in tracking implementation of remedial measures once regulatory violations are found.[111] Both Program Managers told the OIG that they believed that DOJ should be provided with such information. The Program Manager for health and safety issues stated that he believed that three types of information should be reported to him: (1) OSHA violations identified by OSHA inspectors; (2) OSHA violations that inspectors, including industrial hygienists and local safety staff, identified as serious and that are repeated; and (3) any imminent danger or hazard findings, including those made by local safety staff.

D. Health and Safety Management Systems

FOH determined that UNICOR and the BOP lacked important management systems that were needed to conduct work safely in its recycling factories. These included systems that would foster standardized safety practices between factories; establish cohesive national, local, and programmatic safety policies and procedures; implement effective tracking of deficiencies and corrective actions; and promote sharing of safety information and best management practices between institutions. We discuss FOH's findings below.

[111] Examples of other DOJ activities with potential significant health, safety, and environmental issues include laboratory services, automotive and airplane maintenance operations, and arson and bomb response.

1. Standardized Safety-Related Systems and Practices

UNICOR did not implement policies that standardized health and safety practices between its recycling factories. With respect to many health and safety issues, UNICOR effectively operated its factories as stand-alone entities and left key safety-related decisions to the individual initiatives of local safety and factory personnel. FOH determined that this approach resulted in an inconsistent standard of care and levels of compliance. An important contributing factor to this problem was that the BOP Health Services Division did not participate in the early development of the e-waste program and had no role in assessing the safety of the new operations.

For example, UNICOR used varying approaches to the design, selection, and implementation of engineering controls that were essential to control worker exposures to cadmium and lead during glass breaking operations. UNICOR glass breaking standard operating procedures adopted between 2002 and 2004 were not specific in guiding the factories in the selection of their ventilation systems. Many factories used make-shift systems for local exhaust ventilation that were not designed for toxic metals and were fabricated by local factory personnel that were not professionally trained for this work. UNICOR struggled for years at some factories to improve these systems to effectively control toxic metal exposures. In comparison, at USP Lewisburg, UNICOR staff consulted an engineer to select an exhaust system prior to starting work and then installed the system with much better success.

The factories also used varied configurations of glass breaking booths and the associated transition and decontamination systems, again with differing results in the effectiveness of containing contaminants. As with the ventilation systems, UNICOR's glass breaking procedures did not specify the design for the booths and transition areas.

Members of the technical team identified many other examples of UNICOR's lack of standardized, consistent approaches to health and safety issues among its factories, including the selection of respirators and the performance of exposure monitoring. The BOP's Health Services Division had no established role in decision-making concerning UNICOR operations that affected worker health and safety.

2. Policies and Procedures

According to FOH, the BOP and UNICOR lack cohesive and tiered safety policies and procedures for e-waste recycling operations. The BOP's national health and safety policy is found in Program Statement 1600.08 (revised to 1600.09). FOH reviewed this policy and found that it failed to adequately address UNICOR operations, including e-waste recycling, even though these operations account for a significant portion of the health and safety hazards at

BOP institutions. At the program level, UNICOR established some basic e-waste standard operating procedures starting in mid-2002, but these procedures were not comprehensive and lacked key elements such as hazard analysis and controls (discussed above in Section I.B). At the institution level, we found that individual factories took differing approaches to develop implementing procedures for safe work operations, with some relying on BOP institution procedures and programs, while others prepared their own work instructions or procedures or used an ISO 9001 process to develop safety-related procedures.[112] UNICOR and the BOP also did not effectively oversee the development of the various procedures, which resulted in inconsistencies, redundancies, and omissions among the various policies, according to FOH.

FOH also found that UNICOR and the BOP did not apply an effective document control system for its various policies. During its document reviews, FOH found that many safety-related documents lacked effective dates and status identification, such as whether the documents were still in draft and not final, and staff at times could not readily identify which polices remained in effect. In other cases, UNICOR drafted but did not finalize or implement procedures it had created, such as its draft cadmium and lead compliance plans, and the status of the document was not apparent.

3. Tracking Deficiencies and Corrective Actions

Our investigation also determined that UNICOR did not consistently correct deficiencies in a timely manner after they were identified during inspections and audits. FOH found many instances where UNICOR staff failed to implement corrective action recommendations without a documented justification. For example, in 2002 at USP Atwater, a consultant reported that a cadmium and lead compliance program was needed and drafted the necessary plan, but UNICOR failed to implement important aspects of it in violation of OSHA regulations. At multiple factories, OSHA or others recommended that complete noise surveys be conducted or that hearing conservation programs be instituted, but UNICOR did not follow through in a timely manner in many cases and could not explain its rationale for failing to do so when asked by FOH.

4. Information Sharing

Our investigation further determined that leadership of the Recycling Business Group routinely failed to disseminate information to Wardens, Factory Managers, and Safety Managers concerning problems with the e-waste recycling program, such as adverse testing results, the incidence of injuries, and inspection findings. Factory Managers told the OIG that communications

[112] For a description of the ISO 9001 standard, see footnote 40, above.

within the Recycling Business Group prior to 2009 were poor and, other than conferences that were held every 2 to 3 years, they did not recall participating in group meetings or conference calls to discuss common issues and concerns. We found similar problems with the dissemination of "lessons learned" from past operations.

II. Misconduct and Performance Failures of UNICOR and BOP Staff

Our investigation also found misconduct and performance failures that resulted in violations of law and policies. The most serious misconduct concerned acts that either resulted in the endangerment of workers or involved dishonesty, both of which are disciplinary offenses under the BOP's Standards of Employee Conduct. PS 3420.09, Attachment A. This misconduct involving worker endangerment included serious violations of applicable health and safety standards or policies and, we believe, showed particular carelessness or indifference to safety issues. In making these determinations, we consulted with OSHA about whether the acts or omissions in question constituted "willful" OSHA violations within the meaning of its enforcement policies. A "willful violation" occurs where an employer demonstrates either an intentional disregard for the requirements of the Occupational Safety and Health Act, 29 U.S.C. § 651 et seq., or demonstrates plain indifference to employee safety and health. These violations are subject to increased penalties and, in the case of federal agencies, reporting to the White House.

In addition to acts of misconduct, we also identified numerous performance failures by UNICOR and BOP staff which demonstrated poor judgment. These concerned, in part, the failure to exercise adequate oversight of e-waste operations. Overall, we found significant problems with the conduct of staff in the Recycling Business Group at UNICOR Headquarters.[113]

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[113] In response to a draft of this report, Safety Manager Smith expressed concern that we did not conclude that senior BOP and UNICOR executives committed misconduct in their oversight of the e-waste recycling program, and that we did not address the BOP's alleged retaliation against a former industrial hygienist based on his assessments of UNICOR's e-waste operations. Smith also described exposures to toxic metals at FCI Marianna, and that staff were not timely informed of health dangers related to e-waste recycling.

We investigated the activities of senior BOP and UNICOR executives and did not find evidence of misconduct. We found that they often were not provided with accurate or complete information about the e-waste program, which resulted in part from numerous management deficiencies that impeded the BOP's and UNICOR's response to Smith's concerns, including a lack of technical expertise. For example, UNICOR's former Chief Operating Officer, Steve Schwalb, said that he did not recall hearing that anything was "amiss" at e-waste factories other than USP Atwater, and that he recalled on several occasions being told by safety staff at BOP Headquarters that Smith's advice about e-waste operations was wrong. The former National Safety Director told us that he was not aware that the Recycling Business Group was continuing to break glass after Smith identified problems at USP Atwater in the summer of

(Cont'd.)

A. Acts and Omissions Relating to Exposure and Endangerment

We determined that UNICOR recycling managers repeatedly ignored information about hazards that should have caused them to suspend, modify, or postpone glass breaking operations and other activities in UNICOR facilities, or at least to conduct further evaluation and testing. This conduct began prior to Lawrence Novicky's appointment in September 2000 as General Manager of the Recycling Business Group (RBG), but continued with his participation and that of his subordinates despite the accumulation of warnings about the hazards of CRT glass breaking. This conduct sometimes resulted in violations of OSHA regulations and exposures of staff and inmates to toxic metals. As a pattern, we believe this conduct evidenced willful indifference to the safety of staff and inmates, and constituted gross mismanagement. We believe that, in some instances, the acts or omissions of Novicky and others rose to the level of misconduct, due to the endangerment of employees or the willfulness of the violations. The incidents described below are the most serious instances of management indifference to safety issues that we found, but they are not the only examples.

1. Ignoring Early Warnings about Glass Breaking Hazards

As detailed in Chapter Three, the UNICOR Product Support Center (PSC) was aware of safety issues relating to lead in CRTs in 1997 and conducted exposure testing during initial planning prior to the start of the FCI Marianna computer recycling pilot project. The monitoring was based on incidental breakage of CRTs during disassembly, not on large-scale intentional glass breaking. However, the Product Support Center (PSC) did not effectively convey any concerns about large-scale glass breaking to UNICOR. In 1998 the PSC produced a manual on computer recycling that included references on how to break CRTs into gaylord boxes but did not mention potential hazards resulting from breaking large volumes of CRTs.

UNICOR management at FCI Elkton in particular missed several opportunities to learn about and address the hazards from large-scale glass breaking operations. After FCI Elkton began large-scale glass breaking in 1999, a BOP industrial hygienist recommended air monitoring for lead. This recommendation was not implemented despite reports from the Safety Manager, Dan Martin, which identified the need for testing. These reports were

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2002. As described below, we further found that the UNICOR Board of Directors was not fully informed about problems with the e-waste program.

We concur with Smith's assessment that staff was not timely informed of problems with the e-waste program, and we address these issues in Chapter Five when we discuss deficiencies with hazard communication. We also describe what witnesses told us about glass breaking at FCI Marianna in Chapter Three.

provided to the FCI Elkton Warden, Gary Price, as well as the BOP Regional Director, Margaret Hambrick, and Regional Safety Administrator, Dennis Stamper. Yet, we found no evidence that Martin spoke with the Regional Safety Administrator or Headquarters safety staff after it was apparent that the testing was not being promptly performed.[114]

Bruce Ginther, the Assistant Factory Manager at FCI Elkton, also missed several warning signs in 2000 and 2001. In February 2000 he received a copy of correspondence from Wisconsin regulators showing that an employee engaged in "crushing" monitor glass was exposed to airborne dust containing cadmium at 48 times the PEL, while another who was "involved in dismantling and sorting" was exposed at 1.5 times the PEL, triggering a requirement for respiratory protection. Although UNICOR was "breaking" glass rather than "crushing" it, Ginther also knew that UNICOR's processes were releasing large quantities of visible dust from CRT glass. Ginther should have recognized that "breaking" CRT glass in a manner that released a lot of dust might create similar hazards as "crushing" it. We found no evidence that Ginther ever raised a concern about the Wisconsin letter with anyone in UNICOR or the BOP Safety Office at FCI Elkton.

Another opportunity was missed in late November 2000 during a meeting between Novicky, who had just assumed his duties as head of the Recycling Business Group, and recycling Factory Managers at FCI Elkton. According to minutes of the meeting, most of the participants agreed that air testing should be conducted for health reasons in light of the glass breaking activity. Within two weeks of the meeting, a UNICOR Associate Warden at FCI Marianna also prepared and shared a draft memorandum with the Recycling Business Group, which Novicky received, that requested the BOP's industrial hygienist evaluate the safety of the e-waste operations. The memorandum stated that the assessment was needed because "our factories have grown both in size, inmate workers, staff, and the number and variety of materials that we handle and process."

Novicky rejected both recommendations without consulting with health or safety professionals. Novicky told us he rejected the requests because Ginther had told him there was not a problem, he understood that earlier

[114] Testing did not occur until 2001 when Martin's assistant, who was not a hygienist, took several air and wipe samples. We asked Martin why he did not use funding from the FCI Elkton Safety Department budget to pay for the testing, as Smith did at USP Atwater, rather than waiting several years to conduct testing. Martin stated that he believed that UNICOR should have paid for it and he did not want to deplete his office's budget. Martin also acknowledged that he ordinarily would not want his assistant to conduct air testing because the assistant, along with Martin, were not "professionals in that area." We found no written requests from Martin to his supervisors other than routine inspection reports that highlighted the need to complete the testing.

testing had not shown safety concerns, and he did not believe that UNICOR was recycling enough CRTs to endanger anyone. We found Novicky's explanations to be unpersuasive excuses. Novicky had no basis to rely on Ginther, who had no training or expertise in industrial hygiene. Ginther told the OIG that he recommended to Novicky that he hire an industrial hygienist after Novicky proposed opening a glass breaking operation at the UNICOR factory at FCI Elkton.[115] Novicky also should not have relied on the prior testing conducted by the PSC without determining whether it was relevant to large-scale glass breaking, which it was not, and Novicky knew or should have known that FCI Elkton was processing sufficient numbers of CRTs to generate clouds of dust in the recycling factory.

In addition, in the spring of 2001, UNICOR was seeking to renew an agreement with a major supplier of e-waste, the Defense Reutilization Marketing Service (DRMS). DRMS was concerned about UNICOR's compliance with health and safety regulations and provided Ginther and Novicky with materials that described OSHA requirements; the importance of implementing "dust and particulate control" when disassembling electronics; and special hazards relating to metal contamination, including cadmium and lead. We found no evidence that Ginther or Novicky took any action in response to this information.

UNICOR obtained air and wipe tests at FCI Elkton in August 2001 in response to inquiries from DRMS. UNICOR relied on these results for the next year to justify its view that its recycling practices at FCI Elkton and elsewhere were safe. Yet, these tests were later criticized by a BOP Headquarters industrial hygienist and by NIOSH-HETAB and FOH as inadequately documented, so that their reliability could not be confirmed.

2. Mismanagement and Misconduct in Responding to USP Atwater Test Results

As detailed in Chapter Three, Safety Manager Leroy Smith raised concerns about the safety of UNICOR's planned CRT recycling activities at USP Atwater in late 2001 and early 2002. Smith's warnings, which were largely ignored by Novicky and managers at USP Atwater, were accurate. By the time Smith issued his warnings, Novicky was aware of the potential hazards of CRT recycling from his dealings with representatives of the New Jersey Department of Environmental Protection (NJDEP), the Defense Reutilization and Marketing Service, and his own staff. In June 2002, tests that Smith arranged at USP Atwater revealed cadmium exposures many times higher than the applicable

[115] As described earlier in footnote 44, although Ginther refused to be interviewed in our administrative investigation, he consented to be interviewed in our related criminal investigation.

OSHA standard and significant lead exposures as well. Under the authority that BOP policy gave him to stop work that created an "imminent danger," Smith directed that UNICOR halt glass breaking operations at USP Atwater until modifications could be made and additional testing completed. He also directed that inmate glass breakers be furnished respirators and provided blood testing.

Novicky should have taken Smith's and others' warnings seriously and ordered a thorough evaluation of health and safety issues before initiating glass breaking operations at USP Atwater. However, in light of the earlier test results from FCI Elkton indicating that exposure levels were within permissible limits, as well as the PSC test results, we could not conclude that his inaction constituted misconduct. Although FOH and NIOSH-HETAB told us that the reporting of the FCI Elkton and PSC tests was deficient, we have no evidence that UNICOR management knew or should have known of this deficiency at the time. After learning of the many concerns about glass breaking that had been expressed to him, we believe Novicky should have more carefully attempted to determine the safety of these operations. We believe that it was, at the least, mismanagement and poor judgment for him not to have done so.

However, circumstances changed in June 2002, when the safety and health concerns became even clearer. The tests from USP Atwater that month confirmed information that Novicky previously received from DRMS, NJDEP, and others that there were in fact potential serious health and safety risks associated with large-scale CRT glass breaking, and revealed that the FCI Elkton and PSC tests were no longer a viable basis for concluding the opposite. We believe Novicky's conduct in responding to the new information was seriously deficient.

According to OSHA, the USP Atwater tests triggered specific, immediate obligations within UNICOR. After learning of the USP Atwater testing results, UNICOR was required under OSHA regulations to reevaluate and provide appropriate respiratory protection, and to take prompt measures to inform its employees about cadmium hazards associated with its glass breaking operations. 29 C.F.R. §§ 1910.1027(g); 1910.1200(h). Medical surveillance also should have been instituted. 29 C.F.R. § 1910.1027(l)(1).

E-mail traffic shows that Novicky learned about the problems at USP Atwater by no later than July 10, 2002. On July 16, 2002, Associate Warden Samuel Randolph sent a memorandum to Novicky, "formally requesting assistance (legal and otherwise) with current conditions regarding the breaking of CRT glass in the UNICOR factory in USP Atwater, California." Even if Novicky was not aware of UNICOR's obligations under OSHA regulations before this time, the testing results and Randolph's request should have made paramount the need to become aware of those obligations.

After receiving the June test results, Smith insisted that inmates be promptly provided respirators and training on hygiene practices. Although the glass breaking operations were suspended temporarily on Smith's instructions, they had resumed by July 24. At that time, Smith cited UNICOR for allowing inmate glass breakers to wear their dirty respirators and clothing outside the booth. By August 6, a second round of testing also revealed exceedances of the PEL for cadmium and lead, resulting in Smith again ordering a halt to the glass breaking operations. UNICOR, however, restarted the operations without Smith's knowledge within 2 weeks.

Moreover, the implications of the USP Atwater tests were not limited to a single UNICOR facility. At the time of the USP Atwater test results, UNICOR also had large-scale CRT glass breaking operations at FCIs Elkton and Texarkana, and was just starting such operations at FCI La Tuna. There were no significant differences between the operations at USP Atwater and the other facilities with regard to the potential release of toxic metals. Staff and inmates at those institutions reported that contamination from the glass breaking operations was widespread. The USP Atwater test results that Novicky received by July 10 put him on notice that any upgrading of health and safety practices needed at USP Atwater would also be relevant to the other facilities. At the very least, the USP Atwater test results demonstrated an immediate need to perform testing at the other facilities or to suspend glass breaking operations there until such testing could be completed. However, exposure testing was not conducted at FCI Texarkana until October 2002 and at FCI Elkton until May 2003, after a new glass booth had been installed. In the interim 3 months at FCI Texarkana and 10 months at FCI Elkton, glass breaking operations continued at these facilities. Medical surveillance also was not instituted at these institutions until 2003.

Novicky acknowledged that he did not notify factory managers at other facilities about the problems at USP Atwater. When asked why, he said that "[i]t just wasn't done. I don't know why. We didn't tell them when a truck didn't show up either. It wasn't on the to do list." Although the safety manager at FCI La Tuna also shut down the glass breaking operations at that facility in July 2002, Novicky permitted operations to continue unchanged at FCIs Elkton and Texarkana for several weeks. When we asked Novicky what was done with respect to respiratory protection at the other UNICOR factories where glass breaking was occurring during the first few weeks after the USP Atwater tests, he responded, "Not much at all." Inmates continued to work at FCI Elkton without respirators until at least July 24, approximately 1 month after UNICOR staff at USP Atwater were notified of the cadmium exceedance.

The Factory Manager at FCI Texarkana reported to Novicky on August 2, 2002, about a tour at the recycling factory the previous day where a guest had "expressed concern" about lead in the monitor glass. The Factory Manager told

Novicky that inmates were using dust masks instead of respirators in the glass booth at that time.

It was not until August 13, 2002, one month after he received the USP Atwater test results and at least eight months after Safety Manager Smith first raised his safety concerns to Randolph and Novicky, that Novicky sent a memorandum to all recycling facilities that for the first time identified rudimentary procedures for all glass breaking operations. The memorandum prescribed adjustments to the factories' existing practices in glass breaking areas, such as requiring inmates to wear respirators, gloves, and coveralls, as well as forbidding food, drink, and cigarettes.

Novicky told us he had doubts at the time that the USP Atwater tests were accurate and that he was seeking more documentation. He wrote to Randolph shortly after the testing results arrived stating that he believed that the testing could have been inaccurately performed. We found no justifiable basis to doubt the tests, which were conducted by a Certified Industrial Hygienist. Even if he thought the testing results were in error, we do not believe it was appropriate to maintain regular glass breaking operations at the other factories or delay testing there until that conclusion could be confirmed weeks later, due to the risk that the results were in fact accurate. OSHA concurred with this assessment.

Novicky told us that the BOP Safety Office was aware that glass breaking activities were continuing at other facilities during this period. However, according to the BOP's former National Safety Administrator, John Lee, he understood from a meeting at BOP Headquarters after the first USP Atwater testing results arrived that UNICOR had ceased glass breaking at other institutions pending further evaluation, and that if they continued "it was unbeknownst to us in Safety." Moreover, we found a contemporaneous memorandum prepared by Smith that memorialized a conversation with Lee and Steve Tussey, then the BOP's National Safety Administrator, on August 28, 2002, which showed that Tussey was not aware that UNICOR had continued glass breaking operations at other factories after the USP Atwater test results were obtained. We concluded that Novicky never informed Lee and Tussey – key members of BOP safety staff – that glass breaking was continuing at other facilities.

As detailed in Chapter Four, FOH and NIOSH-HETAB's evaluation of exposure conditions in 2002 found that staff and inmates were likely exposed repeatedly to cadmium and lead at concentrations above OSHA occupational exposure limits. Beginning with the USP Atwater test results that Novicky received notice of in July 2002, Novicky bears responsibility for allowing those exposures to continue. By failing to immediately perform testing at facilities other than USP Atwater or to suspend glass breaking operations there until such testing could be completed, and, absent such testing, to allow inmate

glass breakers to work without respirators at a minimum of approximately a month after UNICOR staff at USP Atwater learned of cadmium exceedances in its glass breaking booth, Novicky endangered staff and inmates.[116]

After conferring with OSHA, we also believe that Novicky's acts and omissions caused UNICOR to violate OSHA regulations governing personal protective equipment and federal agency occupational safety and health programs and to commit "willful" violations of OSHA's hazard communication and respiratory protection standards.[117] According to OSHA's Field Operations Manual for Compliance Officers, "[a] willful violation exists under the [Occupational Safety and Health Act, 29 USC 651 et seq.] where an employer has demonstrated either an intentional disregard for the requirements of the Act or a plain indifference to employee safety and health." In this case, Novicky had clear indication that UNICOR's glass breaking operations were exposing staff and inmates to unacceptable levels of toxic metals. These exposures triggered a requirement for immediate increased respiratory protection and prompt hazard communication. 29 C.F.R. §§ 1910.1027(g); 1910.1025(f), (l); 1910.1200(h). We found that Novicky either ignored these requirements or made an inadequate effort to learn what they were.

Novicky not only failed to act expeditiously in response to information about hazards at USP Atwater, he attempted to keep this information from other facilities. Shortly after Smith reported the adverse testing results at USP Atwater, Novicky and Randolph sought to ensure that Smith not "interfere" with operations at other UNICOR recycling factories. On July 10, 2002, Novicky and Randolph spoke on the telephone after Randolph learned that Smith was seeking information about the other factories. Randolph later e-

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[116] The first written communications we identified where Novicky discussed the USP Atwater testing results are dated July 10, 2002, 12 days after Smith provided a memorandum to Randolph informing him that glass booth operations were temporarily suspended. On July 24, Minnick, who worked under Novicky, instructed staff at FCI Elkton that inmate glass breakers should have respirators. We did not find similar written instructions for FCI Texarkana until Novicky issued new glass breaking procedures to all Factory Managers on August 13, 2002. OSHA advised the OIG that, if identified during one of its inspections, it would consider the failure to provide respiratory protection to be a "willful" violation in circumstances where glass breaking continued for more than 8 work days after UNICOR was informed of the exceedance of the cadmium PEL. Even if we assume that Novicky knew nothing of the USP Atwater cadmium exceedance until July 10, Minnick's instructions to FCI Elkton did not occur until 2 weeks later. Inmates at FCI Texarkana were still not using respirators as of at least August 2, 2002.

[117] See 29 C.F.R. § 1910.132(d) (requiring employers to perform hazard assessments to determine what personal protective equipment is needed and to furnish such equipment); 29 C.F.R. § 1910.1027(d) (requiring employers to perform monitoring for cadmium); 29 C.F.R. § 1910.1200(h) (requiring employers to inform workers of hazardous chemicals in their work area); and 29 C.F.R. § 1910.134(a) (requiring employers to provide respirators to protect the health of workers).

mailed Novicky stating, "per our phone call [Smith] is looking for info on other UNICOR Factories such as who, how many staff, inmates our [sic] breaking glass. I spoke to the Warden after your call. He made it clear [Smith] should only be concerned about ATWATER." Novicky told us he believed that USP Atwater was "a big enough job" for Smith and that Smith needed to concentrate on that. Novicky stated that he did not want Smith telling other Safety Managers that UNICOR was running unsafe operations until UNICOR had more documentation. Smith told the OIG that as a result he limited his communications with other Safety Managers until he received the USP Atwater Warden's permission to send a memorandum to them on August 12, 2002, which outlined problems with UNICOR's glass breaking operations.

We found that Novicky and Randolph interfered with Smith's performance of his duties as Safety Manager by inhibiting his consultations with other Safety Managers and the reporting of potential dangers to them. According to OSHA, these were protected communications under its regulations, which means that managers were not allowed to interfere with the dissemination of this information.[118]

We also concluded that Novicky's initial inaction in response to warnings raised by a Safety Manager and to the USP Atwater test results reflected indifference to worker and inmate safety and to UNICOR's obligation to comply with OSHA regulations. In our view, Novicky's acts and omissions violated his duty under BOP policy not to endanger staff and inmates and constituted misconduct.

3. Resumption of Glass Breaking Operations at USP Atwater Over the Objections of the Safety Manager

BOP policy required the Safety Manager's re-inspection and written approval to restart an operation that previously was closed due to the presence of an "imminent danger," a finding that Safety Manager Smith made when he halted glass breaking operations at USP Atwater. PS 1600.08. The BOP's Standards of Employee Conduct, which applied to Novicky and Randolph, also prohibited staff from failing to observe written and oral safety instructions. PS 3420.09, Attachment A. We found that during 2002 and 2003, Novicky and Randolph, the Associate Warden for USP Atwater, violated these Standards by ordering that glass breaking operations be resumed at USP Atwater following shutdowns that were ordered for safety reasons, without the required re-inspection and written approval from Smith.

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[118] See 29 C.F.R. § 1960.8(e)(requiring agency heads to authorize safety and health personnel to utilize expertise "from whatever source available."); 29 C.F.R. § 1960.46(1)(prohibiting restraint or interference from employee participation in agency occupational safety and health program activities).

Smith and Randolph both described a repetitive scenario during this period. According to Randolph, Smith would order the glass breaking booth shut down after testing showed exceedances of occupational exposure limits, and Novicky would tell Randolph to keep it running. Novicky told the OIG that he would instruct Randolph to restart operations in order to perform testing following a modification to the glass booth. However, Randolph stated that Novicky would order him to restart operations to keep up with production and prevent a backlog from developing. Smith told the OIG that during 2002 and 2003 the glass booth would only cease operation for a couple days at a time, and he would return to the factory to find it operating again.

For example, on August 6, 2002, Smith provided a memorandum to Randolph notifying him that work in the glass booth needed to be temporally suspended because recent testing revealed exceedances above the PEL for cadmium and lead. Smith discovered that glass breaking operations were occurring as of August 22, and he drafted another memorandum to Randolph reminding him that glass breaking was to halt until measures could be implemented to ensure the safety of staff and inmates.

The UNICOR Production Controller at USP Atwater corroborated Smith's version of events. She told the OIG that she ordered staff a number of times to stop glass breaking based on Smith's instructions but that Randolph countermanded her orders.

As another example, in January 2003, Randolph failed to act on Smith's instruction to close the glass booth after he discovered it was operating without necessary filters. We believe that Randolph's conduct endangered staff and inmates because the booth vented to areas where staff and inmates were not wearing respirators.[119] According to FOH, a UNICOR consultant report showed that this condition resulted in toxic metal dusts being distributed to other parts of the factory through the exhaust ventilation system. OSHA also determined that this conduct would constitute a "willful" violation of its cadmium and lead standards. 29 C.F.R. § 1910.1027; 29 C.F.R. § 1910.1025.

We concluded that Novicky and Randolph failed to comply with BOP policies when they restarted or continued glass breaking operations at USP Atwater over the objection of Safety Manager Smith. We believe that some of these actions exposed inmates and employees to toxic metal dust and constituted misconduct.

[119] The BOP's internal investigation sustained an allegation against Randolph of "Endangering the Safety of Others" based on this conduct.

4. Delays in Installing Engineering Upgrades to the FCI Elkton Glass Breaking Booth

We concluded that UNICOR management at the FCI Elkton facility delayed installing upgrades to the glass breaking booth that were ordered by UNICOR Headquarters. As detailed in Chapter Three, in July 2002, in the wake of the air monitoring tests at USP Atwater, Recycling Business Group Program Manager Carol Minnick instructed managers at FCI Elkton to add an air filtration system for the glass breaking area, to ensure that workers in that area wore respirators, and to prohibit food and drink in the area. These instructions were conveyed to FCI Elkton Superintendant of Industries Adam Norberg and Factory Manager Frank Shannon.

Although UNICOR authorized expenditures for this work, Norberg and Shannon delayed action in response to these instructions, and the upgrade was not started until February 2003 and not completed until April 2003. In the interim, FCI Elkton continued to break CRT glass and contaminated dust was released into the factory and exhausted through the large vent pipe onto the roof until at least February 2003. The FCI Elkton Safety Manager cited UNICOR for these emissions on several occasions. Norberg and Shannon did not provide to us any persuasive explanation for this delay. In addition, during a Recycling Business Group inspection of FCI Elkton in February 2003, Minnick observed that only one of the inmates in the glass breaking area was wearing a respirator, other inmates were wearing inadequate dust masks, and an inmate was consuming a beverage. We believe that Norberg and Shannon showed inadequate performance with regard to these delays and failures to install required equipment and enforce protective procedures.

5. Failure to Install Engineering Upgrades to the FCI Texarkana Glass Breaking Operation

We believe that UNICOR management also exhibited indifference to staff and inmate safety in 2003 to 2004, when UNICOR failed to install engineering upgrades in the FCI Texarkana glass breaking operation. As noted in Section II.B.3 of Chapter Three, in May 2003 the Recycling Business Group distributed new glass breaking procedures that addressed permitting, engineering controls, safety equipment, respiratory protection, cleaning requirements, and medical surveillance of recycling staff and inmates. Shortly thereafter, the Factory Manager at FCI Texarkana, Eric Fabian, began raising concerns with Novicky and Recycling Business Group Program Manager Carol Minnick that the glass breaking booth at FCI Texarkana was not in compliance with UNICOR's glass breaking policies and needed to be quickly upgraded. Fabian told the OIG that FCI Texarkana's booth was "inadequate" and did not compare well to other glass breaking booths that UNICOR was using at the time. He also stated that the Recycling Business Group's efforts to provide him with a paint booth from FCI La Tuna failed because it was severely damaged during shipping, but even

if it could have been used, he did not believe it would have been adequate for FCI Texarkana's glass breaking operations.

After requesting assistance from Minnick in May 2003, Fabian reminded her in July of deficiencies with FCI Texarkana's glass breaking operations, and requested that Ginther, then an Industrial Specialist with the Recycling Business Group, be sent to the factory to help with the design of a new booth. In August, Fabian contacted Minnick again requesting that efforts to upgrade the glass breaking booth be expedited. Fabian wrote that "Safety is getting really concerned on the issue," and that the Safety Manager's "initial comment was to shut the area down until [the] booth is operational," but that he was willing to defer such action for the time being.

Minnick forwarded Fabian's request to Novicky and Ginther, stating that she was "inclined to wait" until additional testing data were received from other recycling locations that could be used in the design of FCI Texarkana's new booth. By November 2003, Minnick was still waiting to receive the testing results in question and wrote to Novicky that the Warden and Safety Manager at FCI Texarkana were expressing concerns about the status of the glass breaking area. She stated that, "Texarkana is currently operating a glass operation with no 'booth' (per se) that is similar to the other locations."

Fabian told the OIG that he kept glass breaking operations running at FCI Texarkana following his requests for an upgrade in the summer of 2003 because UNICOR Headquarters instructed him to do so. By early 2004, UNICOR Headquarters had authorized funding to replace FCI Texarkana's glass breaking booth. The new booth opened at the camp warehouse in June 2004.

Novicky told the OIG that the delays at FCI Texarkana were caused by problems with the delivery of a paint spray booth from FCI La Tuna that UNICOR wanted to use at FCI Texarkana, and that he also was waiting to hear whether the air filtration system that was proposed by USP Lewisburg would be suitable.

We recognize that inmates were given respirators during the relevant time period.[120] However, as detailed in Chapter Four, FOH and NIOSH-HETAB concluded that exceedances of OSHA exposure limits likely occurred at the time. Such exceedances would have triggered requirements under OSHA regulations for improvements to engineering and work practice controls. See 29 C.F.R. § 1910.1027(f)(1) (requiring employers to reduce and maintain

[120] The BOP's internal investigation determined that Minnick "Endangered the Safety of Others" when she directed Fabian to continue operations without testing the glass booth workers for exposures. However, the BOP did not discipline for Minnick for this conduct.

employee exposures to cadmium at or below the PEL using engineering and work practice controls unless the employer can demonstrate that such controls are not feasible). Despite adverse testing results for other UNICOR glass breaking booths in early to mid-2003, the Recycling Business Group did not arrange for testing on FCI Texarkana's glass booth that year.

Novicky was aware of exceedances of the occupational exposure limits at USP Atwater and FCI Ft. Dix during 2003, at the same time UNICOR was continuing glass breaking operations at FCI Texarkana without upgrades. In the absence of additional testing, we believe that Novicky should have adopted an expedited approach as requested by the FCI Texarkana Factory Manager in August 2003 to the upgrade rather than deferring the upgrade for as long as he did. Alternatively, he could have suspended glass breaking operations at FCI Texarkana pending the arrival of the equipment and information he told us he was waiting for. Likewise, we believe Minnick should not have recommended postponing the upgrades that were needed at FCI Texarkana.[121] We found that the performance of Novicky and Minnick were deficient and reflected poor judgment and mismanagement.

6. Mismanagement of Contaminated Filters

Another example of the failure of UNICOR management to exercise adequate supervision occurred in connection with the handling of ventilation filters contaminated with cadmium and lead, especially at FCI Elkton. Two types of filters were at issue: filters from dedicated glass breaking booth ventilation systems and filters from the general factory HVAC systems.

UNICOR received repeated warnings that glass booth ventilation filters became contaminated with lead and cadmium dust and may be hazardous waste. In October 2001, Maria Lancaster of the Product Support Center visited FCI Elkton to evaluate the recycling operations. She told the OIG that after seeing the glass booth, which was a converted paint booth, she advised Ginther that he needed to check to make sure it was in compliance with EPA air requirements and should test its filters to determine whether they constituted

[121] After reviewing a draft of this report, Minnick's attorney submitted comments arguing that Minnick should not be faulted for this recommendation because she was aware of an earlier inspection report from FCI Texarkana indicating no concerns with the glass breaking operation, and because she received an e-mail dated March 18, 2003, indicating that three inmates had been tested for lead and one for cadmium, and all were normal. However, the fact that the inspection report did not document the repeated complaints from the Safety Manager did not mean that he had withdrawn them, and Minnick's recommendation to Novicky did not cite the inspection report. Moreover, the very limited blood testing referenced briefly in the e-mail (which predated the Safety Manager's repeated complaint by several months) did not establish compliance with UNICOR's regulatory obligations. As detailed in Chapter Four, exceedance of OSHA exposure limits likely occurred at this time, triggering requirements under OSHA regulations for engineering and work practice controls.

hazardous waste. The Assistant Safety Manager at FCI Elkton also told the OIG that shortly after the glass booth was installed he informed Ginther that it needed to have filters and that they should be tested to determine if they were hazardous waste. We found no evidence that Ginther took action in response to these recommendations, however. We concluded that Ginther's failure was a significant deficiency.

The handling of the filters from the glass booth was also identified as a serious problem at USP Atwater. In May of 2002, Safety Manager Leroy Smith expressed concern to USP Atwater and BOP supervisors regarding the hazardous metals content of the used glass breaking booth filters and the procedures for handling them during replacement, and recommended that an outside lab analyze them. This request was denied. In early July 2002, Smith told his supervisors that tests of the used filters, conducted at the expense of the USP Atwater Safety Department, found concentrations of lead, barium, and cadmium that made them hazardous wastes under EPA guidelines. Smith wrote to Randolph that the filters would have to be handled as hazardous waste, with appropriate training, personal protective equipment, and handling procedures.[122] Warden Tabor then sent a memorandum to the Regional Director and UNICOR's Chief Operating Officer, Steve Schwalb, noting, among other things, that USP Atwater had not previously "handled or disposed of [the used air filters from the glass booth] as hazardous waste," as required by the EPA. In August 2002, Smith sent a memorandum to other BOP safety managers that warned, among other things, that the filters which collected metals from breaking CRTs were not being treated as hazardous wastes.

Although we determined that USP Atwater began to treat its used glass booth filters as hazardous waste and to properly dispose of them after Smith received testing results, the Recycling Business Group did not have a consistent approach to its handling of these filters, and institutions at times failed to test the filters or to account for them in their hazardous waste totals. For example, in February 2004 Recycling Business Group Program Manager Carol Minnick met with Craig Dalton, Superintendent of Industries at FCI Elkton, during an inspection and noted as an "area of concern" in her inspection report that boxes labeled "hazardous waste" were being stored in the UNICOR warehouse. UNICOR staff at FCI Elkton told us that these were boxes of used filters from the glass breaking booth ventilation system and were stockpiled at the warehouse for over 2 years. Testing conducted in April 2005 showed that the filters were hazardous waste. We determined that the filters

[122] The former Production Controller at USP Atwater told us that disposing of the glass booth filters as hazardous waste was expensive. The Production Controller advised Ginther in March 2003 that USP Atwater would spend $40,000 to $50,000 in the upcoming year on hazardous waste disposal, an issue that was promptly brought to Novicky's attention by Minnick.

from the glass breaking booth continued to accumulate at the warehouse and were not properly disposed of until August 2005, 18 months following Minnick's inspection.

We also determined that during the period before these tests, UNICOR did not properly label the boxes of contaminated filters at times, and did not include this waste in calculating FCI Elkton's hazardous waste totals. FCI Elkton was claiming "conditionally exempt small quantity generator" status and could generate no more than 100 kg of hazardous waste in any given month. UNICOR staff told the OIG that Dalton told them to remove the hazardous waste labels from the boxes in 2005 prior to their testing. Dalton told the OIG that he did not realize that the filters were piling up at the warehouse and that he had no recollection of instructing staff to remove labels from the boxes. The current Safety Manager at FCI Elkton told the OIG that he was not aware that UNICOR was stockpiling filters and that he would have had them removed because their storage could trigger environmental reporting requirements.

Steve Heffner, Factory Manager at FCI Elkton, also said that he received Minnick's inspection report of February 2004. He also did not address the problem of hazardous waste storage in the UNICOR warehouse. Heffner acknowledged to the OIG that it was his responsibility to address issues raised in Minnick's inspection report, but he had no explanation why he delayed doing so until the following year.

We concluded that Dalton and Heffner did not respond to Minnick's concerns about the glass breaking filters in a timely manner, with the result that hazardous waste was improperly stored at the FCI Elkton facility for many months.

In November 2005, UNICOR Headquarters learned that, like the glass booth filters, the general HVAC filters at the USP Atwater recycling factory also constituted hazardous waste under California law, and that the BOP's National Safety Administrator had recommended that all recycling factories test their filters to determine how they should be handled. Minnick instructed Factory Managers that month to test the HVAC filters in their factories and copied Associate Wardens and Superintendents of Industries with this directive.

Starting in August 2006, UNICOR contracted with a company to perform filter changes and maintenance on its HVAC systems at FCI Elkton. UNICOR did not have manifests for its used filters documenting that they were disposed of as hazardous waste until the following year, however, and the Factory Manager, Heffner, told us he did not recall notifying the company that the filters potentially were hazardous waste.

The FCI Elkton HVAC filters were not tested until March 2007, 16 months after Minnick's instruction to test them. Dalton and Heffner had no explanation for this delay in performing the testing. The tests revealed that filters collected from the general ventilation systems at the recycling factories at FCI Elkton exceeded the hazardous waste criteria for cadmium and lead. In May 2007, FCI Elkton finally began handling the used HVAC filters as hazardous waste. HVAC technicians at FCI Elkton told the OIG that they threw the HVAC filters in the trash prior to UNICOR's contractor assuming responsibility for the disposal of the filters.

Problems with handling contaminated glass breaking filters at FCI Elkton continued to crop up, even after the initiation of our investigation. In December 2007, the EPA inspected FCI Elkton with the OIG, FOH, and NIOSH-DART. We discovered that used glass breaking booth filters were being improperly stored in a trailer that was leaking rainwater, and that rain and snow were found on the boxes of filters. Dalton told the OIG that he was "exasperated" with Heffner for failing to call the hazardous waste disposal company, with which UNICOR had a contract, to come and pick up the boxes of used filters that were found in the trailer.

FOH and NIOSH also found that inmates were cleaning the filters by shaking and banging them on the floor of the glass breaking area, which created a thick cloud of dust and caused significant exceedances of OSHA's cadmium standard. This practice violated the glass procedures that the Recycling Business Group issued in June 2003. UNICOR staff and inmates reported to FOH that the improper handling practices that FOH and NIOSH observed were not an isolated occurrence. We believe that Dalton and Heffner demonstrated inadequate performance by failing to exercise competent oversight of the inmates' handling of used filters.

7. Failing To Obtain Adequate Ventilation for the FCI Elkton Chip Recovery Project

As discussed in Chapter Three, in August 2005 UNICOR initiated a chip recovery project at FCI Elkton that involved heating circuit boards over pots of molten solder and then plucking the computer chips from the boards. This process generated fumes containing lead. UNICOR obtained Material Safety Data Sheets in connection with the project that stated the solder was "harmful by inhalation" and that "good ventilation/exhaustion at the workplace" was necessary. The chip recovery operation began in October 2005 without any ventilation system. Novicky told the OIG that from the outset of the chip recovery project UNICOR hoped to install fume hoods over the operation but that this installation was postponed until UNICOR could determine whether the project was feasible.

UNICOR management allowed the chip recovery operation to continue without adequate ventilation for several months. According to FCI Elkton's former Safety Manager, Dan Martin, respirators were provided to inmates who worked on the project, although some inmates told us that they received paper dust masks and that only a limited number of inmates had respirators. We also determined that Martin failed to arrange for air testing, or otherwise perform a hazard assessment, despite many complaints from staff and inmates about the poor air quality in the factory.

In January 2006, a Recycling Business Group inspection reported the need for the immediate installation of ventilation hoods. Dalton authorized the installation of a jerry-rigged ventilation system made out of plastic buckets and PVC pipe. FCI Elkton staff told the OIG that this system was ineffective. An effective ventilation system was not installed until mid-May 2006. UNICOR continued to run its chip recovery operation in the meantime.

According to OSHA, UNICOR's operation of the chip recovery project without fume hoods violated numerous OSHA regulations, including those governing personal protective equipment and respiratory protection, hazard communication, lead exposure monitoring requirements, and OSHA's requirement that federal agencies promptly abate any unsafe work conditions.[123] OSHA told us that it would have deemed such violations to be "willful" violations if they had been found during an OSHA inspection. NIOSH also concluded that lead exposures during the chip recovery project occurred; although, without contemporaneous test data, NIOSH could not state with certainty whether these would have exceeded the PEL for lead.

Novicky had no explanation for why the fume hoods were not obtained until seven months after the project started. Dalton told the OIG that he had conversations with Novicky about the ventilation problems and understood that Novicky was going to obtain the fume hoods. Dalton said that Novicky "dropped the ball" and they were not delivered as he expected. The evidence shows that Novicky and Dalton were aware of the need for a dedicated ventilation system for this operation soon after it began. We believe that they should have suspended the operation until such a system could be installed and that their failure to do so was a serious deficiency that was part of the larger pattern of inadequate attention to staff and inmate safety.

8. Tampering with the Fire Alarm System at FCI Elkton

We concluded that Alan Ferguson, the General Foreman and Facilities Manager at FCI Elkton, committed misconduct when he instructed Roger

[123] See 29 C.F.R. §§ 1910.132(d); 1910.134(d); 1910.1200(h); 1910.1025(d); and 29 C.F.R. § 1960.30.

Hammond, an electronics technician at FCI Elkton, to tamper with the fire alarm system in the recycling factory because of the false alarms that the duct detectors caused after sensing dust from the e-waste recycling operations. We further determined that Hammond committed misconduct when he taped the fire alarm duct detectors and thereafter failed to report in annual inspections of the UNICOR factory's fire alarm system that they had been disabled.

As noted in Chapter Three, after UNICOR started glass breaking operations at its e-waste factory at FCI Elkton, one problem that developed was the build-up of dust on the fire alarm duct detectors located on the factory's air ventilation ducts. The electronics technicians who serviced the fire alarm system said that the dust in the recycling factory frequently caused the fire alarms to activate. Hammond told the OIG that he eventually was instructed by Ferguson to prevent the duct detectors from activating. He said that the fire alarm system started going off during an inspection, and Ferguson told him to "plug those stupid things up." Hammond said that he protested the instruction but complied by taping the duct's sensors so that they could not sample air.[124]

Ferguson told the OIG that he recalled that dust in the UNICOR recycling factory would cause the fire alarms to "go off all the time" and that the constant alarms became "an issue" for him. Ferguson denied to the OIG that he ever instructed electronics technicians to disable the alarms other than to silence them in order to reset and fix them. He stated that "I did not give anybody an order to go tape any duct detectors."

Ferguson's version of events was contradicted by another electronics technician and a work order that Hammond prepared. The electronics technician stated that he recalled Ferguson approached him and Hammond, that Ferguson explained that there was an inspection coming, that the alarms needed to be silenced, and that Ferguson really didn't care what it took to get that accomplished. The electronics technician stated that he recalled that Hammond explained to Ferguson that the only way to properly fix the problem was to install adequate ventilation in the factory that could handle the dust.

During our investigation we also located a work order that corroborated Hammond's interpretation of events. It was dated May 29, 2002, and stated: "Problem occurred during ACA [American Correctional Association] inspection. Intake into the duct detectors in the recycling side of UNICOR were capped off to alleviate further alarms until the ventilation exhaust problem is solved. This is per the facilities manager."

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[124] After the OIG learned of this misconduct, we requested that the BOP promptly examine the fire detection systems in all UNICOR e-waste factories. The BOP found no evidence of tampering from its inspections.

According to electronics technicians at FCI Elkton, the duct detectors remained taped and unable to detect smoke for over 3 years, until September 2005. Prior to 2005, the duct detectors were tested each year using a magnet to determine whether they were operational. In 2005, the test was modified and smoke introduced into the detector, which is when the technicians discovered that the detectors had been taped off. Hammond said that he left FCI Elkton in January 2005, and that prior to that time he performed the testing on the duct detectors. He said that he tested for "alarm notification," which he could do with a magnet, and that he did not need to introduce smoke to the detector to complete the test. Hammond stated that he did not include in his fire inspection reports any notations that the duct detectors had been blocked from detecting smoke.

In light of the testimony of Hammond, the other electronics technician, and the work order that Hammond prepared, we are not persuaded by Ferguson's denials of his responsibility for the disabling of the duct detectors. We also believe that Ferguson's instructions to Hammond were highly improper in two respects. First, they caused Hammond to tamper with an important component of the UNICOR factory's fire protection system and placed staff and inmates who worked in the factory in danger because the duct detectors were not fully operational.[125] Second, Ferguson gave these instructions to prevent inspectors from the American Correctional Association from learning that there was a problem with the fire alarm system in the UNICOR factory. We believe that Ferguson's actions were deceptive, endangered staff and inmates, and violated BOP fire protection policies.

With respect to Hammond, although we recognize that he was acting pursuant to instructions from his supervisor Ferguson when he disabled the duct detectors, we do not believe he should have followed these instructions, which compromised an important part of the UNICOR factory's fire alarm system. In his interview with the OIG, Hammond referred to his familiarity with the National Fire Alarm Code and BOP policy and acknowledged that his actions were prohibited. We believe that, rather than acquiescing to Ferguson, he should have elevated his disagreement to BOP managers and safety staff who could respond to his concerns.

Hammond told the OIG that his actions were known to his superiors and that "everybody was aware because I made a big stink about it." He also stated that he believed that the Warden was made aware of his actions at meetings with staff from the Facilities Department where Hammond worked. However, another foreman who regularly attended the same meetings told the OIG that he never heard anything about the duct detectors being disabled. While we

[125] We recognize that the duct detectors were not the only type of fire protection in the UNICOR factory and that the fire system there was redundant by design.

understand that it is not easy to elevate an issue for resolution over one's superiors, Hammond should have done so given the danger involved.

We further determined that after Hammond disabled the duct detectors in 2002, he performed annual inspections of the UNICOR factory fire alarm system and failed to note that the duct detectors were not functional. Hammond said that he tested the duct detectors for alarm notification, which he could do with a magnet, and "the device worked." According to Hammond, the duct detectors were "100% operational but [they] could not detect smoke . . . ."

We did not find Hammond's explanation persuasive. BOP policies in effect at the time required compliance with applicable fire codes, including the National Fire Alarm Code (NFPA 72, 2002 edition). PS 4200.09; 1600.08. The Code requires that notification be provided to the owner of a fire alarm system when the system or a part of it is impaired. Code 4.6.1. Duct detectors are required to be tested at least annually and "must be tested or inspected to ensure that the device will sample the airstream." Code 10.4.3; Table 10.4.2.2. The Code further provides that "[i]f a defect or malfunction is not corrected at the conclusion of system inspection, testing, or maintenance, the system owner or the owner's designated representative shall be informed of the impairment in writing within 24 hours." Code 10.2.1.2. Hammond should have informed BOP managers that the duct detectors were disabled and could not sample the airstream as they were designed to do. His failure to do so violated BOP policy and the National Fire Alarm Code.

We therefore concluded that Ferguson and Hammond committed serious misconduct when they tampered with the fire alarm system.

B. Misconduct Involving Dishonesty or Lack of Candor

We also found a pattern of disturbing conduct by Lawrence Novicky and some of his subordinates involving false or misleading statements or lack of candor to regulators in connection with UNICOR's e-waste recycling activities.

1. Misleading Representations to the New Jersey Department of Environmental Protection

We found that UNICOR managers, including UNICOR Program Manager Pauline Quinn, disregarded instructions from the New Jersey Department of Environmental Protection (NJDEP) regarding obtaining State approval before conducting electronics recycling at FCI Ft. Dix. According to Ginther, Quinn informed him that FCI Ft. Dix did not need permits. We also determined that Novicky and Recycling Business Group Program Manager Carol Minnick attempted to mislead New Jersey regulators regarding the true nature of the glass breaking procedures that UNICOR intended to use for recycling CRTs at FCI Ft. Dix.

a. Facts

As detailed in Chapter Three, UNICOR began recycling computers at FCI Ft. Dix in 1999. Prior to the inception of these operations, UNICOR's General Counsel, Jane Merrifield, wrote to the NJDEP regarding State permitting requirements. In February 1999, NJDEP responded in a letter stating that any demanufacturing of computers and monitors requires a "Certificate of Authority to Operate." Merrifield told us that she provided the letter to UNICOR and discussed it with UNICOR staff, and that Quinn was the "primary person" she would have contacted. Merrifield said she assumed that UNICOR either obtained the Certificate from the State or was "added by the State" to receive a Certificate. However, UNICOR did not obtain any approval from the State prior to starting e-waste recycling at FCI Ft. Dix.

UNICOR's recycling operations at FCI Ft. Dix included using hammers to remove the electron gun from the monitors, which resulted in the release of dust. Initially UNICOR was not intentionally breaking monitors to reclaim the funnel glass or the panel glass. However, by mid-2001, Novicky decided to open a full-scale CRT monitor recycling operation at FCI Ft. Dix, with glass breaking activities similar to those in use at FCI Elkton.

The UNICOR Factory Manager at FCI Ft. Dix, Corey Saunders, advised Novicky that it would be necessary to obtain authorization from NJDEP to break glass, and Novicky and Ginther travelled to New Jersey in the summer of 2001 to meet with regulators to learn about permitting requirements. According to Paula Steele, the representative of NJDEP who attended the meeting, UNICOR proposed to break monitor glass manually with hammers. Steele said the State was skeptical of UNICOR's proposal due in part to concerns that the operations would generate uncontrolled releases of lead laden dust from the broken CRTs and would be unsafe. Steele said that at that time other glass recyclers in New Jersey were using machines that contained the glass breaking debris. UNICOR e-mail, which was copied to Novicky and Ginther, also showed that the Recycling Business Group received similar resistance from local regulators that also had to approve UNICOR's proposed glass breaking operations.

According to Steele, UNICOR officials told her at the meeting that they were currently processing e-waste at FCI Ft. Dix and she informed them that they needed to have a Certificate of Authority. She said that Novicky and Ginther both attended the meeting and that it was her understanding after the meeting that UNICOR was going to cease operations until it received the Certificate. As shown below, UNICOR and NJDEP e-mails show that UNICOR continued to recycle and that Steele did not learn of this fact until March 2002.

Novicky told us he did not realize that the State was unaware that UNICOR was still recycling in 2002.[126]

Novicky's notes of the meeting indicate that "glass crushing" was discussed with NJDEP. Novicky told us he was aware that the State was concerned about dust from breaking monitor glass. Minnick did not attend this meeting, but e-mails from July 2001 show that Minnick was aware that the State was concerned about the generation of excessive dust from glass breaking operations.

In an effort to obtain NJDEP approval for its glass breaking operations, UNICOR attempted to arrange for Steele to visit FCI Elkton in Ohio in November 2001 to observe how UNICOR processed CRTs. However, Steele subsequently advised Minnick that she would not be able to travel to FCI Elkton due to a lack of funding but that she was willing to review a video of the glass breaking operation. On November 29 and 30, Minnick sent e-mails to Ginther, the Industrial Specialist at FCI Elkton, and Adam Norberg, the Superintendent of Industries at FCI Elkton, requesting a video of FCI Elkton's glass breaking operation and emphasizing that it was needed to obtain New Jersey's approval of UNICOR's glass breaking procedures.

Minnick received the FCI Elkton video by mid-December.[127] On December 18, 2001, Minnick e-mailed Ginther, Norberg, and Novicky notifying them that the video that FCI Elkton provided was unsatisfactory. Minnick thanked Ginther "for all your work on the video," but stated "[u]nfortunately, the video needs to be re-done. We need to find a way to tape it without so much matter in the air (light reflected off and it appears to be a lot of floating matter) and background noise." She further stated that the new video needed to be made "the sooner the better, as the permit for Ft. Dix hinges on EPA New Jersey accepting our methods." Minnick followed-up her request with another e-mail on January 8, 2002, reminding Norberg that UNICOR could not proceed with its permit application for FCI Ft. Dix without it. She stated, "[r]emember – we need a good clean – little noise video. This video is to be used to convince EPA in New Jersey that our glass process is a good way to go."

Novicky, who was Minnick's boss, was involved in the decision to send a revised video to NJDEP. Ginther told the OIG that Novicky told him to make the second video. Novicky told us that UNICOR did not send the first video

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[126] Steele stated that the State could have found a violation for operating without authorization from NJDEP, but that the State was not enforcing this provision at that time. She stated: "Once we knew they wanted to process electronic waste, we worked with them to get them the approval that they needed."

[127] The OIG was not able to locate the first video. Recycling Business Group e-mail shows that Minnick likely returned it to FCI Elkton.

because, “It was very poor quality, significant noise in the video, you could hardly hear them talking. It wasn’t reflective of what we did and the proper way we did it.”

When we asked Norberg about the creation of a second video, he said he told Factory Manager Frank Shannon and Ginther to “take whatever steps you have to. Eliminate some of the background noise, try to make it more professional because it was for central office and you don’t know who’s going to be looking at it so they had to do it over and it was fixed.”

In February 2002 Minnick provided a different video to Steele. In her letter to NJDEP that included the video, Minnick stated that it showed “the CRT glass recycling operation.” The video lasts approximately three minutes and shows the removal of a single monitor’s electron gun and the breaking of its funnel glass with a few lightly placed hammer strikes. The video did not show the breaking of an entire CRT as was UNICOR’s practice, including the breaking of the monitor’s panel glass. The video also did not show the substantial dust and debris that is generated from manual glass breaking or the shattering of the monitor’s panel glass, which typically is more difficult to break and contains a phosphor coating that often becomes airborne particulate matter when struck. At that time, UNICOR was breaking panel glass at FCI Elkton and was planning to do so at FCI Ft. Dix. Ginther told the OIG that Minnick instructed him not to break the panel glass. He said that if the panel glass was not broken, particles would not fly into the air. UNICOR staff at FCI Elkton who reviewed the video during our investigation stated that it was not an accurate portrayal of UNICOR’s glass breaking operations. Ginther also said that the second video was “deceptive,” and that it was “probably wrong” to create such a video knowing that it would be sent to New Jersey. He further stated that “getting the job done was the most important thing” at UNICOR, and that “one did what he needed to do to get the job done, including deception if necessary.”

A photograph from the video appears below.

PHOTOGRAPH 5.1
UNICOR Simulation of Glass Breaking Process -
Breaking Funnel Glass, FCI Elkton, 2002

Minnick told us that she had no recollection of providing the video to NJDEP.[128] Minnick identified the voice narrating the video as belonging to Ginther.[129] Minnick stated that she knew that breaking monitor panel glass was part of UNICOR's glass breaking process, but she had no explanation for why the video did not show this step. Norberg said he did not review the second video.

Novicky told the OIG he reviewed the second video before it was sent to NJDEP and that it "was an accurate portrayal of how we were going to do, the process we were going to utilize." He admitted, however, that the second video did not show UNICOR breaking the face panel. He stated he did not recall the reason this step in the CRT glass recycling process was omitted. Novicky also admitted that in actual operations, breaking monitors results in emissions of

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[128] Notwithstanding this denial, another Program Manager in the Recycling Business Group told us that Minnick discussed an incident as recently as 2008 involving Ginther's filming years earlier of a video of glass breaking at FCI Elkton that showed extensive contamination. The Program Manager said that he understood from conversations with Minnick that the contents of this tape were something that UNICOR did not want revealed outside of UNICOR. We are skeptical that Minnick lost all memory of this incident subsequent to that conversation.

[129] The OIG located two copies of the second video. One copy had no sound while the other was narrated by Ginther.

dust. He stated that the reason that a video showing such dust was not sent to NJDEP was that, "We didn't think that video was a real time operational video. It was showing the process of what we were going to do, separate the glass, the CRTs. I would have welcomed them to come and personally observe our operations."

Steele, the NJDEP official, told us that the State received the video from UNICOR in February 2002. She said that when she saw the video she could tell it was not a true representation of the actual process, but that she understood that this was because there were legal impediments to videotaping prisoners. She said that the State accepted it because it did show the basics of how UNICOR was going to go about breaking the monitors. However, Steele told the OIG that she would have been concerned if UNICOR's glass breaking procedures resulted in the generation of significant amounts of dust, and that she would have expected UNICOR to provide the video that showed such dust emissions. Steele said that the breaking of the panel glass should have been included in the video if it was UNICOR's practice to break it.

Steele stated that NJDEP eventually issued a Certificate of Authority to UNICOR for its recycling activities in 2002, but that it did not include authority to process CRTs because that activity required an air permit. She stated that NJDEP modified the Certificate of Authority to grant this authority in March 2003. Steele said that NJDEP's understanding that the video was an accurate representation of UNICOR's process "was not the only factor in issuing the approval, but it was one of the factors."

b. OIG Analysis

We concluded that to obtain authorization for glass breaking operations at FCI Ft. Dix, Novicky and Minnick intentionally submitted a video to NJDEP that omitted information about the process used at FCI Elkton that they knew would be relevant to NJDEP's assessment of UNICOR's process. The second video showed a monitor being gently tapped with hammers to break the funnel glass, when in fact UNICOR's process involved a more violent procedure that resulted in the release of dust. The second video did not show workers breaking panel glass, which was being broken at FCI Elkton.[130] Breaking the panel glass required the application of much more force and resulted in the release of more visible airborne debris than the breaking of funnel glass did. The second video did not show the generation of large amounts of dust from

[130] In comments submitted to the OIG, Minnick's attorney pointed out that UNICOR's permit application disclosed to NJDEP that front panel glass would be broken. While true, this observation misses the point. The application did not disclose the force required to break panel glass or the amount of dust generated as a result. This could have been made clear in a video that accurately portrayed UNICOR's process, and the omission of this step was part of what made the video misleading.

breaking monitors, even though such dust was routinely generated in actual FCI Elkton operations. Indeed, it was the visibility of dust in the first video that led Novicky and Minnick to create a new, sanitized video. Novicky ordered the preparation of a new video despite knowing that NJDEP was specifically concerned about dust from breaking CRTs.

Novicky argued that there was no intent to mislead NJDEP because UNICOR invited NJDEP to visit FCI Elkton in person to observe the process. We did not find this persuasive. By the time the second video was made, Novicky and Minnick knew that NJDEP would not be visiting FCI Elkton and would instead be relying on the video for information about the process. They then created a video that provided a misleading picture of the FCI Elkton operation.

Minnick denied to the OIG that she had any recollection of having requested or reviewed either of the videos. We are skeptical about this claim. In any event, the e-mails described above establish without question that Minnick was centrally involved in arranging for the preparation of a sanitized version of the video, in order to persuade NJDEP to authorize glass breaking at FCI Ft. Dix.

We concluded that Novicky and Minnick intentionally sought to mislead NJDEP regarding the true nature of the FCI Elkton operations. We believe their actions in submitting the sanitized video constituted serious misconduct.[131]

We also considered the conduct of Ginther, Shannon, and Norberg in this matter. Minnick sent Ginther and Norberg e-mails directing them to create a second, "clean" video and instructing Norberg to place a "high priority" on the project. Norberg told us that he instructed Ginther and Shannon to make another, "more professional" video with less background noise, but that he never saw the video that was sent to NJDEP. Ginther told the OIG that he made the second "sanitized" video at the insistence of Novicky. Shannon told the OIG that he was not aware that the second video had been made until it was shown to him by investigators.

Although Norberg said that he never saw the video that was sent to NJDEP, Minnick's e-mails to him emphasized that dust and debris should not be apparent in the video and that it was to be used to persuade NJDEP to issue a permit to UNICOR. Norberg told the OIG that no "red flag" was apparent to

[131] The OIG referred this matter to the Environmental Crimes Section of the DOJ Environment and Resources Division for consideration of criminal prosecution. After a lengthy investigation conducted in conjunction with the OIG, the EPA, the FBI, and the U.S. Attorneys' Offices for the Northern District of Ohio and the District of New Jersey, no action was initiated because of various evidentiary, legal, and strategic concerns.

him based on Minnick's requests for a "clean" video, even though he acknowledged to the OIG that her request was not realistic given UNICOR's glass breaking methods, in his words, "how are you going to break the glass without creating some dust?" We believe that Norberg and Ginther should have recognized that Minnick was requesting a video that did not fairly represent FCI Elkton's glass breaking operations and that they should have objected or produced a video for UNICOR's permit application that accurately portrayed FCI Elkton's glass breaking process. We also believe, that as Superintendent of Industries at FCI Elkton with accountability for Ginther's work, Norberg was "inattentive to his duties," a BOP disciplinary offense, PS 3420.09, Attachment A, and that he shares responsibility for delivery of the misleading video to NJDEP.

2. False and Incomplete Statements to the EPA

We determined that Novicky and Craig Dalton, Superintendant of Industries for FCI Elkton, knowingly provided false and incomplete information to the EPA in response to an information request about air emissions at FCI Elkton.

In July 2007, after the OIG expressed concerns to the EPA about UNICOR's environmental compliance performance, EPA Region V sent information requests to UNICOR and FCI Elkton requesting information about air emissions at FCI Elkton. The EPA's information request required UNICOR to "provide a list of all air emissions units . . . owned or operated by UNICOR" at FCI Elkton, and to describe changes in recycling procedures at Elkton since 1995, "including changes in the venting of emissions to the atmosphere." The request required UNICOR to provide a certification attesting to the accuracy and completeness of the information furnished. Yet, the responses provided by Novicky and Dalton did not disclose emissions from the glass breaking booth that was installed at FCI Elkton in 2001, as appears in Photographs 3.2 and 3.3.

Novicky told the OIG that the request was initially misplaced and that he did not see it until near the deadline for responding. He said that after receiving the request he conferred with a representative of theEPA, and he told the EPA representative that UNICOR did not have a lot of the information that was being requested and that it "could take months to collect all this information." He said that the EPA representative told him that he needed "to get this done," and to "just tell me what you have and put it in a letter to us so we can see what you have over there." Novicky said he understood this instruction to mean that the EPA only wanted information about current emissions, not prior emissions. Novicky said that Jane Merrifield, UNICOR's General Counsel, participated in the call as well as another UNICOR employee.

We interviewed the EPA representative, who stated that Novicky contacted her and said that the information that the EPA was seeking was quite voluminous and that he would not be able to collect all the information that the EPA was seeking by the deadline. She said that she told Novicky to "get me what you can by the deadline" and then depending on how much more information needed to be collected, a schedule could be worked out to provide it. However, she said that UNICOR never provided supplemental information after the EPA received UNICOR's response. The EPA representative also stated that if Novicky was aware of an emission source at the time that he provided his response, he should have disclosed it. The EPA representative said he did not tell Novicky that UNICOR was not required to disclose information about prior, discontinued operations and needed only to address current operations.

We also interviewed Merrifield, who had no explanation why the earlier ventilation system was not disclosed to the EPA other than that Novicky had not known about it or remembered it. She stated that she would have disclosed the ventilation system if she had known about it.

Novicky signed UNICOR's response to the information request in September 2007. Craig Dalton, the Superintendent of Industries at FCI Elkton, signed an identical response from FCI Elkton bearing the same date.[132] Novicky and Dalton each signed a certification attached to their respective final responses stating:

> I certify under penalty of law that I have examined the information provided in the modified September 21, 2007 response and am familiar with the information in the enclosed documents, including all attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are, to the best of my knowledge and belief, true and complete. I am aware that there are significant penalties for knowingly submitting false statements and information, including the possibility of fines or imprisonment pursuant to section 113c 2 of the Act, and 18 U.S.C. § 1001 and 1341.

The final information responses from UNICOR and FCI Elkton stated that the only active air emission unit associated with the FCI Elkton e-waste recycling operation was the glass breaking booth and air filtration system that was installed in 2003. The responses also stated: "Prior to the installation of the glass breaking booth, no emissions were generated necessitating the

[132] Novicky had provided a response in August 2007, but superseded it with final responses dated September 21, 2007, after learning that the first response contained errors. Dalton also provided a response at that time.

venting to outside air emissions." This statement was false. In fact, there were significant emissions from the glass breaking operation at FCI Elkton beginning in the fall of 2001, prior to the installation of the glass breaking booth in 2003. These emissions were routed through a large vent pipe from the glass breaking area, as shown in Photographs 3.2 and 3.3 in this report, and were vented to the outside through the roof. As detailed in Chapter Three, staff and inmates at FCI Elkton described the accumulation of metal particles on the roof and complained that the debris that was being blown onto the roof of the recycling factory drifted down onto the prison yard and loading dock of the factory.

Dalton told us that when the responses to the EPA information request were being prepared, he had a conversation with Novicky in which Novicky instructed him that based on his discussions with the EPA there was no need to include information about the large vent pipe used to vent emissions from the glass breaking operation before installation of the glass booth in 2003.

Yet, UNICOR and FCI Elkton did not follow a consistent practice of excluding all information about prior, discontinued emissions. The responses described a paint booth for touch-up painting of reconditioned monitors that vented to the outside and was in use from September 2005 to May 2006. They also described the chip recovery initiative that vented fumes to the outside that was dismantled in August 2006.

The UNICOR and FCI Elkton responses both also stated: "No major changes have occurred in the electronics recycling process operations besides those cited above since 1997." This statement also omitted the introduction of glass breaking emissions in 2001 vented through the large pipe onto the roof, which was later changed with the introduction of the glass breaking booth and filter system in 2003.

The EPA later learned through information gathered from our investigation and from its own interviews that the information in the responses was not true and complete. In 2007, the EPA conducted an inspection of FCI Elkton with the OIG, FOH, and NIOSH-DART, and conducted interviews of staff members who revealed the pre-2003 glass breaking emissions through the large vent pipe. We did not find any evidence that the EPA relied on the false statements in any action.[133]

In sum, we concluded that Novicky and Dalton made false statements to the EPA by stating there were no glass breaking emissions prior to the

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[133] The OIG also referred this issue, along with waste disposal practices at FCI Elkton, for potential criminal prosecution. As discussed in footnote 131, following a lengthy investigation, no action was initiated because of various evidentiary, legal, and strategic concerns.

installation of the 2003 booth and filtration system, and that Novicky was not candid about this matter with the OIG. For several reasons, we did not credit Novicky's claim that he understood the EPA was not seeking historical emissions information. First, the EPA representative denied providing any instruction that would have limited the EPA's request to just current operations, and UNICOR's General Counsel did not describe the EPA representative's instructions as a reason why UNICOR's response did not identify the earlier emissions. Second, Novicky and Dalton did not follow this alleged instruction consistently; they included information about two other discontinued emissions in their responses. Third, if the EPA had given permission not to provide this information, the logical way to respond to a question asking for it would have been to cite to the oral instruction that the EPA representative had imparted, rather than concocting an affirmatively false statement that no glass breaking emissions were generated prior to 2003.

We considered and rejected the possibility that Novicky did not know about the prior glass breaking emissions or had forgotten about them. Significantly, Novicky did not claim poor memory or ignorance. Instead, he claimed that the EPA had sanctioned this omission, a claim we did not find credible for the reasons stated above. In fact, Novicky included information about prior omissions in his response but omitted those associated with glass breaking operations.

We do not know for certain what Novicky's motivation was for withholding information about the pre-2003 emissions from the EPA. He may have believed there could be penalties associated with the unpermitted emissions or that disclosing them would potentially tarnish the image of the Recycling Business Group. As detailed in Chapter Three, Novicky was warned at least once in 2001 by personnel from UNICOR's Product Support Center that UNICOR should evaluate its EPA air pollution permit requirements at FCI Elkton.

We also recognize that the misrepresentations did not have any apparent material effect on any decision reached by the EPA, and that the EPA ultimately learned about the emissions through staff interviews, as well as from the OIG. However, regardless of the motive or impact of the misrepresentation, it was serious misconduct for Novicky to falsely certify that a statement to a government regulator is "true and complete." It was likewise misconduct for him to induce Dalton to make the same misrepresentations. It was also misconduct for Novicky to give an untruthful account of this incident to the OIG.

Dalton was in a different position. He claimed that Novicky told him that the EPA had sanctioned the omission of information about pre-2003 glass breaking emissions. It is not disputed that Dalton knew about the pre-2003 emissions. He therefore should have recognized that the responses were not

"true and complete," as he was being asked to certify. Dalton was Novicky's subordinate, so Dalton would feel pressure to comply with Novicky's instructions and provide identical information in the Elkton response. However, Dalton should have recognized that the way the responses were phrased were not consistent with the instruction that Novicky told him the EPA gave. Instead of citing the instruction, the responses simply denied the truth about the pre-2003 emissions. We believe that notwithstanding Novicky's instructions, Dalton should have declined to sign the certification or raised concerns about it to Novicky or his supervisors. Therefore, we found that Dalton's actions also constituted misconduct.

3. Failing to Disclose Adverse Health and Safety Information to the UNICOR Board of Directors

As described in Part I, beginning in 2004 the Recycling Business Group provided the UNICOR Board of Directors with reports that described inspections and industrial hygiene testing at its e-waste recycling factories that we believe should have identified unfavorable information. Novicky reviewed these reports. We determined that the Recycling Business Group's submissions for 2004 through 2007 omitted important testing information related to exceedances of OSHA occupational exposure limits.

Novicky acknowledged to the OIG that the adverse testing information should have been brought to the Board's attention. He said he could not explain why the adverse testing information was not presented to the Board. Novicky's supervisor at the time, Steve Schwalb, also told the OIG that the Board should have been informed of the adverse testing results.

Given Novicky's position in the Recycling Business Group, we believe that he was fully aware of the adverse testing results during fiscal year 2004 and other years. We believe that the reporting that he approved could have created a false impression for the Board that the Recycling Business Group had not experienced difficulty bringing its factories into compliance with OSHA occupational exposure limits and other requirements.

C. Conclusions Regarding Individual Accountability

1. Lawrence Novicky

We believe that much of the mismanagement of health, safety, and environmental matters at UNICOR e-waste facilities described in this report arose from the acts or omissions of the General Manager of the Recycling Business Group, Lawrence Novicky. Among other things, Novicky failed to ensure that UNICOR met its regulatory obligation to provide respirators and hazard communication at UNICOR facilities in a timely manner. After being informed in August 2001 by the New Jersey Department of Environmental Protection that glass breaking presented hazards, after being warned prior to

April 2002 of safety risks by Safety Manager Smith, and after receiving the USP Atwater test results in July 2002 indicating exposures far above the PEL for cadmium, Novicky failed to take prompt action to safeguard staff and inmates. Instead, he allowed inmates to continue breaking CRTs without adequate warnings or protection. He repeatedly ordered the resumption of glass breaking activity at USP Atwater without the approval of the Safety Manager, in violation of BOP rules; he inhibited the Safety Manager's communications with staff at institutions with other recycling operations; and he led the BOP's national safety staff to believe that glass breaking operations had been suspended at institutions besides USP Atwater. He failed to ensure a needed upgrade of the glass breaking booth at FCI Texarkana without justification and failed to obtain adequate ventilation for the FCI Elkton chip recovery project. In general, Novicky demonstrated willful indifference to the safety of staff and inmates.

We also found a pattern of repeated deception in statements that Novicky made to regulators and others. We believe that he participated in the preparation of a misleading video sent to NJDEP in an effort to obtain a permit for that facility, and he made false and incomplete statements to the EPA in a certified response to a formal information request. He also failed to disclose adverse information to UNICOR's Board of Directors.

Novicky retired from federal service in 2009 and therefore no disciplinary action can be taken against him. However, we are forwarding a copy of this report to the DOJ Security and Emergency Planning Staff for consideration of inclusion in its security files in the event that Novicky should seek employment with the Department of Justice in the future.

2. Bruce Ginther

Ginther held various positions with the Recycling Business Group, including Assistant Factory Manager at FCI Elkton, Industrial Specialist, and Program Manager. Although he had no formal training in industrial hygiene, he became a major authority within UNICOR regarding the design and construction of glass breaking operations. We found serious deficiencies in Ginther's performance, primarily regarding glass breaking operations. Ginther failed to alert his supervisors, staff, or inmates to information he received regarding the hazards associated with dust generated during the recycling of CRTs. He participated in the preparation of a misleading video to NJDEP and concealed e-waste from BOP inspectors and at least one supplier, the Defense Reutilization and Marketing Service, at FCI Elkton. These incidents led us to conclude that Ginther at times lacked candor with regard to operations in the

Recycling Business Group and that he did not sufficiently ensure that UNICOR complied with its obligations under health, safety, and environmental laws.[134]

Ginther retired in 2009 and therefore no disciplinary action can be taken against him. However, we are forwarding a copy of this report to the DOJ Security and Emergency Planning Staff for consideration of inclusion in its security files in the event that Ginther seeks employment with DOJ in the future.

3. Carol Minnick

Carol Minnick was the Program Manager for the Recycling Business Group from 2001 to 2006. As detailed above, we determined that Minnick exercised poor judgment when she recommended to Novicky that he defer a decision on upgrading FCI Texarkana's glass breaking booth despite a request from the local Factory Manager for expedited improvements. We believe that delays in implementing the upgrade likely caused violations of OSHA regulations that require primary reliance on engineering and work practice controls to limit occupational exposures, 29 C.F.R. § 1910.1027(f)(1), and Minnick had reason to know that such improvements were needed given that the UNICOR glass breaking booths at USP Atwater and FCIs Elkton and Ft. Dix recorded exceedances of OSHA occupational exposure limits.

We also determined that Minnick participated in the effort to persuade NJDEP to approve glass breaking at FCI Ft. Dix by submitting an inaccurate and misleading video of the glass breaking operation at FCI Elkton. We were skeptical of Minnick's claim that she has no memory of this activity.

However, in assessing Minnick's conduct we reviewed thousands of internal Recycling Business Group e-mails and correspondence, and we identified many instances where Minnick attempted to promote and enforce compliance with BOP and UNICOR policies dealing with health and safety. We also found that Minnick often functioned more as an administrative assistant to Novicky than as a manager of a program, as her job title described.

Because we believe that Minnick engaged in misconduct when she participated in the effort to provide a misleading video to NJDEP, we are referring her actions to the BOP for appropriate action.

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[134] As noted in Chapter Three, Ginther was previously disciplined by the BOP for conduct involving dishonesty. In 2004 BOP reprimanded Ginther based on findings of the GSA OIG that Ginther had diverted loads of e-waste from UNICOR's FCI Elkton factory and lied to federal agencies about the destination of their e-waste as well as to a federal agent who interviewed him about these activities.

4. Samuel Randolph

Samuel Randolph was the Associate Warden at USP Atwater. As detailed above, we found that, acting on Novicky's orders, he interfered with Leroy Smith's performance of his duties as Safety Manager by inhibiting communications with other Safety Managers that were protected communications under OSHA regulations. Randolph also violated BOP policies by ordering that glass breaking operations be resumed at USP Atwater following shutdowns that were ordered for safety reasons, without the required re-inspection and written approval from the USP Atwater Safety Manager.

Randolph retired from the BOP in 2006 and therefore no disciplinary action can be taken against him. If Randolph had remained with the BOP, we would refer his misconduct to the BOP for disciplinary action.

5. Craig Dalton

Craig Dalton was the Superintendent of Industries at FCI Elkton. As detailed above, we found that Dalton participated in the mismanagement of contaminated ventilation filters that should have been treated as hazardous waste.[135] Along with Novicky, Dalton also failed to provide an adequate ventilation system for the chip recovery project and failed to shut down the project until the system was installed, thereby exposing staff and inmates to noxious fumes. We believe that his mismanagement of contaminated filters constituted a serious performance deficiency, and his lapses in the chip recovery project endangered staff and inmates.

In addition, Dalton signed a certified response to an EPA information request that he knew contained inaccurate information. We recognize that Dalton was instructed to give this response by Novicky, but we believe he should have declined to sign an inaccurate response.[136]

Dalton retired from the BOP in 2008 and therefore no disciplinary action can be taken against him. If Dalton had remained with the BOP, we would refer his misconduct concerning the chip recovery project and the EPA's information request to the BOP for disciplinary action.

6. Adam Norberg and Frank Shannon

During 2002-2003, Adam Norberg was the Superintendent of Industries at FCI Elkton, and Frank Shannon was the Factory Manager there. We found that Norberg and Shannon failed to timely implement an upgrade of the FCI

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[135] As detailed above, we found that Steve Heffner, the Factory Manager at FCI Elkton and a subordinate of Dalton, also participated in the mismanagement of contaminated filters.

[136] We believe that Dalton's conduct was potentially mitigated by [redacted].

Elkton glass booth as instructed by Minnick in 2002, which resulted in the emission of cadmium and lead bearing dust into the factory and the outside environment. Norberg and Shannon also failed to enforce other protective procedures, such as requiring all glass breaking workers to use respirators and prohibiting food and drinks in the work area. We believe these were significant performance issues.

We also found that Norberg was inattentive to his duties and committed misconduct when he failed to review a video that was submitted with a permit application to determine that it fairly represented UNICOR's glass breaking process.

Norberg retired from the BOP in 2003 and therefore no disciplinary action can be taken against him. If Norberg had remained with the BOP, we would refer his misconduct to the BOP for disciplinary action.

7. Alan Ferguson and Roger Hammond

We determined that Alan Ferguson, the General Foreman and Facilities Manager at FCI Elkton, instructed Roger Hammond, an electronics technician at FCI Elkton, to tamper with the fire alarm system in the recycling factory because of the false alarms that the duct detectors caused after sensing dust from the e-waste recycling operations. Hammond taped the fire alarm duct detectors and thereafter failed to report in annual inspections of the UNICOR factory's fire alarm system that they had been disabled.

We believe that Ferguson and Hammond committed serious misconduct in connection with this incident. We are referring their actions to the BOP for consideration of appropriate discipline.

8. Steve Heffner, UNICOR Factory Manager, FCI Elkton

As with Dalton, we determined that Heffner demonstrated performance deficiencies by failing to ensure that ventilation filters from FCI Elkton's recycling factory locations and filters from the glass breaking booth were properly handled. Heffner also disregarded instructions that he received from Minnick in November 2005 to test the factory ventilation filters. He said that he received Minnick's inspection report of February 2004 but failed to address the problem of hazardous waste storage in the UNICOR warehouse.

In addition, we determined that Heffner failed to oversee proper handling of used glass breaking booth filters in 2007, including their removal from the booth and storage.

We recommend that the deficiencies identified above be addressed in Heffner's performance evaluation.

9. Dan Martin, former Safety Manager, FCI Elkton

During the period when Martin was Safety Manager at FCI Elkton, UNICOR started several projects that we determined were not properly evaluated and were not safe, including glass breaking operations, the chip recovery project, and a monitor refurbishment project. We believe that Martin should have been more assertive in protecting the safety of staff and inmates. We concluded that Martin's job performance was deficient.

Martin retired from the BOP in June 2010.

CHAPTER SIX
CONCLUSIONS AND RECOMMENDATIONS

I. OIG Analysis

In this chapter we summarize our conclusions regarding UNICOR's e-waste recycling program, and we provide recommendations to address the problems we identified in this program.

The OIG's investigation examined the safety of UNICOR's e-waste recycling program from its inception in 1996 through 2009. We obtained assistance from four federal agencies with expertise in health, safety, and environmental compliance matters – the Federal Occupational Health Service (FOH), the National Institute for Occupational Safety and Health (NIOSH), the Occupational Health and Safety Administration (OSHA), and the U.S. Environmental Protection Agency (EPA).

UNICOR performed e-waste recycling at 10 BOP institutions, and with the help of the federal agencies above we completed extensive field work to evaluate UNICOR's operations. Our investigation examined staff and inmate exposures to toxic metals, primarily cadmium and lead; the medical effects resulting from these exposures; legacy contamination in UNICOR's factories from improper recycling practices; exposures to noise and heat stress; the incidence of injuries; environmental compliance; and general administrative control and oversight of UNICOR's e-waste operations.

Our investigation identified significant problems with the e-waste program and a troubling lack of adequate measures to address the safety of staff and inmates who participated in the program. UNICOR failed to properly evaluate the safety of its recycling operations before starting them, and staff and inmates at several BOP institutions were exposed to levels of cadmium and lead that exceeded OSHA standards. Due to variations in susceptibility to adverse health effects from toxic metal exposures, some contribution to future health problems from exposures at UNICOR cannot be completely ruled out.

We identified particular problems with UNICOR's handling of computer monitors and breakage of monitor glass. Especially during the first five years of the e-waste program, UNICOR lacked proper engineering controls; work practice controls; personal protective equipment; and administrative controls, such as hazard communication and training to mitigate toxic metals exposures that resulted primarily from glass breaking operations. As a result, UNICOR violated numerous OSHA regulations, including those dealing with cadmium, lead, hazard communication,

personal protective equipment, and respiratory protection. OSHA concluded that some of these violations were "willful" and showed indifference to the safety of workers.

We determined that testing was undertaken at the United States Penitentiary in Atwater, California at the initiative of the institution Safety Manager following his earlier recommendations to UNICOR that a hazard assessment should be completed on glass breaking operations due to possible health and safety risks. After testing results in 2002 from these operations showed exceedances of OSHA's occupational exposure limits, the leadership of UNICOR's e-waste program was slow to institute adequate remedial measures at USP Atwater and other e-waste factories. For example, respiratory protection was not promptly provided at other glass breaking operations and additional monitoring was delayed. FCI Texarkana did not upgrade its glass breaking booth with adequate ventilation and air filtration until nearly two years after the first adverse USP Atwater testing results were received.

The medical evaluation conducted pursuant to this investigation revealed that UNICOR and the BOP failed to institute proper medical surveillance at some institutions for UNICOR staff and inmates who required it and, in some circumstances, failed to share testing results with staff and inmates. Necessary medical examinations were not completed on inmates as mandated by OSHA's cadmium and lead standards, and biological monitoring was not standardized, resulting in some staff and inmates not receiving the testing required under OSHA's regulations. We did not identify any blood or urine testing results that exceeded occupational standards for cadmium and lead, but UNICOR failed to complete monitoring as required by OSHA and the records that we were able to review were incomplete and did not include data from periods when exposures were likely greatest. However, of the many symptoms of illness that staff and inmates reported in their interviews and attributed to their work in UNICOR's e-waste factories, none could be linked to recycling work.

In addition, we found that recycling operations created problems related to injuries, noise, and excessive heat. Our interviews and review of inmate injury records revealed that inmates who worked in glass breaking operations were frequently cut by the broken glass. Neither UNICOR nor the BOP shared injury information between factories, and the BOP does not collect injury information to identify injury trends in UNICOR operations. We found staff and inmate noise exposures above OSHA limits at various UNICOR factories during glass breaking operations, baling operations, and other activities. We also determined that inmates had the potential for excessive exposure to heat during certain recycling operations.

UNICOR's Recycling Business Group's (RBG) environmental compliance performance also was inadequate. We found that UNICOR at times did not fully evaluate environmental permitting requirements before starting new operations, properly characterize its hazardous wastes, and lawfully store or dispose of such wastes at multiple BOP institutions. We also determined that the Recycling Business Group provided misleading information to environmental regulators who sought information about UNICOR's e-waste operations at FCIs Elkton and Ft. Dix.

Overall, we concluded that prior to 2009, UNICOR's e-waste program was poorly managed by its Headquarters staff. The leadership of the Recycling Business Group failed to institute policies in a timely way to protect staff and inmates from the hazards associated with e-waste recycling; to properly advise staff and inmates about hazards once they were identified; to correct hazards in a timely way once they were identified; and to conduct e-waste operations in compliance with applicable health, safety, and environmental regulations.

We found numerous instances of staff misconduct and performance failures. These included actions that endangered staff and inmates, dishonesty, dereliction of duty, and theft, among others. In all, we concluded that 11 UNICOR and BOP employees committed either misconduct or performance failures in their work related to the e-waste recycling program.

Our investigation concluded that the General Manager of the RBG, Lawrence Novicky, committed significant acts of misconduct, including discounting warnings about the hazards associated with e-waste recycling and failing to respond appropriately after testing confirmed exceedances of OSHA occupational exposure limits. We also found that Novicky repeatedly countermanded the instructions of Safety Manager Smith, directing that glass breaking operations be restarted after Smith had ordered them shut down, and sought to inhibit Smith's communications with other BOP Safety Mangers about the safety of UNICOR's glass breaking operations.

We believe that Smith deserves special credit for his resolve in attempting to protect the health and safety of staff and inmates at USP Atwater. He was required to work under adverse circumstances, including mistreatment from Associate Warden Randolph, the senior UNICOR representative who oversaw the recycling program at USP Atwater. To his credit, Smith repeatedly highlighted to UNICOR staff their obligations under the law and BOP policy and attempted to enforce compliance.

Our investigation also identified numerous acts of deception by Novicky and his assistant, Ginther. For example, we concluded that they, along with others, arranged for the New Jersey Department of

Environmental Protection to receive a video that deceptively presented UNICOR's glass breaking practices and that was submitted as part of a permit application. Novicky further provided inaccurate and misleading information to the EPA in response to an information request about activities at FCI Elkton. In addition, interviews with UNICOR staff and customers showed that Ginther deceived inspectors at FCI Elkton by concealing e-waste during inspections. Overall, we believe that a significant contributing cause of the problems we identified within the Recycling Business Group was that Novicky and Ginther lacked judgment and at times acted dishonestly.

Aside from problems caused by individuals' misconduct and inadequate performance, we also identified numerous systemic deficiencies in UNICOR's and the BOP's operations that continue to jeopardize UNICOR's future ability to comply with applicable health, safety, and environmental requirements. For example, too often we identified circumstances where inadequate technical expertise was utilized in the e-waste program, primarily because of UNICOR's over-reliance on BOP safety staff that was inadequately trained to handle many of the health and safety issues that UNICOR's operations presented. As a result, BOP safety staff at times assumed duties that they were not qualified to perform because UNICOR would not take responsibility for them. For example, UNICOR's lack of adequate protection of the health and safety of staff and inmates is reflected by the fact that it has only 1 Certified Industrial Hygienist to service 103 UNICOR factories that are scattered across the United States. The BOP has no Certified Industrial Hygienists.

BOP and UNICOR's inspection oversight and follow-up on problems in the e-waste program also were inadequate and failed to identify many of the issues we found during our investigation. We were especially concerned that the Health Services Division at BOP Headquarters provides no compliance oversight of health and safety functions. In addition, the quality of the oversight provided by local safety departments was inconsistent and would benefit from additional Headquarters scrutiny. Further, DOJ has no compliance monitoring or enforcement role with regard to health, safety, and environmental matters within the Department. Despite the Department's longstanding commitment to upholding enforcement of the nation's environmental laws, the Department does not collect information about its own component's compliance performance, including UNICOR and the BOP, and does not provide oversight to ensure that compliance is achieved.

It is important to note that, despite the many problems we found, our investigation also identified improvements that UNICOR has made to its e-waste recycling operations since 2003. These include developing written procedures, enhancing staff and inmate training, and improving industrial

hygiene at its factories. Some factories performed much better than others with respect to industrial hygiene, such as USP Lewisburg and USP Leavenworth. UNICOR's e-waste factories have also obtained certifications from standard-setting organizations, and the Recycling Business Group's new General Manager is a recognized expert on e-waste recycling and has more than 32 years of experience with the EPA.

UNICOR also has made progress in implementing more than 150 recommendations that the federal agencies that assisted the OIG provided during our field work. We provided these recommendations to UNICOR as our investigation was progressing. Overall, we determined that by 2009, UNICOR's e-waste operations were generally operating in a safe manner, including the practice of manually breaking CRTs with hammers, though some additional improvements were recommended. We also concluded that UNICOR's e-waste program has made significant environmental contributions since its inception in 1996 to address the problems caused by e-waste, and has provided employment to thousands of inmates over the years.

However, to further address the problems identified during our investigation, and to ensure that health and safety issues do not recur in the e-waste program, we provide the following 12 recommendations to UNICOR, the BOP, and DOJ for needed improvements. Our recommendations seek to ensure UNICOR's compliance with applicable health, safety, and environmental regulations; promote accountability for such compliance among UNICOR and BOP managers; encourage acquisition of sufficient technical expertise by UNICOR and the BOP to identify and remedy non-compliance; improve oversight over UNICOR's operations by the BOP and DOJ; and to strengthen the role of the BOP's Health Services Division in the management of health, safety, and environmental issues related to UNICOR's operations.

II. Recommendations

Implement the OIG Technical Team's Recommendations

1. UNICOR and the BOP should complete implementation of the OIG technical team's recommendations.

FOH, NIOSH, OSHA, and the EPA made numerous recommendations during our investigation to address deficiencies that they identified from their field work at UNICOR's e-waste factories. The OIG technical team's recommendations addressed 47 issues in 12 general topic areas, including toxic metal contamination, personal protective equipment, medical surveillance, regulatory compliance, hazard assessments, oversight, and glass breaking procedures.

Following a request by the OIG to describe the progress that had been made to implement the technical team's recommendations, the BOP and UNICOR provided a written update in January 2010, which is found in Attachment 1. After reviewing this submission, we determined that UNICOR and the BOP have made significant progress to implement the recommendations. However, 16 of the 47 issues require future updates to the OIG.[137] These 16 issues involve matters such as decontaminating prior glass breaking areas, improving record keeping for medical surveillance data, monitoring surface contamination levels, and improving compliance with the OSHA noise standard.

Enhance Accountability and Improve Inspections and Oversight

2. UNICOR and the BOP should hold their supervisors accountable for compliance with health, safety, and environmental requirements. In particular, the performance appraisals of UNICOR and BOP supervisors should address compliance with these requirements.

UNICOR and the BOP are required to comply with the OSHA and EPA regulations cited throughout our report. We believe that supervisors in UNICOR and the BOP should be held accountable for ensuring compliance with these requirements.

OSHA regulations provide that "[e]ach agency head shall ensure that any performance evaluation of any management official in charge of an establishment, any supervisory employee, or other appropriate management official, measures that employee's performance in meeting requirements of the agency occupational safety and health program, ..." 29 C.F.R. § 1960.11. Executive Order 13148 on Greening the Government Through Leadership in Environmental Management also requires that the implementation of pollution prevention and environmental management efforts be accounted for in the performance reviews of federal supervisory personnel.

According to OSHA, UNICOR and the BOP's past and current performance appraisals are inadequate. For example, our review of BOP performance appraisals for Wardens revealed that their performance measures made no reference to ensuring occupational safety and health. We believe that UNICOR and the BOP should ensure that their performance appraisals account for performance that directly impacts institution health and safety.

[137] The issues that require additional information from UNICOR and the BOP are issue numbers 1, 2, 7, 8, 9, 14, 16, 17, 19, 20, 23, 26, 32, 35, 36, and 38 in Attachment 1.

In addition, we believe that supervisors' performance appraisals should include input from the Health Services Division and account for inspections made by local and regional safety staff, the Program Review Division, UNICOR and BOP industrial hygienists, and external auditors.

3. UNICOR and the BOP should develop inspection checklists and guidelines for each UNICOR business group and complete inspections of all business groups within 18 months from the date of this report.

An important tool to assist with the detection of non-compliance with health and safety regulations and policies is an inspection checklist. UNICOR does not have an inspection checklist that is specifically designed for its recycling operations. Although we do not believe that checklists are a substitute for well-trained staff, the use of checklists by local and regional safety staff during their inspections of UNICOR's e-waste operations should improve the detection of health, safety, and environmental problems. We also recommend that checklists should be developed for new operations at the time that their initial hazard assessments are performed.

Our discussions with UNICOR and BOP staff revealed that the regulatory non-compliance that we identified in the Recycling Business Group's operations likely exists in other UNICOR business groups. We believe that the development of inspection checklists for UNICOR's six other business groups is important based on the general lack of effective oversight that we identified during this investigation.[138]

In addition, our investigation found that the Program Review Division's guidelines for UNICOR's operations omit evaluation of health and safety issues, and that the Guidelines for Health Services and Safety do not reference UNICOR. The Assistant Director for the Program Review Division told us that it is not guaranteed that Program Review Division safety inspections will include UNICOR operations. To remedy this deficiency, we believe that the Program Review Division should develop guidelines that specifically address health and safety issues in UNICOR's factories, and that the Health Services Division and UNICOR's Environmental and Occupational Health Services Manager should assist with this effort. Moreover, to ensure that Program Review Division auditors are properly trained on use of the new guidelines, Health Services Division or UNICOR hygienists should provide instruction to the auditors and a hygienist should participate in the inspection when practicable.

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[138] The other business groups are Textiles, Fleet Services, Electronics, Office Furniture, Industrial Products, and Services. According to the UNICOR Certified Industrial Hygienist, the Recycling Business Group ranks in the middle of UNICOR's business groups in terms of health, safety, and environmental compliance.

We therefore recommend that within 18 months from the date of this report, the Health Services Division, in conjunction with UNICOR and BOP hygienists and regional and local safety staff, should complete industrial hygiene inspections for all UNICOR business groups. Results showing significant non-compliance with regulatory requirements should be reported to DOJ, consistent with Recommendation 4 below.

4. DOJ should monitor health, safety, and environmental compliance by UNICOR and the BOP and establish internal compliance oversight procedures to address repeat non-compliance.

Our interviews with the environmental and occupational health and safety program managers in DOJ's Justice Management Division revealed that DOJ does not monitor or collect health, safety, and environmental compliance information from Department components, including UNICOR and the BOP, such as the issuance of fines or notices of violation from regulatory inspections. Both JMD program managers told the OIG that they thought that DOJ should receive and review compliance-related health and safety information from components within the Department. The occupational health and safety program manager said that three types of information should be reported to him: (1) OSHA violations identified by OSHA inspectors; (2) OSHA violations that inspectors, including industrial hygienists and local safety staff, identified as serious and that are repeated; and (3) any imminent danger or hazard findings, including those made by local safety staff.

We believe that DOJ should monitor UNICOR's and the BOP's health, safety, and environmental compliance performance, and should be prepared to ensure that corrective action is taken in the event that it appears that the non-compliance is not being adequately addressed.

Acquire Necessary Technical Resources

5. UNICOR and the BOP should perform an evaluation to determine how many additional industrial hygienists are needed. UNICOR and the BOP and should use hygienists to oversee the selection and use of industrial hygiene contractors.

The OIG technical team concluded that UNICOR and the BOP have an insufficient number of industrial hygienists. According to the team, the increasing complexity of the occupational health and safety fields requires trained safety staff with ample skills and competencies.

According to UNICOR's sole industrial hygienist, UNICOR's operations frequently require evaluation by personnel with training that exceeds that typically possessed by BOP safety staff. The Assistant Director of the Health

Services Division, Dr. Newton Kendig, told the OIG that he was aware of the need to improve the technical competency of safety staff and that he is attempting to professionalize the discipline within the BOP. He stated that there is probably more technical expertise required for the safety discipline than almost any other in the BOP; although, BOP safety staff members have not had the depth of training that is needed for their positions.

To increase the technical resources available to UNICOR and the BOP, we believe that UNICOR and the Health Services Division should perform an evaluation to determine how many hygienists are needed. The Chief Operating Officer of UNICOR, Paul Laird, told the OIG that it would not be unreasonable for UNICOR and the BOP to obtain four additional hygienists pending the outcome of the evaluation above.

We believe that oversight of the hygienists should be performed by the Health Services Division, under the leadership of an experienced Chief industrial hygienist and safety professional who can manage the delivery of industrial hygiene and safety services throughout UNICOR and the BOP. The complexity of the industrial hygiene and safety services required by UNICOR and the BOP warrants overall supervision of those services by an experienced hygienist with familiarity in managing a large industrial hygiene and safety program. Recommendation 6 also discusses the need for hygienists or other safety professionals from the Health Services Division to supervise regional and institution safety staff.

Our investigation also found that UNICOR and the BOP often obtained industrial hygiene consulting services that were deficient and that UNICOR and BOP staff lacked sufficient training to recognize the deficiencies. We believe that this problem can be addressed by requiring UNICOR and BOP industrial hygienists to participate in drafting the scope of work for the contractors, overseeing their selection and use, and evaluating their work product.

Strengthen the Role of the Health Services Division

6. The Health Services Division should oversee the delivery of health, safety, and environmental services at BOP institutions and UNICOR factories. We believe that the BOP and UNICOR should consider requiring that local and regional safety staff, as well as BOP and UNICOR industrial hygienists, report to the Health Services Division rather than to institution or regional correctional managers. In addition, compliance enforcement of health, safety, and environmental regulations should be an integral part of the Division's responsibilities.

Our investigation revealed that the quality of services that institution safety offices provided to the BOP and UNICOR varied significantly, and that local safety staff at times provided inaccurate information and advice. We found that BOP regional and Headquarters safety personnel are not responsible for the management of local safety programs, including the performance of institution safety staff, and that important safety information often was "stove piped" at the institution level and not shared. We believe that this method of furnishing industrial hygiene and safety services exacerbated problems with the e-waste recycling program, primarily by delaying both the recognition of the hazards associated with e-waste and the formulation of a sufficient response to these hazards that was implemented consistently between factories.

To avoid similar problems in the future, as well as to improve UNICOR and the BOP's compliance performance, we believe that the BOP should evaluate whether the Health Services Division should be assigned management responsibility for the delivery of industrial hygiene and safety services throughout the BOP and UNICOR. The Health Services Division presently establishes health, safety, and environmental policies, and is knowledgeable about regulatory requirements that must be carried-out in BOP's institutions. We believe that for the BOP and UNICOR to achieve compliance with regulatory requirements and ensure that the advice of safety staff is consistent and accurate, regional and local safety personnel should be overseen by experienced industrial hygienists or other safety professionals from the Health Services Division who are familiar with regulatory requirements and are committed to seeing that they are respected.

This change would also ensure that local safety staff would not be overseen by managers whose performance evaluations depend in part on the outcome of safety staff inspections. OSHA regulations require that the performance appraisals of UNICOR and BOP supervisors include an assessment of their performance in meeting the requirements of the BOP's occupational safety and health program (see Recommendation 2), which

mandates compliance with applicable health, safety, and environmental regulations. 29 C.F.R. § 1960.11. Requiring safety staff to report to institutional correction managers whose performance evaluations depend in part on the results of safety inspections could compromise the independence of safety staff.

We also believe that the Health Services Division should adopt a rigorous program of compliance enforcement. The Division should oversee regular, unannounced inspections of UNICOR operations and UNICOR and BOP managers should be held accountable for the results. When regulatory violations are found, the Health Services Division should issue warnings to institution and regional BOP managers. Large numbers of single instance violations or repeated serious violations should be addressed in manager performance appraisals, and the violations should also be reported to DOJ.

In addition, UNICOR's issuance of health, safety, and environmental policies should be contingent on the Health Services Division's review and approval. UNICOR currently is able to issue its own health and safety policies without review and approval from any oversight entity. We believe that the BOP should consider making the Health Services Division the sole authority on health, safety, and environmental matters within UNICOR and the BOP. We believe that without centralized BOP control over policy development, inconsistent advice will be provided to UNICOR and BOP managers.

7. The BOP should evaluate the need to establish an occupational health program administered by the Health Services Division.

Our investigation determined that the BOP lacks an adequate occupational health program that seeks to reduce illnesses and injuries in the workplace. According to the Assistant Director for the BOP's Health Services Division, Dr. Kendig, BOP health staff is currently not assigned occupational health duties. We believe that the deficiencies we identified with the BOP's medical surveillance of UNICOR staff and inmates were caused in large part by the lack of occupational health resources within the BOP. The BOP should evaluate the need to create an occupational health program that would be overseen by the Health Services Division.

Enhance Training

8. UNICOR and the BOP need to improve their ability to detect violations of health, safety, and environmental regulations, and should develop a joint plan to enhance site-specific training for regional and institution staff with oversight responsibilities of UNICOR operations.

Our investigation found an unacceptably high number of regulatory violations, the vast majority of which were not identified by UNICOR and BOP staff. To improve staff members' ability to identify health, safety, and environmental problems, UNICOR and the BOP should jointly formulate and implement intensive training on regulatory requirements for safety staff, UNICOR Factory Managers, Production Controllers, Associate Wardens, and Superintendents of Industries. This training should supplement annual training and be focused on the particular operations that the managers are required to supervise.

Improve Communications

9. Safety Managers who oversee similar UNICOR operations should communicate regularly about health, safety, and environmental issues that they identify in their UNICOR's factories. The results of industrial hygiene and environmental testing and inspections should be shared promptly between institutions and with UNICOR Program Managers.

We found during our visits to BOP institutions that Safety Managers who oversaw e-waste recycling operations did not regularly communicate with each other about problems that they were finding with the e-waste operations, and that the results of industrial hygiene testing and inspections were not consistently shared between institutions and with UNICOR Program Managers. This "stove piping" of information and the lack of communication between institutions and with UNICOR and BOP Headquarters placed workers in jeopardy. For example, information on injuries from glass breaking operations was not shared, resulting in delays in furnishing adequate protective equipment to inmate glass breakers at some factories.

To avoid problems related to poor communications, we believe that safety staff with similar UNICOR operations should consult through conference calls at least bi-annually, that information about problems should promptly be shared with other factories, and that testing and inspection results should be promptly distributed to institutions with similar UNICOR operations and to UNICOR Program Managers following receipt.

Evaluate Use of OSHA Cooperative Programs

10. UNICOR should complete an assessment of the feasibility of enrolling its factories in OSHA cooperative programs and report the results to the OIG.

During our investigation, OSHA encouraged UNICOR to enroll in one of its cooperative programs to improve compliance performance. Many agencies in the federal government participate in programs such as the OSHA Voluntary Protection Program, including the Postal Service and the Navy. A Voluntary Protection Program establishes performance related criteria for the management of safety and health systems and uses the criteria to assess the progress of the program participant.

We believe that UNICOR currently may not be in compliance with federal health and safety regulations, and that enrollment of its factories in an OSHA cooperative program could significantly improve compliance performance. UNICOR should assess the feasibility of enrolling its factories in an OSHA cooperative program and report the results of its evaluation to the OIG. We recommend that the UNICOR Board of Directors be briefed on the results of this evaluation.

Evaluate Controls on Exports of E-Waste

11. The Recycling Business Group should evaluate ways to better ensure that exports of its e-waste are in compliance with U.S., host-nation, and international laws and do not result in harm to workers or to the environment.

According to current General Manager of the Recycling Business Group, Robert Tonetti, UNICOR currently sells e-waste products to other recyclers and brokers who export them to smelters in other countries in order to complete the recycling process. Tonetti told the OIG that this practice is common in e-waste recycling. For example, he stated that recycled CRT glass from the U.S. goes to only four plants in the world that manufacture new CRTs – two are in India, one is in Korea, and one is in Malaysia. However, investigations of e-waste recycling practices in many nations abroad have revealed serious health, safety, and environmental problems. To address this issue, since approximately 2003, UNICOR has required its vendors to self-certify that they do not send e-waste to landfills for disposal and that their exports of e-waste comply with all national and international laws. Tonetti told the OIG that while the vendor self-certifications "are a start," he stated that, "it is nowhere near where we need to be." He said that he is seeking to obtain third-party certifications for the Recycling Business Group's operations that address the issue of "downstream" due diligence.

We concur with Tonetti's actions and believe that the Recycling Business Group should institute procedures to better ensure that its e-waste that is sold to vendors does not end up later causing harm to workers or to the environment. We recommend that within six months from the release of this report, the Recycling Business Group should identify current "best practices" for performing due diligence on downstream vendors and develop a written plan to put those practices into use.

Prevent Injuries

12. UNICOR and the Health Services Division should track injury trends in UNICOR operations. UNICOR Program Managers should be informed of all injuries in factories that they oversee.

Our investigation determined that the BOP was failing to comply with OSHA regulations governing the recording of inmate worker injuries. UNICOR and the BOP have advised the OIG that they intend to comply with this requirement.

We believe that UNICOR and the Health Services Division should use the inmate injury data that is collected to determine whether injury trends are evident in UNICOR operations, such as would have been apparent from examination of injuries sustained by inmate glass breakers. In addition, all injuries in UNICOR operations should be reported to Headquarters' Program Managers. This will enable UNICOR Headquarters staff to assist in monitoring the safety of the operations for which they are responsible. The Assistant Director for the Health Services Division, Dr. Kendig, told the OIG that he is attempting to upgrade the Division's ability to collect and manage occupational health and injury data, and he is evaluating web-based options to perform this work.

III. Conclusion

In conclusion, our investigation identified serious deficiencies with UNICOR's e-waste recycling program, especially prior to 2003. In recent years, while UNICOR has made substantial progress to improve the safety of its e-waste operations, we believe that the success of these efforts in the future will be hindered by lingering, systemic problems such as the lack of technical resources, inadequate oversight, and a Health Services Division at BOP Headquarters that lacks authority to manage the delivery of quality safety services throughout the BOP and UNICOR. We believe that our 12 recommendations can help ensure that the BOP and UNICOR conduct their operations, including the e-waste recycling program, in compliance with federal regulations and BOP policies and with the necessary concern for the health and safety of BOP staff and inmates.

ATTACHMENT 1

OIG REQUEST

U.S. Department of Justice

Office of the Inspector General

November 18, 2009

MEMORANDUM FOR VANESSA P. ADAMS
ASSISTANT DIRECTOR
PROGRAM REVIEW DIVISION
FEDERAL BUREAU OF PRISONS

FROM: [redacted]
INVESTIGATIVE COUNSEL
OVERSIGHT AND REVIEW DIVISION

SUBJECT: UNICOR Recycling Investigation

During the Office of the Inspector General's (OIG) investigation of UNICOR's e-waste recycling program, the Occupational Safety and Health Administration (OSHA), the Federal Occupational Health Service (FOH), the U.S. Environmental Protection Agency (EPA), and two divisions within the National Institute for Occupational Safety and Health (NIOSH), provided the OIG with various reports that evaluate UNICOR's and the Federal Bureau of Prison's (BOP) health, safety, and environmental compliance practices. These reports typically have included recommendations for improvements. The OIG expects to provide an update in its final report on UNICOR's and the BOP's progress in implementing these recommendations. We therefore request that you provide written responses to the questions below by December 18, 2009. For recommendations related exclusively to United States Penitentiary (USP) Atwater, please provide a status update by January 15, 2010.

We have organized our questions by topic and attached a listing of the outstanding recommendations from the agencies for your convenience. These also are organized by topic and correspond to the citations in the questions. We understand that UNICOR has ceased all glass breaking operations and, with limited exceptions, we therefore are not seeking information on recommendations concerning that topic.

Please provide answers to the following questions as well as any documents that support your responses (e.g., new written policies or guidance to the field).

Toxic Metal Contamination

- Legacy Contamination

1. Please describe the status of decontamination and decommission activities recommended for Federal Correctional Institutions (FCI) Ft. Dix and Marianna, and how these activities complied with the cleanup procedures specified by FOH in its recommendations. [Reports 8, 15]

2. Please describe the results of all additional surface testing recommended in the FOH reports with respect to 1) elevated surfaces above the UNICOR factory ceiling at USP Lewisburg; 2) the tunnel from the basement of the UNICOR factory at FCI Texarkana to the power plant, the former LEV system in the furniture factory, the outdoor cyclone filter, and the dairy barn; and 3) the Atwater warehouse and ventilation systems serving the former glass breaking areas. Please describe any Operations and Maintenance (O&M) plans, cleanup, or remediation activities that have been planned or undertaken in response to such test results. [Reports 3, 10, 18]

-Development of Operations and Maintenance Plans

3. Please describe any recycling factory refurbishment, remodeling, demolition, or similar activity planned or taken since November 2007 at any UNICOR recycling facility that could disturb contaminated surfaces, and describe the steps planned or taken to control worker exposure and environmental releases, as recommended by FOH. [Report 4, 7, 10]

4. Please describe the status of O&M plans developed and implemented for the purpose of minimizing surface contamination and preventing inhalation or ingestion exposures as recommended by FOH with respect to USP Lewisburg and FCI Texarkana. [Reports 10, 18]

-Disassembly Operations - Contamination

5. Please describe the status and results of any evaluation you have conducted of the feasibility of controlling potential contamination from e-waste during general disassembly operations. [Report 10]

6. Please describe the status and results of the follow-up evaluation of lead and cadmium exposures recommended for FCI Tucson [Report 20]

-Evaluation and Monitoring Plans

7. Please describe how UNICOR or the BOP intend to identify and monitor changes in exposure conditions resulting from new activities or

modifications in e-waste work operations, production rates, work processes/practices, personal protection, and other practices. Describe whether such changes have been introduced at UNICOR factories since 2008 and whether monitoring was performed. [Reports 7, 10, 18]

8. Please describe how UNICOR or the BOP intend to evaluate surface contamination levels and exposure conditions in e-waste factories to ensure that lead and cadmium contamination is not increasing over time and to verify that clean-up, housekeeping, and operations and maintenance practices are effective. [Reports 8, 10, 21]

9. Please describe UNICOR's efforts to specify a surface contamination criteria for use in evaluating the cleanliness of its e-waste recycling factories. [Report 21]

-Housekeeping and Hygiene Activities

10. Please describe the status of dry sweeping in UNICOR e-waste factories and the actions that have been taken to eliminate this practice, including any communications with Factory Managers on this issue. [Reports, 3 16, 21]

11. Please describe the status of activities to promote cleaning in e-waste factories using HEPA-vacuuming and wet mopping. [Reports 1, 3, 6, 9]

12. Please describe the status of activities to promote hand washing in e-waste factories [Reports 1, 6, 9]

13. Please describe the status of activities to prohibit consumption of food and drink in recycling areas. [Report 7]

-FCI Elkton Remediation

14. Please describe the status of the FCI Elkton remediation and provide any final reports or testing results from the contractor, UNICOR or BOP after-action reports, diagrams of the areas that were remediated, and photographs of the remediation. [Reports 4, 7]

Personal Protective Equipment

- Respiratory Protection

15. Please describe the status of any UNICOR self-assessment to ensure compliance with OSHA respiratory protection requirements, including medical clearance, training, fit testing, cleaning and maintenance, and

furnishing Appendix D of 29 C.F.R. 1910.134 to workers. [Reports 7, 9, 20]

16. Please describe the status of any UNICOR efforts to implement a respiratory protection program in accordance with 29 C.F.R. 1910.134 for the cleanup of broken CRT glass. [Report 21]

Medical Surveillance

17. Please describe the status and results of any efforts by UNICOR or the BOP to improve recordkeeping for medical surveillance and exposure monitoring data to meet OSHA requirements for types of information maintained, records retention, and employee (staff and inmate) notification of results. [Report 7]

18. Please describe the work of the FOH physician who was retained to assist with medical surveillance at FCI Elkton, and provide all resulting written reports or recommendations provided to UNICOR or the BOP. [Reports 5, 7]

19. Please specify whether any staff or inmates at FCI Elkton require continued surveillance under the cadmium standard based on past exposures. Explain the justification for your response. [Report 7]

Other Hazards

- Noise

20. Please describe the status and results of any efforts by UNICOR or the BOP to improve compliance in e-waste factories with OSHA's noise standard (29 C.F.R. 1910.95). [Report 18]

21. Please describe the status and results of any noise testing by UNICOR or the BOP of USP Atwater's e-waste recycling operations since February 2009. [Report 1]

22. Please describe the status of any UNICOR efforts to implement a hearing conservation program for inmates performing baling operations. [Reports 3, 21]

- Heat Stress

23. Please describe the implementation status of the heat stress program for FCI Marianna and whether UNICOR intends to institute heat stress programs at other UNICOR factories. [Reports 10, 11, 12, 13, 20]

24. Please describe the status and results of any evaluation by UNICOR or the BOP of whether fan use at USP Atwater contributes to surface contamination and constitutes a violation similar to the one issued by OSHA to USP Lewisburg for pedestal fan use. [Report 3]

- Ergonomics

25. Please describe the status and results of any efforts by UNICOR or the BOP to evaluate ergonomic issues in e-waste recycling factories. Identify any changes that have been made as a result of such assessments. [Reports 1, 3, 6, 7, 9, 10, 20]

BOP Health and Safety Policies

26. Please specify whether the BOP intends to revise the "imminent danger" provision found in PS 1600.09 in accordance with FOH's recommendations. [Report 3]

Institution Health and Safety Documentation

27. Please describe the status of any efforts by UNICOR or the BOP to prepare a concise safety and health guidance document for each e-waste recycling factory. [Reports 3, 8, 10]

28. Please describe the status of any efforts by UNICOR to revise its work instructions, process descriptions, and respiratory protection program to ensure accuracy and internal consistency, and to reflect actual work practices in its e-waste recycling factories. [Reports 3,18]

29. Please describe the status of any efforts by UNICOR to implement a document control system for its e-waste recycling operations to clearly define document status, establish review and revision cycles, and ensure that they consistently reflect work practices. [Report 18]

Health and Safety Regulatory Compliance

30. Please identify any efforts by UNICOR to improve compliance with OSHA regulations in its e-waste recycling factories since January 2008. [Reports 2, 5, 6, 9]

Environmental Compliance

31. Please identify any efforts by the BOP and UNICOR to better coordinate their environmental control efforts. [Report 7]

32. Please describe the status and results of any efforts by UNICOR and FCI Elkton to evaluate wastewater, stormwater, air emissions, and hazardous waste streams to ensure compliance with applicable environmental requirements. [Report 7]

33. Please describe the results of all TCLP analyses on air filters (general ventilation) from the UNICOR e-waste recycling factory at FCI Ft. Dix since December 2008. [Report 8]

34. Please identify the date when UNICOR or the BOP notified the owners of the formerly leased 'Blue' and 'Gold' buildings at FCI Marianna of FOH and NIOSH testing results at those properties. [Report 15]

UNICOR Assessments

- Job Hazard Analysis

35. Please describe the status and results of any efforts by UNICOR to develop and implement a hazard analysis program that includes baseline hazard analysis for current operations and also job (activity-specific) hazard analysis (JHA) for both routine and non-routine activities. [Reports 15, 18]

36. Please identify any policies that UNICOR has instituted that require the performance of a detailed job hazard analysis prior to beginning any new operation or before making changes to existing operations. [Reports 2, 5, 7, 8, 10]

37. Please describe the status and results of any efforts by UNICOR to conduct self assessments in its e-waste recycling factories to determine the effectiveness of its safety and health and hazard control programs. [Report 7]

- Evaluations of UNICOR Operations

38. Please describe the status and results of any efforts by the BOP and UNICOR to perform management assessments of all UNICOR operations, not just e-waste recycling, for compliance with applicable environmental, safety and health requirements. [Reports 1, 6, 7, 9]

Industrial Hygiene and Environmental Expertise

-Technical Resources

39. Please describe the status and results of any efforts by the BOP and UNICOR to establish a program to assure that health, safety, and

environmental issues in UNICOR factories are adequately addressed by competent trained and certified individuals. Please identify whether the BOP or UNICOR have any plans to hire certified industrial hygienists. [Reports 6, 9]

-Procurement of Testing and Consulting Services

40. Please describe whether the duties of the UNICOR industrial hygienist includes overseeing all procurement of industrial hygiene consultant and testing services in UNICOR factories. [Reports 2, 5, 10]

41. Please describe how UNICOR and the BOP intend to ensure that staff and consultants conducting industrial hygiene and environmental assessments, evaluations, inspections, and monitoring activities are qualified for their assigned tasks and led by certified or highly qualified professionals. [Report 15]

-Training

42. Please describe any changes in training for UNICOR e-waste recycling staff and inmates resulting from recommendations made by FOH, OSHA, or NIOSH, especially as concerns dust suppression, personal protection equipment (e.g., coveralls, respirators, gloves) and hazard communication. [Reports 1, 6, 8, 9]

-Information Sharing

43. Please describe the status of any efforts by UNICOR to operate its recycling factories in an integrated fashion and to ensure that all of its e-waste recycling factories (as well as BOP safety staff) are informed of health, safety, and environmental violations and deficiencies that are found at individual factories along with any recommended corrective actions. [Reports 3, 10]

Oversight

- Recommendation Tracking

44. Please describe the status and results of any efforts by the BOP and UNICOR to implement a system to list, track, and document closure of any identified deficiencies or recommendations, regardless of the source, at UNICOR factories. [Report 10]

Miscellaneous

-Union Representation

45. Please describe any actions taken to implement NIOSH's recommendation that union safety and health representatives be appointed to joint labor-management safety committees that meet quarterly. [Reports 2, 5, 14, 17]

Glass Breaking

46. Please describe the assessment that resulted in UNICOR's decision to cease glass breaking operations.

47. Please describe how UNICOR is currently handling cathode ray tubes and whether you expect these procedures to change in the next year.

If you have any concerns or questions, please contact me at (202) 353-0332. We appreciate your assistance.

Attachment

ATTACHMENT TO OIG REQUEST

INSTITUTION REPORT RECOMMENDATIONS

Report Titles

USP Atwater, California

1. Walk-Through Survey Report: Electronic Recycling Operation At United States Penitentiary Atwater, California, February 2009, National Institute for Occupational Safety and Health, Division of Applied Research and Technology

2. HETA 2008-0055 Report, USP Atwater, California, June 25, 2009, National Institute for Occupational Safety and Health

3. Evaluation of Environmental, Safety, and Health Information Related to Current UNICOR E-Waste Recycling Operations at USP Atwater, December 2009, Federal Occupational Health Service

FCI Elkton, Ohio

4. Summary Findings and Recommendations Pertaining to Air/Wipe/Bulk/TCLP Sampling Data from Electronics Recycling Facilities, FCI Elkton (Lead and Cadmium Data Only), November 15, 2007, Federal Occupational Health Service

5. HETA 2008-0055 Report, FCI Elkton, Ohio, July 16, 2008, National Institute for Occupational Safety and Health

6. Control Technology and Exposure Assessment for Electronic Recycling Operations Elkton Federal Correctional Institution Elkton, Ohio, August 2008, National Institute for Occupational Safety and Health, Division of Applied Research and Technology

7. Evaluation of Environmental, Safety, and Health Information Related to Current UNICOR E-Waste Recycling Operations at FCI Elkton, Ohio, October 10, 2008, Federal Occupational Health Service

FCI Ft. Dix, New Jersey

8. Evaluation of Environmental, Safety, and Health Information Related to UNICOR E-Waste Recycling Operations at FCI FT. DIX, New Jersey, December 19, 2008, Federal Occupational Health Service

USP Lewisburg, Pennsylvania

9. Control Technology and Exposure Assessment for Electronic Recycling Operations United States Penitentiary, Lewisburg, Pennsylvania, January 2009, National Institute for Occupational Safety and Health, Division of Applied Research and Technology

10. Evaluation of Environmental, Safety, and Health Information Related to UNICOR E-Waste Recycling Operations at USP Lewisburg, Pennsylvania, June 2, 2009, Federal Occupational Health Service

FCI Marianna, Florida

11. Worker Heat Stress Measurements - FCI Marianna, Florida, September 21, 2007, Federal Occupational Health Service

12. Review of 'Heat Stress Procedures' and 'Operational Requirements' Documents Associated with Electronics Recycling Operations at FCI Marianna, Florida, May 15, 2008, Federal Occupational Health Service

13. Control Technology and Exposure Assessment for Electronic Recycling Operations, UNICOR Marianna Federal Correctional Institution Marianna, Florida, October 2008, National Institute for Occupational Safety and Health Division of Applied Research and Technology

14. HETA 2008-0055 Report, FCI Marianna, Florida, June 1, 2009, National Institute for Occupational Safety and Health

15. Evaluation of Environmental, Safety, and Health Information Related to UNICOR E-Waste Recycling Operations at FCI Marianna, Florida, June 5, 2009, Federal Occupational Health Service

FCI Texarkana, Texas

16. Resource Conservation & Recovery Act Compliance Evaluation Inspection Report, FCI Texarkana, Texas, January 23, 2009, U.S. Environmental Protection Agency

17. HETA 2008-0055 Report, FCI Texarkana, Texas, February 9, 2009, National Institute for Occupational Safety and Health

18. Evaluation of Environmental, Safety, and Health Information Related to UNICOR E-Waste Recycling Operations at FCI Texarkana, Texas, September 24, 2009, Federal Occupational Health Service

FCI Tucson, Arizona

19. Walk-Through Survey Report: Electronic Recycling Operation at Federal Correctional Institution Tucson, Arizona, February 2009, National Institute for Occupational Safety and Health Division of Applied Research and Technology

20. Evaluation of Environmental, Safety, and Health Information Related to UNICOR E-Waste Recycling Operations at FCC Tucson, Arizona, March 20, 2009, Federal Occupational Health Service

USP Leavenworth, Kansas

21. Evaluation of Environmental, Safety, and Health Information Related to Current UNICOR E-Waste Recycling Operations at USP Leavenworth, November 5, 2009, Federal Occupational Health Service

Recommendations by Category

Toxic Metal Contamination

-Legacy Contamination

-Development of Operations and Maintenance Plans

-Disassembly Operations – Contamination

-Evaluation and Monitoring Plans

-Housekeeping Activities

-FCI Elkton Remediation

Personal Protective Equipment

- Respiratory Protection

Medical Surveillance

Other Hazards

-Noise

-Heat Stress

-Ergonomics

BOP Health and Safety Policies

Institution Health and Safety Documentation

Health and Safety Regulatory Compliance

Environmental Compliance

UNICOR Assessments

- Job Hazard Analysis

- Evaluations of UNICOR Operations

Industrial Hygiene and Environmental Expertise

-Technical Resources

-Procurement of Testing and Consulting Services

-Training

-Information Sharing

Oversight

- Recommendation Tracking

Miscellaneous

-Inmate Work Assignments

-Union Representation

Glass Breaking

Toxic Metal Contamination

Legacy Contamination

1. UNICOR should decontaminate and decommission the Torit LEV system and associated bag house and filters that served the glass breaking operations conducted between 2003 and 2005 [at FCI Ft. Dix]. In performing this D&D operation, UNICOR should draw upon the experience and lessons learned from FCI Elkton and FCI Mariana regarding filter change-out and remediation processes. UNICOR should ensure the following:

- A written plan for worker and environmental protection should be developed following completion of a hazard evaluation. This plan should include appropriate work practices, hazard controls, and waste disposal methods.

- Work practices should include such techniques as wet methods, HEPA vacuuming, containment of emissions, bagging methods, housekeeping, and final cleanup. UNICOR's FCI Elkton and FCI Mariana filter change-out and other remediation methods should be reviewed for applicability to FCI Ft. Dix.

- Worker protection should include appropriate PPE, respiratory protection, hygiene practices, and other hazard control measures.

- Personal and area exposure monitoring should be conducted. Surface sampling should be used to confirm successful decontamination.

- Hazardous waste sampling should be performed to determine and implement proper disposal techniques, and those techniques should be applied and documented.

- Records should be developed and maintained to demonstrate worker protection, environmental compliance, and successful decontamination. [Report 8]

2. Should UNICOR decide to permanently stop CRT breaking at FCI Marianna, it should decontaminate and decommission the LEV and enclosure systems. If performed, this activity should be preceded by proper hazard analysis, training, preparation, development and implementation of work practices and hazard controls, exposure monitoring, hazardous waste testing and disposal, and clearance sampling. Depending upon the hazard

analysis results, this could be performed by a remediation contractor or inmate workers under an O&M Plan. If the latter option is chosen, UNICOR should ensure the preparations described above are in place and should ensure that inmate workers are trained and qualified to perform this task. [Report 15]

3. Based on a limited number of bulk dust samples collected by NIOSH/DART and FOH from areas in proximity to where CRT glass had been broken in the past (e.g., the warehouse and GBO-associated exhaust systems), UNICOR should further delineate contamination in these former GBO locations and compare results with applicable surface contamination assessment criteria. UNICOR should address any contamination found through an O&M plan, clean-up, and/or remediation activities, depending on the results of the evaluation. UNICOR should ensure that the work is performed with the benefit of sound planning, hazard analysis, training, preparation, development and implementation of effective work practices and hazard controls, exposure monitoring, hazardous waste testing and disposal, and clearance sampling. Depending upon the results of the hazard analysis, this work could be performed by a remediation contractor or inmate workers under an O&M plan. If the latter option is chosen, UNICOR should ensure the preparations described above are in place and that inmate workers are trained and qualified to perform their assigned duties. [Report 3]

4. UNICOR should specifically conduct additional surface testing of elevated surfaces above the [USP Lewisburg] factory ceiling. FOH found that bulk dust samples in this area had high levels of toxic metals contamination. Depending on the degree and extent of surface contamination, UNICOR should determine appropriate methods to control the hazard: that is, through O&M activities when access to the area is required, surface clean-up by inmate workers similar to that conducted for warehouse elevated surfaces, or remediation by a professional contractor. [Report 10]

5. Based on FOH bulk dust samples from a cable box near the former glass breaking area [at FCI Texarkana], UNICOR should further evaluate surface contamination in this and nearby areas. This evaluation should include the tunnel from the FCI basement to the power plant and former LEV system. UNICOR should control any contamination found through O&M, clean-up, and/or remediation, depending on sample results. The FCI Texarkana Safety Manager stated that he recollected that the tunnel had been cleaned. UNICOR should verify this and conduct surface testing to confirm the area is adequately clean. [Report 18]

6. As part of the surface contamination testing program, UNICOR should also evaluate other legacy GBO areas [at FCI Texarkana], such as the old

dairy barn, for potential legacy contamination. UNICOR should clean-up or remediate these areas, if indicated by the results. [Report 18]

Development of Operations and Maintenance Plans

1. UNICOR should ensure that any recycling factory refurbishment, remodeling, demolition, or similar activity that could disturb contaminated surfaces is conducted in a manner that controls worker exposure and environmental release. Preparation processes for the activity should include hazard analysis with surface testing, work planning, procedure development, worker training, and selection and implementation of hazard controls and measures to prevent worker exposures and environmental releases. Appropriate ES&H oversight, exposure monitoring, TCLP waste testing, and other ES&H support should be provided during the activity. The February 2009 clean-up of elevated surfaces in the USP Lewisburg warehouse is an example of a smaller activity that incorporated such preparation, oversight, and control measures. The same type of process should be applied to other activities that could disturb contaminated surfaces and create potential for worker or environmental exposures. [Report 10]

2. The USP Lewisburg activity for cleaning elevated surfaces in the warehouse can serve as a model process for standardizing clean-up activities for elevated or other surfaces conducted under an O&M plan for all UNICOR facilities. Noteworthy approaches included advance preparation and training, development of task-specific safety and health and work practices including worker protection measures, safety and health oversight by an industrial hygiene professional, exposure monitoring, and clearance testing. Should UNICOR conduct future non-routine clean-up activities by inmate workers at USP Lewisburg and/or its other factories, as a prerequisite to authorizing the work, UNICOR should ensure that the level of worker training, capabilities, and qualifications are appropriate for the scope of the activity (e.g., degree and extent of contamination, location of contamination, degree of difficulty, and presence of other safety hazards, etc.). [Report 10]

3. UNICOR should develop and implement an operations and maintenance (O&M) plan to ensure that surface contamination is minimized and that existing contamination does not result in inhalation or ingestion exposures. Elements of this plan could include:

- Identification of activities that could disturb contamination (e.g., HVAC maintenance, periodic or non-routine cleaning of elevated or other surfaces, access to areas where higher levels of surface

contamination are present, and various building maintenance functions);

- Processes to identify and control hazards for routine and non-routine activities (e.g., job hazard analysis process prior to conducting certain work activities with identification of mitigating actions);

- Mitigating techniques and procedures during activities of concern (e.g., dust suppression and/or clean-up and capture, filter removal and bagging processes, and use of PPE and respiratory protection);

- Training and hazard communication;

- Disposal of contaminated materials based on testing data such as TCLP tests; and

- Periodic inspection, monitoring and evaluation of existing conditions, as appropriate. Exposure monitoring is particularly recommended for activities that can disturb surface dust. [Note: Follow-up surface sampling is important to ensure that surface contamination does not build up and to take preventive and corrective action, if it does.]

At UNICOR's discretion, the O&M plan could also include periodic clean-up of surfaces by inmate or other workers; that is, surfaces that are not subject to routine clean-up and housekeeping activities. If this element were adopted, however, UNICOR should ensure that practices to control exposures are included in the plan and implemented, such as appropriate worker training, PPE, respiratory protection, exposure monitoring, medical surveillance (if required based on hazard analysis and monitoring results), clean-up methods (e.g., HEPA vacuuming and wet methods), waste disposal, hygiene practices, and others deemed appropriate by UNICOR. Initial exposure monitoring should be conducted to determine whether exposure during clean-up is above the action levels for lead and cadmium. TCLP testing should also be conducted on waste materials generated to ensure proper disposal. Controls for future clean-up activities should then be based on exposure results. [Note: See FOH report for USP Lewisburg [FOH 2009] that describes the preparation, hazard analysis, training, controls, work practices, and performance of a clean-up activity conducted for warehouse elevated surfaces. This is a noteworthy practice that could serve as a model for other activities conducted under an O&M plan.] [Reports 3, 10, 18, 21]

4. An operations and maintenance (O&M) plan should be immediately developed and implemented [for FCI Elkton] in order to protect staff, inmates, contractors, and the environment from lead and cadmium residues found on various surfaces throughout the Recycling Factory, Warehouse and FSL. The O&M plan should identify policies and procedures for minimizing personal exposures and the spread of contamination during any activities which might result in the disturbance of or contact with contaminated building surfaces and components. Given the very high concentrations of lead and cadmium found in many dust deposits, special emphasis should be on preventing re-entrainment and release to the workplace air or exposure via ingestion. Elements of the O&M plan should include:

- Specific identification of activities and operations which may disturb the contamination (e.g., duct maintenance, work involving contact with structural supports, etc.);
- Pre-job identification, delineation and assessment of areas/surfaces of concern;
- When and how to use exposure mitigating techniques (e.g., techniques for dust suppression, local capture ventilation, etc.) and personal protection equipment (e.g., coveralls, respirators, gloves) during any activities/operations of concern;
- Training and hazard communication;
- Emergency scenario contingencies (e.g., should inadvertent release/exposures occur);
- Disposal of dust-contaminated materials/wastes (possibly classified as hazardous waste); and
- Ongoing monitoring and evaluation of conditions (via air, skin, surface sampling)

The O&M plan should also include safe work procedures and hazard controls to change-out the filters on the general air handling system, particularly if these filters are confirmed as needing to be treated as hazardous waste.

At UNICOR's discretion, the O&M plan could also include periodic clean-up of surfaces by inmate workers. If this element were adopted, however, UNICOR should ensure that practices to control exposures are included in the plan and implemented, such as appropriate PPE, respiratory protection,

exposure monitoring, clean-up methods (e.g., HEPA vacuuming and wet methods), waste disposal, hygiene practices, and others deemed appropriate by UNICOR. Initial exposure monitoring should be conducted to determine whether exposure during clean-up is above the action limits for lead and cadmium. Controls for future clean-up activities should then be based on exposure results. [Reports 4 & 7]

Disassembly Operations - Contamination

1. UNICOR should evaluate the feasibility of controlling potential contamination from component parts during handling and disassembly. This could include control of incoming materials, HEPA vacuuming of parts prone to dust deposits during disassembly, and other measures. [Report 10]

2. UNICOR should conduct follow-up evaluation of lead and cadmium exposures [at FCI Tucson] including additional personal exposure (breathing zone) monitoring during disassembly and associated activities to determine the significance of the one cadmium area exposure result that was above the action level, but below the PEL. Guidance for further analysis and monitoring is recommended below:

- The minimum requirement specified in the OSHA cadmium standard is that breathing zone samples be taken at least every six months (and possibly more often) when any initial or periodic monitoring sample exceeds the action level. To justify discontinuation of monitoring for the personnel represented, two additional monitoring episodes at least seven days apart must indicate exposures to be below the action level. It is recommended that UNICOR conduct monitoring beyond the minimum requirement to ensure that variability in exposures be evaluated and to ensure that all activities that could result in exposure be captured.

- Additional monitoring should concentrate on the use of breathing zone samples, and represent the breadth of activities related to disassembly, including both routine and non-routine activities. UNICOR should ensure that additional exposure monitoring characterizes the activities and location represented by the area sample collected by its consultant in 2006 that exceeded the action level. Cleaning and any other activities that could disturb existing dust should also be monitored.

- The follow-up monitoring and analysis should involve more than just collecting samples. It should involve an analysis and documentation of the operations and activities conducted, their duration, pertinent observations, locations, types and quantities of materials processed, and any other information that is important to evaluate exposure levels and take preventive or corrective action in the future should exposures be elevated.

Evaluation and Monitoring Plans

1. UNICOR should promptly conduct monitoring of any new activities (e.g., non-routine or certain O&M activities) and future changes in work operations, production rates, work processes/practices, personal protection, and other practices. Exposure monitoring is an OSHA requirement when any change is made that could result in a new or additional lead or cadmium exposure. An example of a production change that should have been monitored more promptly is the increase in CRT breakage [at USP Lewisburg] to between 450 – 600 CRTs per day of processing. Monitoring is scheduled for this increased production in June 2009, but should have been performed shortly after ramp up. The factory refurbishment conducted between mid-2006 and early 2007 should have also been monitored. Conversely, the monitoring performed for the new non-routine activity involving clean-up of elevated warehouse surfaces in 2009 is an excellent example of the proper way that initial/additional monitoring should be conducted for a new/additional exposure. [Reports 3, 10]

2. As required by OSHA lead and cadmium standards, UNICOR should also promptly conduct exposure monitoring for any future changes that could result in an increased level of exposure, such as changes in work operations, work processes/practices, quantities or types of materials processed, new activities, and non-routine activities. Periodic monitoring should be conducted to evaluate any existing or newly developed engineering controls to make sure that the controls are operating at the design parameters. [Reports 3, 18]

3. Any time that a change or improvement is made to the LEV system or work practice that reasonably could be foreseen to change exposure conditions, UNICOR should perform exposure monitoring to verify that the desired effect is achieved. [Report 7]

4. UNICOR should periodically conduct at least a limited amount of personal exposure monitoring that characterizes exposures resulting from current work activities conducted on the factory floor. This monitoring will serve to document continued control of the lead and cadmium hazards. An

annual monitoring program would be appropriate. Alternately, assuming results are low, as found by FOH [at FCI Ft. Dix], two annual monitoring episodes would suffice to document minimal exposures. Subsequently, monitoring could be limited to any future changes that could result in an increased level of exposure, such as changes in work operations, work processes/practices, or quantities or types of materials processed. Given the low exposures found by FOH, this recommendation goes beyond the requirements of the OSHA lead and cadmium standards, but would provide important documentation to establish consistently low exposures. [Report 8]

5. UNICOR should continue its exposure monitoring program that has been conducted annually since 2004. This monitoring will serve to document continued control of the lead and cadmium hazards. This recommendation, which goes beyond the requirements of the OSHA lead and cadmium standards, would provide important documentation to establish consistently low exposures and provide a basis for continued improvements. This recommendation applies to recycling activities even if glass breaking remains suspended. This recommendation is consistent with NIOSH/HETAB Recommendations 1 and 2 of Attachment 3. [Reports 3, 18, 21]

6. UNICOR should ensure that non-routine practices are included as part of its monitoring program. These non-routine practices could include maintenance activities and cleaning performed under an O&M plan, among others. [Report 3]

7. As part of its monitoring program, UNICOR should continue to implement the consultant's recommendation of 2006, 2007, and 2008 to evaluate surface contamination levels to ensure that lead and cadmium contamination is not increasing over time and to verify that clean-up, housekeeping, and operations and maintenance (O&M) practices are effective. This monitoring should be part of the annual monitoring program and the O&M program discussed below. The surface sampling should include elevated surfaces that are not routinely cleaned to ensure that contamination is not building up over time. Such monitoring results should also be used to focus activities conducted under the O&M plan. [Reports 3, 10]

8. In addition to personal exposure monitoring, the UNICOR exposure assessment program should continue to evaluate surface contamination levels. UNICOR should establish a surface contamination criteria that it intends to use to evaluate results and plan any clean-up or O&M actions. UNICOR should take preventive action to keep contamination of elevated surfaces (e.g., mechanical systems) from building up to problematic levels. [Reports 3, 21]

Housekeeping and Hygiene Activities

1. Daily and weekly cleaning of work areas by HEPA-vacuuming and wet mopping should be continued. The BG/BIA guidelines [2001] recommend daily cleaning of tables and floors with a type-H vacuum cleaner. Type H is the European equivalent of a HEPA vacuum, where the H class requires that the filter achieve 99.995% efficiency, where 90% of the test particles are smaller than 1.0 um and pass the assembled appliance test, 99.995% efficiency where 10% of the particles are smaller than 1.0 um, 22% below 2.0 um, and 75% below 5.0 um. While some surface contamination was measured in work areas, this would be much greater if it were not for the good housekeeping practices in effect in all locations observed. Other practices not observed during the time of this evaluation, but which have been observed at other facilities should be discouraged; these include the use of compressed air to clean parts or working surfaces, and the consumption of food, beverage or tobacco in the workplace. [Reports 6, 9]

2. Daily and weekly cleaning of work areas by HEPA-vacuuming and wet mopping should be conducted, taking care to assure no electrical or other safety hazard is introduced. [Report 1]

3. Discontinue dry sweeping. Use a floor squeegee to carefully collect large pieces of debris that cannot be effectively vacuumed from the floor. Whenever possible, use a HEPA-filtered vacuum cleaner and/or wet methods for removing dust from all other surfaces. [Report 3, 16, 21]

4. Due to the levels of surface contamination of lead measured in the recycling facility, workers should wash their hands before eating, drinking, or smoking. [Reports 1, 6, 9]

5. FCI Elkton should re-enforce the importance of hand washing to prevent the potential for hand-to-mouth ingestion exposures. Pre-job briefings, end-of-shift discussions, and general supervision are opportunities to ensure that workers apply proper hand washing and hygiene practices. FCI Elkton should ensure rigorous enforcement of no eating and drinking from open cup restrictions in recycling areas. [Report 7]

FCI Elkton Remediation

1. Air monitoring in the general factory work areas of each of the three buildings indicates that the presence of surface contamination containing lead and cadmium is not posing an imminent inhalation threat that requires immediate evacuation and remediation but rather one that can be responded to in a prompt but well-coordinated manner. Assuming that the industrial hygiene assessment and the ongoing monitoring of conditions are

favorable and do not show that degradation or other factors are resulting in increased exposure potential, some flexibility in scheduling the clean-up activities is deemed acceptable. However, it is recommended that cleanup activities should be completed in accordance with approved project specifications within three years. As such, abatement activities may be coordinated with and integrated into other building upgrade plans (e.g., ventilation retrofits, rooftop filter cleaning and/or replacement, expansion operations, etc.). [Report 4]

2. It is recommended that comprehensive plans be developed and implemented to remediate the contamination (inside ducts, on surfaces, etc.) in accordance with sound hazardous material abatement specifications (such as, for example, adaptations of specifications currently used to remove lead paint from residences). These plans should address considerations such as the containment of the remediation areas, method of remediation (removal, isolation/enclosure, encapsulation, etc.), worker protection, clearance levels to be achieved, disposal of hazardous wastes, etc. [Report 4]

3. Especially in the Warehouse and FSL [FCI Elkton] where some areas/surfaces were found to exist with little/no contamination, it may be prudent to more precisely delineate which building locations and components warrant clean-up and which do not. [Report 4]

4. It is recommended that additional characterization be performed of possible environmental impacts from the release to the FSL building exterior [FCI Elkton] of lead exhaust air from the de-soldering operation. [Report 4]

5. Based on the testing performed, bulk quantities of settled dusts originating from the glass breaking and de-soldering operations should be treated as hazardous waste, unless additional testing permits otherwise. [Report 4]

6. Clean-up operations to remediate lead and cadmium legacy contamination appear to be imminent. Prior to the implementation of this work, in order to prevent release to the air or work areas of legacy surface contamination deposited on various structural and general ventilation systems, FCI Elkton should implement operations and maintenance (O&M) practices for any non-routine activities that could disturb this contamination. Such activities could include contractor maintenance of ventilation systems or non-routine internal activities. Should this contamination be disturbed for any reason, FCI Elkton should immediately apply clean-up practices using HEPA filtered vacuums, wet methods, and other remediation techniques to mitigate the release. After remediation of all legacy contamination is completed under contract, these O&M actions should no longer be necessary. At that point, current housekeeping and

cleaning activities to control any dust migration from the glass breaking room should suffice to keep contamination in check. [Report 7]

7. Given the very high concentrations of lead and cadmium in some dust samples (one sample from the FSL was as high as16% lead), periodic industrial hygiene evaluations and facility inspections are recommended to confirm that conditions remain acceptable until corrective actions are completed. Such evaluations (air sampling, hand wipe sampling, assessments of dust disturbance potential, etc.) should be performed to better characterize current exposures during various routine and non-routine operations and activities. [Reports 4, 6, 7, 9]

Personal Protective Equipment

Respiratory Protection

1. UNICOR should self-assess and ensure that its respiratory protection program meets OSHA requirements for medical clearance, training, fit testing, cleaning and maintenance, and other items. [Report 7]

2. Per OSHA requirements regarding voluntary respirator use, UNICOR should provide Appendix D of 29 CFR 1910.134 to workers and ensure that the workers read and understand the information. In addition, UNICOR should ensure that workers understand the proper use and limitations of the respirators that UNICOR provides. For good practice documentation purposes, UNICOR should have inmate workers read and sign Appendix D of 29 CFR 1910.134, and UNICOR and FCI Tucson should maintain the Appendix D signed records. [Report 20]

3. The respiratory protection program for [USP Lewisburg] should be evaluated for this operation in order to ensure that it complies with OSHA regulation 1910.134. [Report 9]

4. UNICOR should develop and implement a respiratory protection program in accordance with 29 CFR 1910.134, Respiratory protection, for the cleanup of broken CRT glass. UNICOR should also upgrade respiratory protection for this glass cleanup operation and all other operations (e.g., disassembly) consistent with the N-95 or better recommendation made by its consultant. For voluntary respirator use, UNICOR should implement the consultant's recommendation for informing workers of Appendix D information in the respiratory protection standard. These respiratory protection recommendations for cleanup of broken glass and for voluntary use during disassembly apply to all UNICOR factories. [Report 21]

Medical Surveillance

1. UNICOR should improve its recordkeeping for medical surveillance and exposure monitoring data to meet OSHA requirements for types of information maintained, records retention, and employee (staff and inmate) notification of results. [Report 7]

2. Contract a board-certified, residency-trained occupational medicine physician who is familiar with OSHA regulations and exposures at [FCI Elkton] to oversee the medical surveillance program. BOP may be able to find a local physician, or contract with Federal Occupational Health. This contractor should also oversee medical clearance for respirators. [Reports 5, 7]

3. UNICOR and FCI Elkton should consistently inform personnel of medical surveillance and biological monitoring results and retain and maintain records consistent with OSHA standards. [Report 7]

4. UNICOR and FCI Elkton can discontinue medical surveillance for staff and inmates who are not involved in glass breaking, clean-up in the glass breaking room, and filter change-out. An occupational physician should be retained to confirm this recommendation and determine whether some staff or inmates could require continued surveillance under the cadmium standard based on past exposures. [Report 7]

5. NIOSH/HETAB states that there is no need to perform any further medical surveillance if the GBO remains closed. [Report 3]

Other Hazards

Noise

1. UNICOR should improve its hearing conservation program to include all elements defined by 29 CFR 1910.95, Occupational noise exposure. The means of providing the training component of this program should be defined. [Report 18]

2. Noise levels in the USP [Atwater] recycling factory should be measured during normal operations to evaluate the potential for occupational exposures in this area. [Report 1]

3. To control hazards from noise exposures, the BOP should evaluate the adequacy of the FCI Elkton hearing conservation program and ensure that it is effectively implemented. UNICOR should ensure the proper use of

hearing protection for recycling areas and operations where it is required. [Report 7]

4. UNICOR should conduct a complete noise evaluation for its recycling operations at USP Lewisburg. A hearing conservation program should be implemented based on test results. NIOSH/DART noise monitoring results found a hearing conservation program is required for glass breakers and baler operators. [Report 10]

5. UNICOR should implement hearing conservation practices as indicated by FOH noise monitoring results and should prepare a written hearing conservation program for the FCI Marianna recycling activities. [Report 15]

6. UNICOR should conduct a noise survey [at FCI Marianna] as recommended by OSHA in 2006 (Enclosure 2) to ensure compliance with 29 CFR 1910.95, Noise. Some noise monitoring was conducted by a safety representative at FCI Marianna in 2005, but this data was questionable (see Section 4.5). UNICOR has not conducted noise monitoring in response to the OSHA recommendation of November 2006. UNICOR should not rely solely upon the FOH noise monitoring conducted as part of the OIG investigation. UNICOR should implement a hearing conservation program as indicated by its monitoring results and FOH data. [Report 15]

7. UNICOR should perform an assessment [at FCI Texarkana] to ensure that the hearing conservation program is fully implemented as indicated by the Factory Manager and Safety Specialist. [Note: Consultants performing noise monitoring in 2006, 2007, and 2009 did not seem to be unaware that such a program was implemented.] [Report 18]

8. UNICOR should implement a hearing conservation program for inmates performing metal baling at all factories, including USP Leavenworth unless repeated exposure monitoring clearly shows that it is not required at a particular factory. Although the metal baler's exposure was slightly less than the OSHA noise action level at USP Leavenworth, monitoring was only conducted on one day, and this operation has been shown to exceed the action level at other factories. UNICOR should also repeat noise monitoring as part of its annual program to confirm exposure levels and determine any variability in the metal baler's exposure. [Reports 3, 21]

Heat Stress

1. The BOP should develop a site specific heat stress program that accounts for the heat stress data/information provided in this document, and at a minimum, should incorporate the following:

a. Engineering controls are the preferred method to reduce and/or eliminate occupational stressors in the workplace; therefore, cooling methods, such as, air conditioning systems, should be investigated to reduce the heat load in this work place;

b. A medical surveillance component should be included in the program with pre-placement and periodic screening to identify health conditions which may be aggravated by elevated temperatures;

c. In lieu of implementing engineering controls, the BOP needs to reassess its current use of PPE (i.e., the use of Tyvek, PAPR's, gloves, etc.) and consider adding personal cooling devices, such as, cooling vest or packs for workers in the GBO;

d. An initial and periodic training program informing employees about the effects of heat stress, and how to recognize heat-related illness symptoms and prevent heat-induced illnesses;

e. An acclimation program for new employees or employees returning to work from absences of three or more days;

f. The development of specific procedures to be followed for heat-related emergency situations;

g. Provisions that first aid be administered immediately to employees displaying symptoms of heat-related illness;

h. Annual and periodic heat stress monitoring should be performed to reflect seasonal changes and assist in updating the site specific heat stress program.

The BOP should establish provisions for a work/rest regimen so that exposure time to high temperatures and/or the work rate is decreased; the BOP should permit workers access to water at liberty; and it is strongly recommended that the current 2007 version of the ACGIH-TLV's be referenced to assist in adding additional specific information to the Marianna Site Specific Heat Stress program. Therefore, a thorough understanding of the various clothing ensembles worn throughout the year at Marianna (especially during the warmer seasons) and the role that PPE (i.e., the use of Tyvek suites, hoods, gloves, etc.) may play on the effects of heat stress. Additional emphasis should be placed on the TLV's Guidelines for Limiting Heat Strain and the Guidelines for Heat Stress Management. We also recommend that additional materials on heat stress be investigated, such as OSHA's Heat Stress Card (OSHA Publication 3154) which can be found on OSHA's web page

http://www.osha.gov/SLTC/heatstress/index.html and
http://www.osha.gov/SLTC/heatstress/index.html [Reports 11, 12, 13]

2. UNICOR has prepared a draft Heat Stress Program dated 09/26/08, which will be evaluated prior to the completion of the OIG investigation. UNICOR should implement the heat hazard analysis elements of this program for USP Lewisburg and its other facilities and implement any required controls actions that are warranted based on heat exposure results. UNICOR has implemented heat controls at USP Lewisburg, including installation of air conditioning in the recycling factory and has implementing use of "breathable" PPE to reduce heat exposure during glass breaking. However, through appropriate hazard analysis, UNICOR should confirm and document that these measures are adequate to control the heat hazard. [Report 10]

3. ACGIH-TLVs, Heat Stress and Heat Strain lists general controls for consideration and incorporation, as appropriate, into the FCI Marianna heat stress procedure. The OSHA-Recommended Elements of a Heat Stress Program should also be addressed in the procedure. Some of these as well as other general controls are discussed below, as applicable or not applicable to the preparation of a revised FCI Marianna heat stress procedure.

- Water/Fluids: Provision of water/fluids should be addressed in the procedure. As a possible example if feasible, water should be made available during rest periods in a cool down area (free of toxic metal exposure).

- Acclimation of Workers: Approaches to acclimate workers to the hot environment with necessary accommodations should be addressed. The ACGIH-TLV Heat Stress and Heat Strain section provides some information on this topic. OSHA-Recommended Elements of a Heat Stress Program also states that re-acclimation of workers is necessary if they are away from the job for more than three days.

- Training: The means of training, its general content, and its periodic reinforcement should be addressed in the heat stress procedure.

- First Aid and Emergency Response: The procedure should address how first aid and emergency response will be provided to workers suffering acutely from heat exposure.

- Record Keeping: Heat stress exposure and monitoring data and information must be maintained for staff and inmates involved in the GBO operations.

- Heat Strain Physiological Monitoring: Physiological monitoring approaches are also discussed in ACGIH-TLVs Heat Stress and Heat Strain; however, this monitoring is not a desired approach, unless absolutely necessary. Usually this monitoring is reserved for cases where impermeable PPE is required. If FCI Marianna should require use of impermeable PPE, then physiological monitoring may need to be added to the heat stress procedure. [Report 12, 13]

4. An initial and periodic training program should be implemented, informing employees about the hazards of heat stress, predisposing factors and how to recognize heat-related illness signs and symptoms, potential health effects, first aid procedures, precautions for work in hot environments and preventing heat-induced illnesses, worker responsibilities, and other elements [NIOSH 1986]. [Report 13]

5. Specific procedures should be developed for heat-related emergency situations, including provisions that first aid be administered immediately to employees displaying symptoms of heat related illness. [Report 13]

6. NIOSH/DART recommends that UNICOR evaluate the heat exposure hazard [at FCC Tucson] to determine any precautions necessary to prevent heat strain and heat stress (see Attachment 1, Recommendation 3.) [Report 20]

7. Although the Production Controller stated that all operations are conducted in air conditioned areas, UNICOR should verify that heat exposure is not a factor at USP Leavenworth. [Report 21]

8. UNICOR should ensure that USP Atwater has implemented heat exposure assessments and controls as required by the UNICOR heat stress program. [Report 3]

9. UNICOR should evaluate whether the fans used at the working level (height) constitute a similar violation as issued by OSHA to UNICOR at USP Lewisburg. UNICOR should implement alternate methods of ventilation and cooling if these fans have potential to disturb, re-suspend, and redistribute surface contamination or contamination that could be released from equipment being recycled. [Note: UNICOR issued a violation for pedestal fan use at USP Lewisburg even though exposures were less than the action levels.] [Report 3]

Ergonomics

1. Frequently while conducting the on-site work, NIOSH researchers observed tasks (such as lifting and using screwdrivers) being conducted in an awkward manner which could produce repetitive stress injuries. Tasks should be evaluated to determine if they are biomechanically taxing and if modifications in procedures or equipment would provide benefit to this workplace. [Reports 1, 6, 7, 9, 10, 20]

2. FCI Elkton should evaluate heat stress and ergonomic hazards (specifically lifting loads and twisting while carrying loads) and ensure that controls are implemented to mitigate any identified hazards and comply with OSHA standards. For workers at risk for ergonomic injury from lifting loads, FCI Elkton should implement training for lifting and carrying techniques. Also see the NIOSH Revised Lifting Equation (http://www.cdc.gov/niosh/dos/94-110/) for information on this topic. [Report 7]

3. UNICOR should evaluate USP Lewisburg work activities for hazards related to lifting and repetitive stress, and implement any appropriate procedures, training, or equipment to address the hazards. [Report 10]

4. UNICOR should evaluate FCI Marianna work activities for hazards related to lifting and repetitive stress, and implement any appropriate procedures, training, or equipment to address the hazards. [Report 15]

5. UNICOR should also ensure that other hazards are evaluated and controlled [at USPs Atwater and Leavenworth] such as tasks that are potentially biomechanically taxing (e.g., lifting and repetitive stress). [Reports 3, 21]

BOP Health and Safety Policies

1. BOP and UNICOR should clarify its stop-work policy and lessen the technical threshold for its use. In particular, FOH recommends that stop-work authority under BOP and UNICOR policies not be reserved for just "imminent hazards that could reasonably and immediately be expected to cause death or serious physical harm" but relaxed somewhat to allow for an expanded applicability to other safety and health hazards that, although significant, may fall short of this definition. Also, stop-work authority should be expanded to others besides just the Occupational Safety staff members. Other federal components have adopted less restrictive stop work policies than the one currently in use by the BOP. (Attachment) In general, potential ambiguities in any stop-work policy should be clarified so that

terms like 'imminent', 'danger' and 'serious physical harm' can be properly and consistently understood in the context of the UNICOR work environment. [Report 3]

2. BOP should modify, clarify, and expand its stop-work policy when unsafe work conditions are identified and prepare implementation guidance to detail the stop-work and restart process. BOP and UNICOR should clearly communicate this policy to its staff and ensure compliance with the policy. This policy and associated implementing guidance should clearly establish the general conditions under which it is the "responsibility" of authorized personnel to stop work, define stop-work authority, identify personnel/positions with stop-work authority, detail the methods to achieve immediate but safe shutdown of work, describe the process for follow-up analyses and corrective action processes after work is stopped, and describe the verification and authorization processes for work start-up. Stop-work actions should always be communicated to all factories as lessons learned information along with any associated UNICOR-wide directives. BOP and UNICOR should expand authority to stop work to more personal than just the safety staff. In many work settings, all staff, particularly supervisors, have the responsibility to stop work when conditions are identified that could cause excessive exposure to hazards, injuries, death, or significant risk outside the established safe work parameters. Stop-work conditions should be expanded to include any work or condition that is outside of established safe work parameters, which would include work being conducted with a failed or improperly operated engineering control. The means for inmates and other workers to promptly communicate unsafe conditions to appropriate staff should be established in policy and procedures and effectively communicated to all. [Report 3]

Institution Health and Safety Documentation

1. UNICOR should improve its recordkeeping for medical surveillance and exposure monitoring data to meet OSHA requirements for types of information maintained, records retention, and employee (staff and inmate) notification of results. [Report 7]

2. As a "good practice" approach, UNICOR should prepare a concise written safety and health document specifically for its recycling operations at USP Lewisburg as well as for each of its other recycling factories that lack such a document. Such a document should be developed and implemented and would serve to supplement and consolidate ISO 9000 documents that contain safety and health practices and other documents with safety and health content. The existing documents are vague in some ways and contain some conflicting information that is not consistent with actual

practices. A written safety and health document would ensure that practices are consistent with written requirements and would benefit verification processes. Additionally, the document should prescribe inspection, verification, assessment, and hazard analysis processes. This document should address both routine and non-routine activities. [Reports 3, 8, 10, 21]

3. For all its factories, UNICOR should revise its work instructions, process descriptions, respiratory protection program and other documentation to ensure consistency in work practice and hazard control content among the documents and to ensure all written documents are consistent with actual work practices and processes. [Reports 3, 18]

4. UNICOR should revise the USP Leavenworth work instruction for housekeeping to emphasize the restriction on dry sweeping and to add the process for weekly cleaning using a de-leading agent. [Report 21]

5. UNICOR should implement a document control system to clearly delineate the status of existing work instructions, procedures, and safety and health programs/plans and other documents. Such a system should clearly define the status of the document (e.g., operational, expired, superseded, revised, etc.). Review and revision cycles and dates should be established. Redundant and inconsistent work instructions, procedures, and other documents should be corrected, consolidated and avoided through document control. [Reports 3, 18]

Health and Safety Regulatory Compliance

1. Ensure full compliance with all applicable OSHA standards, including the General Industry Lead Standard [29 CFR 1910.1025], the Cadmium Standard [29 CFR 1910.1027], the Hazard Communication Standard [29 CFR 1910.1200], and the Respiratory Protection Standard [29 CFR 1910.134]. This includes record keeping requirements, hazard communication requirements, compliance plans, and medical surveillance. In addition to the OSHA requirements, we recommend that the preplacement examination for cadmium exposure be identical to the periodic examinations so that baseline health status may be obtained prior to exposure. [Reports 2, 5, 6, 9]

Environmental Compliance

1. UNICOR and FCI Elkton should evaluate their wastewater, stormwater, air emissions, and hazardous waste streams to ensure

compliance with applicable environmental requirements. The BOP and UNICOR should coordinate their environmental control efforts. [Report 7]

2. In implementing clean-up methods and the O&M plan, UNICOR should periodically evaluate the wastes from HEPA vacuums, mop rinse water, and other potentially contaminated debris to determine acceptable disposal methods per U.S. EPA regulations. [Report 10, 15]

3. UNICOR should develop a list of waste materials and/or wastes generated from specific activities that should be periodically and/or routinely TCLP tested to determine proper disposal methods per U.S. EPA RCRA regulations. This would include wastes generated from clean-up of elevated surfaces and other O&M activities, as well as other wastes from routine and non-routine activities. This recommendation applies to all UNICOR recycling factories. [Report 10]

4. FCI Ft. Dix should conduct/continue periodic internal inspections for compliance with environmental regulations and, in particular, the requirements of the Class D permit should be performed. The report of findings issued in 2005 by the NJDEP provides a good listing of criteria for these assessments. UNICOR should perform TCLP analysis of the air filters from the general factory to determine if filters are to be treated as hazardous waste. This testing should be conducted after the filters are next changed to confirm the findings reported in Section 4.4.3 of this report. During the filter change-out process, appropriate safety and environmental precautions should be implemented to ensure that workers are protected against possible lead and cadmium exposure and to ensure that the filters are properly bagged and stored pending test results. Future filter change-out procedures should be developed based on the test results and these procedures should be incorporated into an O&M plan. [Report 8]

5. UNICOR should ensure that the scrap metal wastes deposited in the outside roll-offs are covered, that dusts and runoff from the containers are not released into the environment, and that any other provisions of the DEP conditional exemptions for e-wastes are being met. Also, UNICOR should perform additional testing to better characterize this waste and share the results with the scrap metal vendor and the DEP. Modify work practices and environmental controls based on testing. [Report 10]

6. The testing results from samples collected at the formerly leased 'Blue' and 'Gold' buildings should be provided to the building owners. [Report 15]

7. UNICOR should ensure proper management of its hazardous wastes (tracking volumes, labeling, characterization, etc.) in light of all applicable regulatory requirements (federal, state and local). [Report 3]

8. UNICOR should share salient lessons learned regarding the environmental aspects of its e-waste operations among all its recycling facilities (e.g., waste characterization testing results, compliance strategies, etc.) [Report 3]

UNICOR Assessments

Job Hazard Analysis

1. UNICOR should develop and implement a hazard analysis program that includes baseline hazard analysis for current operations and also job (activity-specific) hazard analysis (JHA) for both routine and non-routine activities. UNICOR and FCI Marianna should conduct JHAs for any new, modified, or non-routine work activity prior to the work being conducted. It should also conduct hazard analyses of existing processes that have not had such an analysis. The JHA process is intended to identify potential hazards and implement controls for the specific work activity prior to starting the work. For instance, the JHA process should be integral to an effective O&M plan, as described in Section 6.1. [Reports 3, 15, 18, 21]

2. Perform a detailed job hazard analysis prior to beginning any new operation or before making changes to existing operations. This will allow UNICOR and BOP to identify potential hazards prior to exposing staff or inmates, and to identify appropriate controls and PPE. Involve the UNICOR and/or BOP industrial hygienists in these job hazard analyses. If medical surveillance is needed then UNICOR and BOP should perform pre-placement evaluations of exposed staff and inmates. This medical surveillance should be overseen by an occupational medicine physician. [Reports 2, 5, 7, 8, 10]

3. UNICOR should conduct self assessments at the working level to determine the effectiveness of its safety and health and hazard control programs. Examples include the hearing conservation program, respiratory protection program, lead and cadmium compliance program, medical surveillance program, hazard communication program, among others. Self-assessments can, of course, be conducted using safety and health contractors and/or UNICOR safety and health staff in support of internal safety and health staff, as desired. Any deficiencies should be documented and corrective actions should be implemented and documented to close out any deficiencies. [Report 7]

Evaluations of UNICOR Operations

1. The BOP and UNICOR should perform management assessments of all UNICOR operations, not just recycling, for compliance with applicable environmental, safety and health requirements. These assessments should be designed at the management level to ensure that the individual institutions have and implement the required ES&H programs, as well as conduct their own self-assessments to determine effectiveness. [Report 7]

2. A program should be established within the Bureau of Prisons to assure that all UNICOR operations, including but not limited to recycling, should be evaluated from the perspective of health, safety and the environment in the near future. This program should be overseen by competent, trained and certified individuals. [Reports 1, 6, 7, 9]

Industrial Hygiene and Environmental Expertise

Technical Resources

1. A program should be established within the Bureau of Prisons to assure that [health, safety, and environmental] issues are adequately addressed by competent trained and certified individuals. While a written program to address these issues is necessary at each facility, adequate staffing with safety and health professionals is required to ensure its implementation. One indication of adequate staffing is provided by the United States Navy, which states "Regions/Activities with more than 400 employees shall assign, at a minimum, a full time safety manager and adequate clerical support" [USN 2005]. That document also provides recommended hazard-based staffing levels for calculating the "number of professional personnel needed to perform minimum functions in the safety organization." [Reports 6, 9]

2. A comprehensive program is needed within the Bureau which provides sufficient resources, including professional assistance, to assure each facility the assets needed to assure both staff and inmates a safe and healthy workplace. [Reports 6, 9]

3. BOP and UNICOR should ensure that they have proper personnel resources, consulting resources, and material resources to effectively implement the management systems, such as corrective action tracking, information disbursement, and assessment processes to ensure effective ES&H and work processes. The need for sufficient resources also applies to the evaluation of and response to assessment, investigation, inspection, and

monitoring findings and data to ensure prompt corrective action and information distribution. [Report 10]

Procurement of Testing and Consulting Services

1. Carefully evaluate the qualifications and expertise of consultants who are hired to assess occupational or environmental health and safety issues. One useful benchmark for vetting individuals who provide industrial hygiene services is the designation of Certified Industrial Hygienist (CIH). Certification by the American Board of Industrial Hygiene (ABIH) ensures that prospective consultants have met ABIH standards for education, ongoing training, and experience, and have passed a rigorous ABIH certification examination. The UNICOR and/or BOP industrial hygienists can assist in the selection of your consultants. [Reports 2, 5, 10]

2. BOP, UNICOR and FCI Marianna should ensure that staff and consultants conducting ES&H assessments, evaluations, inspections, and monitoring activities are qualified for their assigned tasks and led by certified or highly qualified professionals. One benchmark for vetting individuals performing industrial hygiene services is to ensure certification in the practice of industrial hygiene (CIH) by the American Board of Industrial Hygienists (AIHA). [Reports 3, 15]

3. UNICOR should scope the work activities of its exposure assessment consultants to include a critical review and evaluation of work practices and hazard controls. The consultants should evaluate exposure results in the context of its evaluation of such practices and controls and provide recommendations for continued improvements. For example, as consultants provide data and results regarding metal exposures, noise exposures, effectiveness of engineering controls, and surface contamination levels, they should also offer expert interpretation of results with any recommendations for improvements of controls, practices, and systems. [Note: Recent consultant reports for USP Lewisburg could serve as an example of the scope of the consultants' evaluations and content of reports.] [Report 3]

Training

1. Training of workers should be scheduled and documented in the use of techniques for dust suppression, personal protection equipment (e.g., coveralls, respirators, gloves) and hazard communication. Additional training, recordkeeping and other restrictions apply if a formal respiratory protection program is implemented. [Reports 1, 6, 8, 9]

Information Sharing

1. UNICOR should operate its recycling factories in an integrated fashion. Across its factories, UNICOR should share information such as exposure data, controls, corrective actions, accidents and incidents, regulatory violations, successes, adverse events, lessons learned, and stop-work directives. UNICOR should accompany any directed actions that are required across the factories with commensurate opportunities for sharing information related to their implementation. UNICOR should develop management systems to address this recommendation. [Report 3]

2. UNICOR should also develop other essential management systems for information sharing, lessons learned, and factory-wide directives. BOP and UNICOR should ensure that staff responsibilities for verifying and enforcing hazard controls are established and carried out. [Report 3]

3. UNICOR should ensure that all of its recycling facilities are informed of violations and other deficiencies, along with corrective actions, that are found at any individual facility. Effective practices demonstrated at one factory should also be shared with others. UNICOR should develop and implement a system to achieve this communication and information sharing, which could possibly be part of the tracking system recommended above. [Report 10]

4. UNICOR should share information among its factories to ensure proper work practices, correction of violations, and implementation of actions for effective worker protection. Specific to the findings of this FOH report for USP Leavenworth, UNICOR should inform all factories of the respiratory protection recommendations above regarding cleanup of broken glass and regarding voluntary use during disassembly. UNICOR should also emphasize the prohibition on dry sweeping. [Report 21]

Oversight

Recommendation Tracking

1. BOP and UNICOR should implement a system to list, track, and document closure of any identified deficiencies or recommendations, regardless of the source. Closure of deficiencies and recommendations with documentation of those accepted and implementation details, along with those not accepted or pending (and why) is important to document improvement actions. This recommendation applies to all UNICOR recycling

factories. This topic will be discussed in further detail in the final OIG report. [Reports 3, 10]

Miscellaneous

Inmate Work Assignments

1. This facility [FCI Elkton] is a Federal prison, and the workers are Federal prisoners. The Belmont Report [HEW 1979] notes that, "...under prison conditions they [prisoners] may be subtly coerced or unduly influenced to engage in research activities for which they would not otherwise volunteer." Although we did not observe this, Elkton managers should ensure that prisoners are not unduly influenced to perform work which is considered unsafe or unhealthy. [Report 6]

Union Representation

1. Appoint a union safety and health representative. This individual should be a regular participant on the joint labor-management safety committee that meets quarterly. Since inmates do not have a mechanism for representation on this committee, ensure that they are informed of its proceedings and that they have a way to voice their concerns about and ideas for improving workplace safety and health. [Reports 2, 5]

Glass Breaking

Assessment of Glass Breaking Methods

1. The use of alternative methods to break cathode-ray tubes should be investigated by management. Lee et al. [2004] present different methods to separate panel glass from funnel glass in CRT recycling (sec 2.1) and for removing the coatings from the glass (sec 2.2). The hot wire and vacuum suction methods (supplemented with local exhaust ventilation) described by Lee et al. may produce fewer airborne particulates than breaking the glass with a hammer. The authors [Lee et al. 2004] describe a commercially-available method in which an electrically-heated wire is either manually or automatically wound around the junction of the panel and funnel glass, heating the glass. After heating the glass for the necessary time, cool (e.g., room temperature) air is directed at the surface, fracturing the glass-to-glass junction using thermal shock. The separated panel and funnel glass can then be sorted by hand. They also describe a method wherein a vacuum-suction device is moved over the inner surface of the panel glass to

remove the loose fluorescent coating [Lee et al. 2004]. The vacuum used must be equipped with HEPA filtration. Industrial central vacuum systems are available; they may cost less in the long run than portable HEPA vacuum cleaners. These modifications may also reduce the noise exposure to glass breakers. [Reports 6, 7, 9]

BOP RESPONSE

U.S. Department of Justice

Federal Bureau of Prisons

Office of the Director

Washington, DC 20534

January 19, 2010

MEMORANDUM FOR [redacted] INVESTIGATIVE COUNSEL
OVERSIGHT AND REVIEW DIVISION

FROM: Harley G. Lappin, Director

SUBJECT: Status Update Regarding NIOSH/FOH Reports Issued

Attached is the response to your November 18, 2009, memorandum. As you will see, we are making progress. If you have any questions regarding this update, please contact VaNessa P. Adams, Assistant Director, Program Review Division, at 202-353-2302.

Toxic Metal Contamination

- Legacy Contamination

1. Please describe the status of decontamination and decommission activities recommended for Federal Correctional Institutions (FCI) Ft. Dix and Marianna, and how these activities complied with the cleanup procedures specified by FOH in its recommendations. [Reports 8, 15]

Response: The decontamination and decommission activities used at Lewisburg are currently being reviewed by the Recycling Business Group's (RBG) General Manager and UNICOR's Environmental and Occupational Health Services Manager for applicability to all other factories that have glass breaking equipment. The FOH recommendations are being carefully considered in the development of these procedures. Thus, planning for cleanup and disposition of the glass breaking equipment at Ft. Dix (Torit system) and at Marianna will begin shortly. The remediation stage at Ft. Dix and Marianna is expected to be completed by summer 2010.

2. Please describe the results of all additional surface testing recommended in the FOH reports with respect to 1) elevated surfaces above the UNICOR factory ceiling at USP Lewisburg; 2) the tunnel from the basement of the UNICOR factory at FCI Texarkana to the power plant, the former LEV system in the furniture factory, the outdoor cyclone filter, and the dairy barn; and 3) the Atwater warehouse and ventilation systems serving the former glass breaking areas. Please describe any Operations and Maintenance (O&M) plans, cleanup, or remediation activities that have been planned or undertaken in response to such test results. [Reports 3, 10, 18]

Response:

Lewisburg: No further surface testing or cleanup is required above the factory ceiling at this time. This area is completely isolated from the working area. If renovation or other work is performed in the future that would disturb this isolated area, the area will be cleaned prior to commencement of the work, consistent with the FOH recommendation.

Texarkana: According to Texarkana staff, the tunnel to the power plant has been cleaned and painted on several occasions since glass breaking ceased near the tunnel in 2004. In the 2010 annual factory testing for toxic metals, wipe samples will be taken in the tunnel. There is no portion of the LEV system inside the former furniture factory that remains. This was removed in 2004. The only portion of the former LEV system that remains outside the factory is the cyclone, which is not in use. UNICOR will perform surface testing of the cyclone during the 2010 annual factory testing for toxic metals. The former dairy barn is a very old building that is used only for long-term storage. UNICOR intends to remove the remaining few pieces of old equipment and cease use of this building. No further testing or cleanup of the building is required at this time.

Atwater: Wipe sampling was performed in 2009 by contractor, Bill Collier and Associates, to evaluate surface contamination. Measured levels from several work surfaces in the warehouse

were found to exceed the OSHA guidance level for lead on work surfaces. Since this testing, more rigorous daily cleaning procedures have been implemented. Per the September 14, 2009, recommendation by the contractor, the factory continues to HEPA-vacuum and mop/wet wipe work surfaces. This facility has also incorporated the use of D-Lead solution in the cleaning procedures. The LEV system at the USP, which has not been in use since March 2005, will be tested, cleaned, de-installed and surplused by Spring 2010.

- Development of Operations and Maintenance Plans

3. Please describe any recycling factory refurbishment, remodeling, demolition, or similar activity planned or taken since November 2007 at any UNICOR recycling facility that could disturb contaminated surfaces, and describe the steps planned or taken to control worker exposure and environmental releases, as recommended by FOH. [Reports 4, 7, 10]

Response: No such activities have taken place at UNICOR recycling factories since November 2007, and none are currently planned. However, should such activities be planned, UNICOR will utilize its technical resources to evaluate and control potential environmental and occupational health hazards.

4. Please describe the status of O&M plans developed and implemented for the purpose of minimizing surface contamination and preventing inhalation or ingestion exposures as recommended by FOH with respect to USP Lewisburg and FCI Texarkana. [Reports 10, 18]

Response: Existing O&M documentation for each factory will be improved and made more comprehensive as the RBG progresses toward having all factories achieve accreditation under the Recycling Industry Operating Standard (RIOS) and the Responsible Recycler (R2) certification programs. These programs build on the certifications UNICOR's recycling factories have held under the International Association of Electronics Recyclers and the ones they currently hold (with the exception of Leavenworth) under ISO 9001. O&M documentation for each factory, including specific procedures for minimizing surface contamination and preventing inhalation and ingestion exposures, will form part of the documents that are necessary to hold RIOS and R2 certifications. The plan is that at least two recycling factories (Lewisburg and Leavenworth) will achieve third-party certification under the RIOS and R2 programs by Fall 2010. Thus, O&M documentation will be substantially upgraded for those factories by that time. This same documentation will then be used as the basis for other factories to become RIOS and R2 certified. This improved O&M documentation is anticipated to be in place, as part of the RIOS and R2 documents for the remaining factories, by Spring 2011.

- Disassembly Operations – Contamination

5. Please describe the status and any results of any evaluation you have conducted of the feasibility of controlling potential contamination from e-waste during general disassembly operations. [Report 10]

Response: As indicated previously, UNICOR contracted with Bill Collier and Associates to conduct air and wipe sampling at the recycling factories. UNICOR received the final reports for all of the factories in September 2009. These reports confirm that all air monitoring results in all factories were far below OSHA regulatory levels for lead, cadmium and beryllium, and in many samples these toxic metals were below laboratory detection limits. However, the reports did indicate elevated levels of lead and cadmium in some surface wipe samples. The elevated levels that were sometimes found on work surfaces, as well as non-work surfaces, indicate that further improvements in daily and periodic cleaning activities can still be made at most of our factories. All of the electronics recycling factories (with the exception of Tucson, see #6 below) have reevaluated their daily and periodic cleaning procedures and have implemented, or are in the process of implementing, more rigorous cleaning procedures for both work surfaces and non-work surfaces.

6. Please describe the status and results of the follow-up evaluation of lead and cadmium exposures recommended for FCI Tucson. [Report 20]

Response: UNICOR's contractor took air and wipe samples in March 2009 at the Tucson factory and camp operations. The documentation of this sampling, as well as the results, is described in the contractor's report dated May 27, 2009. All results for lead and cadmium were below laboratory detection levels, and consequently, far below allowable OSHA levels. Based on this sampling, it is clear that electronics recycling activities at Tucson are extremely effective at controlling toxic metal exposures. Though not required, based on the March 2009 monitoring results, UNICOR will include Tucson operations in the annual RBG testing.

Please note that the elevated cadmium measurement documented in the July 2006 industrial hygiene report was not representative of worker exposures. Contrary to that report, the contractor has since indicated the elevated cadmium level was measured approximately 6 inches above the work table, and not in the breathing zone where the action level would be applicable.

- Evaluation and Monitoring Plans

7. Please describe how UNICOR or the BOP intend to identify and monitor changes in exposure conditions resulting from new activities or modifications in e-waste work operations, production rates, work processes/practices, personal protection, and other practices. Describe whether such changes have been introduced at UNICOR factories since 2008 and whether monitoring was performed. [Reports 7, 10, 18]

Response: By policy, institution safety staff are required to inspect the recycling operations on at least a monthly basis. UNICOR will continue to work with institution safety staff to evaluate operational changes in our factories. In addition, UNICOR has internally mandated that factory management staff assess environmental and occupational health considerations prior to new factory activations and/or factory modifications.

Other than activities such as moving work stations or equipment, adjusting to a variable rate of incoming material, or initiating or restarting an activity at one of our factories that is routinely conducted at others (for which we have conducted assessments and monitoring at other recycling

factories), no more significant changes have been introduced to the electronics recycling factories since 2008.

8. Please describe how UNICOR or the BOP intend to evaluate surface contamination levels and exposure conditions in e-waste factories to ensure lead and cadmium contamination is not increasing over time and to verify that clean-up, housekeeping, and operations and maintenance practices are effective. [Reports 8, 10, 21]

Response: The sampling and analysis conducted by the contractor in 2009 was the initiation of an annual assessment of work and non-work surfaces at UNICOR recycling factories. Such annual testing will be used in the future for determining whether further changes to daily and/or periodic cleaning procedures are necessary at any of our factories.

9. Please describe UNICOR's efforts to specify a surface contamination criteria for use in evaluating the cleanliness of its e-waste recycling factories. [Report 21]

Response: Designation of a specific surface contamination criterion, like many FOH recommendations, is not based upon a regulatory requirement. UNICOR will base its O&M, housekeeping, and cleaning procedures for electronics recycling on the regulatory goal of maintaining all surfaces as free of toxic metals as practicable.

- Housekeeping and Hygiene Activities

10. Please describe the status of dry sweeping in UNICOR e-waste factories and the actions that have been taken to eliminate this practice, including any communications with Factory Managers on this issue. [Reports 3, 16, 21]

Response: Dry sweeping is prohibited in areas of UNICOR's electronics recycling factories, where electronics dismantling is performed. This prohibition was communicated in a presentation to recycling factory managers at the 2008 factory managers' conference. This prohibition was re-emphasized in a directive from the RBG General Manager to factory management staff in January 2010. (Attachment 1)

11. Please describe the status of activities to promote cleaning in e-waste factories using HEPA-vacuuming and wet mopping. [Reports 1, 3, 6, 9]

Response: HEPA-vacuuming and wet wiping or wet mopping is routinely used at all UNICOR recycling factories. Some of these practices are used daily and some are used on a weekly basis.

12. Please describe the status of activities to promote hand washing in e-waste factories. [Reports 1, 6, 9]

Response: An emphasis on hand washing has been part of UNICOR's electronics recycling program since its inception, and was included in the original RBG's Standard Operating Procedures in 2003. Hand washing is emphasized at every UNICOR recycling factory, in training sessions and in oral directions from UNICOR staff.

13. Please describe the status of activities to prohibit consumption of food and drink in recycling areas. [Report 7]

Response: OSHA's prohibition on food and drink consumption is dependent on lead and cadmium personal exposures. Based on recent personal exposure monitoring, this prohibition would not be required by OSHA for electronic recycling operations. Though not required, the RBG is committed to maintaining its prohibition of food consumption within recycling work areas. Drinking fountains are available in the recycling factories. Several factories also allow workers to have water bottles, with coverings over areas of mouth contact, at their work stations. The RBG is reviewing the appropriateness of water bottles at work stations under the specific conditions now permitted at several factories.

- FCI Elkton Remediation

14. Please describe the status of the FCI Elkton remediation and provide any final reports or testing results from the contractor, UNICOR or BOP after-action reports, diagrams of the areas that were remediated, and photographs of the remediation. [Reports 4, 7]

Response: The remediation of FCI Elkton was completed in two phases. The first phase was awarded to Precision Environmental and consisted of remediation of the interior of the FCI factory, warehouse, and the FSL factory. This phase began in November 2008 and was completed in June 2009. The second phase was awarded to GB Hawk Construction and consisted of roof abatement of the FCI factory and the remediation of the HVAC systems in the FCI factory and warehouse. This phase began in June 2009 and was completed in September 2009. Attached are copies of the related statements of work and project completion clearance letters. (Attachment 2)

Personal Protective Equipment

- Respiratory Protection

15. Please describe the status of any UNICOR self-assessment to ensure compliance with OSHA respiratory protection requirements, including medical clearance, training, fit testing, cleaning and maintenance, and furnishing Appendix D of 29 CFR 1910.134 to workers. [Reports 7, 9, 20]

Response: Based on recent industrial hygiene monitoring (see previously provided reports from Bill Collier and Associates), respiratory protection is not required for current electronic recycling operations. However, dust masks are made available to staff and inmate workers for voluntary use. Appendix D of 29 CFR 1910.134 is made available to all workers voluntarily utilizing dust masks.

16. Please describe the status of any UNICOR efforts to implement a respiratory protection program in accordance with 29 CFR 1910.134 for the cleanup of broken CRT glass. [Report 21]

Response: All electronics recycling factories currently have procedures in place for cleanup of broken CRT glass. The adequacy and consistency of these procedures will be reviewed by Summer 2010, following an assessment of worker exposures to lead and cadmium during the cleanup of accidental CRT breakage. This assessment will be conducted by a Certified Industrial Hygienist. Should measured exposures warrant, a respiratory protection program will be developed, implemented and maintained for cleanup of accidental CRT breakage.

Medical Surveillance

17. Please describe the status and results of any efforts by UNICOR or the BOP to improve recordkeeping for medical surveillance and exposure monitoring data to meet OSHA requirements for types of information maintained, records retention, and employee (staff and inmate) notification of results. [Report 7]

Response: Medical monitoring for staff is being coordinated by Federal Occupational Health (FOH) under the direction of Dr. Sylvie Cohen, Director of Medical Employability Program, FOH. Exit exams were offered to UNICOR staff working at FCI Elkton glass breaking operation. The exam, which was conducted by FOH medical staff at a designated FOH site, consisted of a complete occupational history and physical exam paired with the following diagnostic testing, which was sent to Quest Labs:

- Blood and Urine Cadmium levels
- Beta-2-microglobulin level in urine
- Electrolytes including blood urea nitrogen and createnine level
- Blood lead level
- Blood Zinc Protopophyrin level (ZPP)
- Pulmonary Function Test (PFT)
- Chest x-ray [Posterior Anterior (PA)]

An examination consisting of a complete history and physical exam, for those inmates still in BOP custody, was completed by institution medical staff. The Clinical Director and Health Services Administrator at each institution housing inmates who had worked in the Elkton operations received online Centra training from Dr. Cohen prior to the beginning of any examination and diagnostic testing. Inmates are receiving the same diagnostic testing through the Quest Lab utilized for staff testing.

18. Please describe the work of the FOH physician who was retained to assist with medical surveillance at FCI Elkton, and provide all resulting written reports or recommendations provided to UNICOR or the BOP. [Reports 5, 7]

Response: Dr. Cohen has been retained in an advisory capacity. She has visited FCI Elkton and met with institution staff explaining the issued and listening to their concerns. She has reviewed all available staff medical data and provided letters to each employee, who completed the testing, regarding their results. She provided online Centra training to medical staff that would be

completing the inmates' exams and assessments. She has been available to institution medical staff to answer or address any questions, issues, or concerns which may arise.

19. Please specify whether any staff or inmates at FCI Elkton require continued surveillance under the cadmium standard based on past exposures. Explain the justification for your response. [Report 7]

Response: Based on medical surveillance results to date, there is no clinical reason to conclude that ongoing surveillance is required. Dr. Cohen will continue to evaluate diagnostic test results and make recommendations regarding the need for further testing.

Other Hazards

- Noise

20. Please describe the status and results of any efforts by UNICOR or the BOP to improve compliance in e-waste factories with OSHA's noise standard (29 CFR 1910.95). [Report 18]

Response: Compliance with 29 CFR 1910.95 is addressed in Chapter 2, Section D, of BOP Program Statement 1600.09. As a supplement to this program statement, UNICOR's RBG plans to develop, implement, and maintain a hearing conservation plan for each of its factories to better ensure compliance with this regulation.

21. Please describe the status and results of any noise testing by UNICOR or the BOP of USP Atwater's e-waste recycling operations since February 2009. [Report 1]

Response: Personal noise dosimetry was conducted by a contractor in April 2009 to evaluate noise during various operations at FPI Atwater. Ten personal noise exposure measurements were collected. Noise exposures ranged from approximately 12 to 53 percent of the allowable OSHA limits. Measured personal noise dosimetry levels at the USP factory were below the allowable OSHA limits. However, one worker at the Camp (the baler operator) recorded a dose in excess of OSHA's Hearing Conservation Level (e.g., recorded a dose higher than fifty percent). Please see the response to #22 below regarding baling operations.

22. Please describe the status of any UNICOR efforts to implement a hearing conservation program for inmates performing baling operations. [Reports 3, 21]

Response: All baler operators will be included in the RBG's hearing conservation program. In addition, hearing protection will be required for all workers operating balers.

- Heat Stress

23. Please describe the implementation status of the heat stress program for FCI Marianna and whether UNICOR intends to institute heat stress programs at other UNICOR factories. [Reports 10, 11, 12, 13, 20]

Response: A heat stress program was first initiated with heat monitoring at Marianna in May 2008. The program was modified, formal training for staff was provided in September 2008, and the current program was finalized in January 2009. Beginning in the Summer 2010, the RBG plans to evaluate the need for a heat stress program at its other factories.

24. Please describe the status and results of any evaluation by UNICOR or the BOP of whether fan use at USP Atwater contributes to surface contamination and constitutes a violation similar to the one issued by OSHA to USP Lewisburg for pedestal fan use. [Report 3]

Response: The OSHA violation issued to USP Lewisburg from inspection number 310227467 pertained to housekeeping. The instance referencing pedestal fans was included to illustrate that low levels of lead dust could be generated within the general disassembly area should surfaces not be maintained as free as practicable from lead accumulations. The inspector did not specify to what extent pedestal fans contributed to the airborne levels measured, which were well below allowable limits.

UNICOR recognizes the importance of housekeeping in the electronic recycling operations and has implemented housekeeping practices to minimize surface contamination (see response to question #4 above).

- Ergonomics

25. Please describe the status and results of any efforts by UNICOR or the BOP to evaluate ergonomic issues in e-waste recycling factories. Identify any changes that have been made as a result of such assessments. [Reports 1, 3, 6, 7, 9, 10, 20]

Response: The "awkward" use of screwdrivers at Tucson has been effectively resolved with the issuance of additional screwdriver bits for the hand-held pneumatic drill-drivers. Subsequent ergonomic changes will continue to be implemented, as necessary, on a case-by-case basis.

BOP Health and Safety Policies

26. Please specify whether the BOP intends to revise the "imminent danger" provision found in PS 1600.09 in accordance with FOH's recommendations. [Report 3]

Response: The BOP will discuss the impact of FOH's recommendations regarding "imminent danger" and determine if revisions are necessary for PS 1600.09

Institution Health and Safety Documentation

27. Please describe the status of any efforts by UNICOR or the BOP to prepare a concise safety and health guidance document for each e-waste recycling factory. [Reports 3, 8, 10]

Response: Existing safety and health documentation for each factory will be improved as the RBG progresses toward having all factories achieve accreditation under the RIOS and R2 certification programs. These programs build on the certifications that UNICOR's recycling factories have held under the International Association of Electronics Recyclers and the ones they currently hold (with the exception of Leavenworth) under ISO 9001. Safety and health documentation for each factory will form part of the documents that are necessary to hold RIOS and R2 certifications. The plan is that at least two recycling factories (Lewisburg and Leavenworth) will achieve third-party certification under the RIOS and R2 programs by Fall 2010. Thus, safety and health documentation will be substantially upgraded for those factories by that time. This same documentation will then be used as the basis for other factories to become RIOS and R2 certified. This improved safety and health documentation is anticipated to be in place, as part of our RIOS and R2 documents for our remaining factories, by Spring 2011.

28. Please describe the status of any efforts by UNICOR to revise its work instructions, process descriptions, and respiratory protection program to ensure accuracy and internal consistency, and to reflect actual work practices in its e-waste recycling factories. [Reports 3, 18]

Response: The principal efforts to revise work instructions, process descriptions, and safety and health procedures will take place as part of the effort to achieve third-party certification under the RIOS and R2 certification programs (described above in response to questions #4 and #27). However, updates and improvements in this documentation are constantly being made at the factory level. For example, through implementation of a Lean Six Sigma project, Texarkana has revised its procedures for the handling and dismantling of computer monitors and televisions. Tucson has revised its work instructions by adopting procedures used by Marianna for the dismantling of monitors and televisions. Texarkana has also, as a result of 2009 monitoring data from the contractor, revised its daily and periodic factory cleaning procedures. Ft. Dix is currently in the process of rewriting its factory cleaning procedures.

29. Please describe the status of any efforts by UNICOR to implement a document control system for its e-waste recycling operations to clearly define document status, establish review and revision cycles, and ensure that they consistently reflect work practices. [Report 18]

Response: Certainly, there is a need for the RBG to improve document tracking and control. As the recycling factories progress toward third-party certification under RIOS and R2, the RBG will examine options for improving these systems at both the factory and Central Office levels.

Health and Safety Regulatory Compliance

30. Please identify any efforts by UNICOR to improve compliance with OSHA regulations in its e-waste recycling factories since January 2008. [Reports 2, 5, 6, 9]

Response: UNICOR has taken several steps towards improving OSHA compliance within its electronic recycling operations. For instance, the RBG contracted a Certified Industrial Hygienist to assess compliance with OSHA's noise, lead, and cadmium standards at each of the

current recycling facilities. Also, UNICOR plans to hire a second industrial hygienist to assist with environmental and occupational health compliance. Lastly, the RBG plans to develop compliance plans for each of its facilities as part of the RIOS and R2 certification processes.

Environmental Compliance

31. Please identify any efforts by the BOP and UNICOR to better coordinate their environmental control efforts. [Report 7]

Response: The BOP issued a policy to implement its Environmental Management System (EMS), PS 1600.10 (12/14/2007). As part of this policy, institutional staff, including UNICOR, are required to regularly meet to discuss environmental issues. In addition, a newly-formed Central Office EMS Committee has been established that meets regularly, and includes senior level representatives, to discuss environmental issues affecting BOP/UNICOR and measures to improve its EMS.

32. Please describe the status and results of any efforts by UNICOR and FCI Elkton to evaluate wastewater, storm water, air emissions, and hazardous waste streams to ensure compliance with applicable environmental requirements. [Report 7]

Response: UNICOR is committed to evaluating our environmental requirements prior to the activation of a new facility, or the modification of an existing operation, and has developed an EOH Checklist. This evaluation will be conducted by trained, competent, and certified professionals. UNICOR will assess its environmental responsibilities should operations resume at FCI Elkton.

33. Please describe the results of all TCLP analyses on air filters (general ventilation) from the UNICOR e-waste recycling factory at FCI Ft. Dix since December 2008. [Report 8]

Response: Since the visit by FOH to the Ft. Dix factory in January 2008, the frequency with which the air filters for general building ventilation are replaced has been increased. Further, per the recommendation contained in the December 2008 FOH report, the air ventilation filters were sent for TCLP analysis in March 2009. The building ventilation filters were analyzed by a certified laboratory and determined to be non-hazardous using the TCLP test. In December 2009, the building ventilation filters were again tested by a certified laboratory using the TCLP, and again, the filters were determined to be non-hazardous.

34. Please identify the date when UNICOR or the BOP notified the owners of the formerly leased 'Blue' and 'Gold' buildings at FCI Marianna of FOH and NIOSH testing results at those properties. [Report 15]

Response: The notifications were sent on October 19, 2009, via USPS certified mail. Attached are copies of the notifications along with the signed USPS receipts. (Attachment 3)

UNICOR Assessments

- Job Hazard Analysis

35. Please describe the status and results of any efforts by UNICOR to develop and implement a hazard analysis program that includes baseline hazard analysis for current operations and also job (activity-specific) hazard analysis (JHA) for both routine and non-routine activities. [Reports 15, 18]

Response: Baseline hazard analysis was recently conducted by a Certified Industrial Hygienist for all current electronics recycling operations to evaluate noise and airborne/surface levels of toxic metals. Except for a few elevated noise levels, all measured exposures were below allowable OSHA limits. In the future, additional exposure assessments will be conducted for certain non-routine tasks.

36. Please identify any policies that UNICOR has instituted that require the performance of a detailed job hazard analysis prior to beginning any new operation or before making changes to existing operations. [Reports 2, 5, 7, 8, 10]

Response: BOP's Program Statements 1600.09 and 1600.10 require the institution Safety Manager to conduct a hazard assessment, a Personal Protective Equipment (PPE) hazard assessment, and a monthly review of operations.

Prior to undertaking a new operation or changing operations, UNICOR has taken additional measures to ensure that an environmental and occupational health review is conducted beforehand. UNICOR hired an Environmental and Occupational Health Services Manager to assist in addressing EOH issues. Recently, UNICOR issued guidance to staff seeking to reiterate that EOH issues are reviewed prior to new operations or changing operations, and an EOH checklist is being utilized (Attachment 4). UNICOR plans to hire an additional staff person to assist UNICOR EOH Services Manager with these efforts. In addition, a review is also conducted by the BOP's newly formed Central Office EMS Committee.

37. Please describe the status and results of any efforts by UNICOR to conduct self assessments in its e-waste recycling factories to determine the effectiveness of its safety and health and hazard control programs. [Report 7]

Response: As previously noted, during 2009, a contractor conducted air and wipe sampling and analysis at our recycling factories. UNICOR received the final reports for our factories in September 2009. These reports made it clear that all air monitoring results in all factories were far below OSHA regulatory levels for lead, cadmium, and beryllium, and in many samples, these toxic metals were below laboratory detection limits. However, the reports did indicate elevated levels of lead and cadmium in some surface wipe samples. The elevated levels that were sometimes found on work surfaces, as well as non-work surfaces, indicate further improvements in daily and periodic cleaning activities can still be made at most of our factories. All factories (with the exception of Tucson, see response to question #6 above) have reevaluated their daily and periodic cleaning procedures and have implemented, or are in the process of implementing, more rigorous cleaning procedures for both work surfaces and non-work surfaces.

- Evaluations of UNICOR Operations

38. Please describe the status and results of any efforts by the BOP and UNICOR to perform management assessments of all UNICOR operations, not just e-waste recycling, for compliance with applicable environmental, safety and health requirements. [Reports 1, 6, 7, 9]

Response: BOP Health Services Division is conducting national self declaration environmental management system audits to evaluate conformance with ISO 14001. Also, third party environmental audits are being conducted within the BOP and where present, UNICOR operations will be included in these audits. Additional management assessments will occur as part of the RIOS and R2 certification processes.

Industrial Hygiene and Environmental Expertise

- Technical Resources

39. Please describe the status and results of any efforts by the BOP and UNICOR to establish a program to assure that health, safety, and environmental issues in UNICOR factories are adequately addressed by competent trained and certified individuals. Please identify whether the BOP or UNICOR have any plans to hire certified industrial hygienists. [Reports 6, 9]

Response: Efforts are being made by BOP and UNICOR to ensure that health, safety, and environmental issues are being adequately addressed by competent trained and certified individuals. UNICOR plans to hire an additional industrial hygienist to assist UNICOR's EOH Services Manager develop, implement, and maintain EOH plans for UNICOR operations. These plans will supplement existing BOP policy to better ensure EOH compliance. BOP's Health Services Division is also in the process of hiring additional staff to assist with EOH issues.

- Procurement of Testing and Consulting Services

40. Please describe whether the duties of the UNICOR industrial hygienist include overseeing all procurement of industrial hygiene consultant and testing services in UNICOR factories. [Reports 2, 5, 10]

Response: One responsibility of UNICOR's Environmental and Occupational Health Services Manager is to provide oversight in the procurement of industrial hygiene services for UNICOR operations.

41. Please describe how UNICOR and the BOP intend to ensure that staff and consultants conducting industrial hygiene and environmental assessments, evaluations, inspections, and monitoring activities are qualified for their assigned tasks and led by certified or highly qualified professionals. [Report 15]

Response: UNICOR's Environmental and Occupational Health Services Manager will utilize his extensive academic and professional experiences to vet and coordinate with EOH consultants for UNICOR projects.

- Training

42. Please describe any changes in training for UNICOR e-waste recycling staff and inmates resulting from recommendations made by FOH, OSHA, or NIOSH, especially as concerns dust suppression, personal protection equipment (e.g., coveralls, respirators, gloves) and hazard communication. [Reports 1, 6, 8, 9]

Response: The RBG provided heat stress, housekeeping, and hygiene general awareness level training to factory management staff at the November 2008 factory manager's conference. Also, site specific heat stress training was provided to FPI Marianna staff on September 8, 2008. Additional training is under development by both UNICOR and the BOP Environmental Management System Task Force.

- Information Sharing

43. Please describe the status of any efforts by UNICOR to operate its recycling factories in an integrated fashion and to ensure that all of its e-waste recycling factories (as well as BOP safety staff) are informed of health, safety, and environmental violations and deficiencies that are found at individual factories along with any recommended corrective actions. [Reports 3, 10]

Response: Under the new RBG General Manager, a number of changes have been made and other steps are planned toward further integration of RBG operations. First, communications from Central Office to the factories, and communication among the factories, has increased. Frequent memoranda are sent from the Central Office to all recycling factories regarding a wide variety of topics, including fiscal performance, operational aspects, environmental goals, etc. Conference calls are held with all of the factories to share information from the Central Office, as well as an opportunity for the factories to share important information with each other. A set of RBG "principles" has been developed (Attachment 5). With the addition of several new staff in the Central Office, oversight of RBG operations has been enhanced significantly, particularly in areas such as consistency of performance and the achievement of third-party certifications under RIOS and R2 for all factories. Where appropriate, personnel from one factory are sent to another in order to share operational information and experiences. All marketing personnel in the RBG have been placed under a single team leader. Equipment and commodity sales for all RBG factories are likely to largely be centralized, offering significant economic and environmental performance advantages among others. Some consolidation of sales functions has already taken place and options for further centralization of sales are being examined. By policy, each recycling factory is to be visited on a monthly basis by its institution safety officer. These safety visits are an opportunity for the factory staff and inmate workers to share information about recycling operations with the institution safety officer.

Oversight

- Recommendation Tracking

44. Please describe the status and results of any efforts by the BOP and UNICOR to implement a system to list, track, and document closure of any identified deficiencies or recommendations, regardless of the source, at UNICOR factories. [Report 10]

Response: UNICOR has sought to track implementation of the IG recommendations for its recycling operations, with the assistance of its EOH Services Manager, and is considering other tracking mechanisms specific to its operations. In furtherance of the BOP's EMS and compliance efforts, the BOP's Central Office EMS Committee is also reviewing the use of a new tracking system and centralized reporting mechanism, developed by U.S. Army Corps of Engineers, whereby institution information, reports, and findings can be incorporated onto a centralized data base that can be shared internally by appropriate staff for BOP/UNICOR operations. This is planned to be implemented by Fall 2010, and possibly sooner.

Miscellaneous

- Union Representation

45. Please describe any actions taken to implement NIOSH's recommendation that union safety and health representatives be appointed to joint labor-management safety committees that meet quarterly. [Reports 2, 5, 14, 17]

Response: Union representation is included in at least quarterly Institution Safety Committee meetings per BOP Program Statement 1600.09, Chapter 1, Section E. Union participation is also included for meetings of the Monthly Central Office Task Force and the bi-annual Institution Environmental Management Committees per BOP Program Statement 1600.10.

Glass Breaking

46. Please describe the assessment that resulted in UNICOR's decision to cease glass breaking operations.

Response: In April and May of 2009, UNICOR's new RBG General Manager conducted a cost/revenue analysis of UNICOR's glass breaking operations. This analysis (Attachment 6) was conducted at the same time the RBG was considering bids from prospective downstream vendors for various forms of glass or CRTs that UNICOR produced or could produce. This analysis, and the downstream vendor bid data, helped the RBG to determine that UNICOR was losing a significant amount of money per year by breaking CRT glass, and that instead of breaking CRT glass UNICOR should be producing whole bare CRT tubes. As of June 1, 2009, UNICOR ceased all glass breaking operations and now produces whole, bare CRT tubes for further processing by downstream recyclers.

47. Please describe how UNICOR is currently handling cathode ray tubes and whether you expect these procedures to change in the next year.

Response: UNICOR currently continues to produce whole, bare CRT tubes for processing by downstream recyclers. In late 2009, UNICOR awarded two-year contracts to two downstream recyclers for the processing of whole, bare CRT tubes that UNICOR produces from its recycling factories. Although UNICOR does not anticipate changing its handling of CRTs during the next two years, UNICOR must remain responsive to market changes. However, given that the economic analysis of UNICOR glass breaking was, and remains to be, so unfavorable, UNICOR plans its cessation of glass breaking to be permanent.

ATTACHMENT 2

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service

National Institute for Occupational
Safety and Health
Robert A. Taft Laboratories
4676 Columbia Parkway
Cincinnati OH 45226-1998

July 16, 2008
HETA 2008-0055

[redacted]
Investigative Counsel
Oversight and Review Division
Office of the Inspector General
United States Department of Justice, Suite 13100
Washington D.C. 20530

Dear [redacted]:

On November 27, 2007, the National Institute for Occupational Safety and Health (NIOSH) received your request for technical assistance in your health and safety investigation of the Federal Prison Industries (UNICOR) electronics recycling program at Federal Bureau of Prisons (BOP) institutions in Elkton, Ohio; Texarkana, Texas; and Atwater, California. You asked us to assist the United States Department of Justice, Office of the Inspector General (USDOJ, OIG) in assessing the existing medical surveillance program for inmates and staff exposed to lead and cadmium during electronics recycling, and to make recommendations for future surveillance. In addition, you asked us to assess past exposures to lead and cadmium, and to investigate the potential for take home exposure. This interim letter summarizes our findings and provides recommendations to improve the safety and health of the inmates and staff at the Federal Correctional Institution (FCI) in Elkton, Ohio. These findings will be included in a final report that will contain findings from the evaluations at all three institutions identified in your request.

Electronics recycling at FCI Elkton appears to have been performed from 1997 until May 2003 without adequate engineering controls, respiratory protection, medical surveillance, or industrial hygiene monitoring. The current GBO is a significant improvement, but can be further enhanced to limit exposure to those performing glass breaking, as well as limiting the migration of lead and cadmium from the room into other areas.

Background

FCI Elkton opened in 1997, and began electronics recycling soon thereafter. The recycling of electronic components is done in three separate buildings: 1) the main factory located within the FCI main compound (which will be referred to as the factory in this report); 2) the Federal Satellite Low (FSL); and 3) the warehouse.

The glass breaking operation (GBO) is where cathode ray tubes (CRTs) from computer monitors or televisions are processed. Disassembly and glass breaking occurred at the factory from 1997 until early 2003 and the warehouse until about 2003, although staff at Elkton were unsure when glass breaking ended at the warehouse. Based upon our review of documents and interviews with staff and inmates conducted by DOJ and by us, it appears that there was no respiratory protection used or any type of engineering control in place to minimize exposures during the GBO until about 2001. At this time a "sawdust collection system" was installed at the factory, but not in the warehouse. It was also reported that some inmates began to use respiratory protection at this time. The type of respiratory protection is unknown. In April of 2003, construction of a glass breaking room was completed in the factory.

The glass breaking room is divided into four areas by vinyl strip curtains hanging from the ceiling: an entry area, the GBO workstations, the ventilation discharge area, and the "clean area" where inmates don and doff coveralls and other personal protective equipment (PPE). There is a walk-off mat immediately outside the entrance to the room to reduce dust carryout on shoes. A local exhaust ventilation (LEV) system adapted from a spray painting operation is installed in the room. Two inmate glass breakers, who stand facing each other at the ends of a rectangular grated work surface (table), are oriented at 90 degrees to the LEV airflow entering the prefilter. Each workstation has two small rectangular hoods and fans mounted behind and just below the work surface that are intended to capture airborne dust above the Gaylord boxes containing broken CRT glass. The fans/hoods are not ducted, but discharge into the work area approximately 2 ½ to 3 feet from the face of the retrofitted spray painting LEV system. The discharge is directed toward the face of the LEV system.

An inmate receives large open-top wooden and cardboard boxes with CRTs for the GBO, and stages the boxes outside the glass breaking room. Periodically, he uses a manual pallet jack to roll the boxes through the strip curtain into the area where the operation actually occurs, and to remove Gaylord boxes of broken glass from the room.

Inmates who perform the GBO ("glass breakers") enter the clean area where they don cloth coveralls, gloves, and a hooded powered air purifying respirator (PAPR), and then enter the glass breaking area. CRTs are placed on the grate where they are manually shattered with hammers. The glass breakers reach through a strip curtain at opposite ends of the grate to break funnel glass at one work station, and panel glass at the other. Broken glass falls into Gaylord boxes positioned below the grate. When inmates finish breaking glass, they return to the clean area in their coveralls and PAPR, use a high-efficiency particulate air (HEPA) filtered vacuum on their coveralls before removing them, then remove their PPE and leave the area. Staff enter the room only when there is no glass breaking going on to put away tools and search the area, otherwise they observe the inmates in the glass breaking room through the window or vinyl curtains.

While housekeeping is a routine component of all production processes, a weekly extensive cleaning is conducted in the glass breaking area. During that operation no production takes place and all workers in this area remove settled dust by vacuuming and wet mopping. All surfaces, including walls, equipment, and floors are cleaned. The blanket pre-filter on the LEV system is vacuumed using the HEPA vacuum cleaner.

Additionally, at approximately monthly intervals, the filters in the LEV system are removed and either cleaned or replaced. Prior to an evaluation by Federal Occupational Health (FOH) and the NIOSH Division of Applied Research Technology (DART) in March 2007, filters were removed and cleaned by vacuuming, shaking, or banging on the floor to shake dust out. This took most of the work shift and reportedly created a thick cloud of dust within the enclosed glass breaking room. This process was changed after the FOH-NIOSH/DART evaluation, and is reported to now be a wet process where the filters are wetted, removed, and bagged for disposal and new filters used as replacements.

A chip recovery program began at the FSL in October 2005, and ended in October 2006. Computer chips were removed from the mother board by holding the mother board over either a lead solder pot or a lead solder wave fountain. Although the solder temperature was supposed to be maintained just above the melting point (reportedly 400 to 600 degrees F), staff reported that the solder temperature was set subjectively (i.e., the temperature was not measured), which may have resulted in overheating, producing lead fume. There was no LEV for the first several months of this operation until what was described by staff as a "make-shift PVC system" was installed. This LEV system was replaced the following year with a LEV system designed by a consultant. Despite the use of LEV at chip recovery stations, staff described a visible haze in the FSL, and expressed concern about exposure to lead fume from this operation.

Assessment

In response to your request we reviewed the following documents:
- Results of medical surveillance provided by your office;
- Results of biologic monitoring provided by the medical clinic at FCI Elkton;
- Work instructions for the GBO and maintenance;
- Rosters for inmates working in recycling that provided location and dates of work, provided by the factory manager;
- Timelines for recycling operations provided by the American Federation of Government Employees (AFGE) Local 607;
- DOJ interviews with staff and inmates;
- Industrial hygiene sampling performed by consultants to UNICOR;
- Findings and recommendations of industrial hygiene assessments performed by FOH; and
- Draft report of the industrial hygiene assessment performed by the NIOSH/DART

We conducted a site visit on February 21-22, 2008 with you and a representative of FOH . During this site visit we held an opening conference with FCI and UNICOR management, AFGE representatives, UNICOR recycling staff, and the health service administrators and regional medical director. After the conference we toured the FCI, including the recycling factory, the warehouse, and the FSL. We conducted informational meetings for FCI and UNICOR staff, and inmates. We spoke to several UNICOR staff who approached us after the meetings about their medical issues and how they might relate to exposures at the FCI. We also met with the safety manager, factory manager, and health services administrator. We ended the site visit with a closing conference where we presented our initial impressions and recommendations.

We were told that BOP has had an industrial hygienist on staff for several years, and that UNICOR recently hired one. Neither of these individuals was present during our visit, and it is unclear what, if any role, they may have had in setting up or monitoring the electronic recycling program.

On March 25, 2008, we conducted an industrial hygiene survey to determine if lead- and cadmium-bearing dust had migrated from the glass breaking room to other FCI buildings and work areas and if there was evidence of "take-home" contamination in inmate housing and privately-owned staff vehicles. The purpose of this survey was to gather additional information to complement the extensive body of industrial hygiene data collected by FOH and NIOSH/DART.

The survey was preceded by a brief opening meeting with FCI and UNICOR management, AFGE representatives, and UNICOR recycling staff to explain the purpose of the site visit. Following the meeting, we were escorted to the factory and automated data processing (ADP), where we set up area air sampling pumps to assess airborne concentrations of lead, cadmium, and other elements (minerals and metals). Air samples were collected, digested, and analyzed according to NIOSH Method 7303 [NIOSH 2003a] with modifications for digestion.

Wipe samples were collected from undisturbed dusty surfaces in ADP, as well as at air diffusers in ADP, inside air handling units serving the laundry, visiting room, education, chapel, ADP offices, and from the floor mat at the entrance to the glass breaking room. Wipe samples were collected from the floor in three inmate cubicles where inmates place their boots, and from combination locks on lockers in the cubicles. Wipe samples were collected from personal vehicles used by UNICOR staff. Flat surfaces (e.g., ADP work stations) were sampled by wiping a 100 square centimeter (cm^2) area (10 cm^2 x 10 cm^2) according to the sampling procedure outlined in NIOSH Method 9102 [NIOSH 2003b]. Surface area was not considered when collecting wipe samples from non-flat surfaces such as padlocks and vehicle steering wheels. Hand wipe samples were collected according to the dermal sampling procedure outlined in NIOSH Method 9105 [NIOSH 2003c] Hand wipe samples were collected after workers had washed their hands at the end of the workday. All wipe samples were collected using Ghost Wipes, which were digested and analyzed for elements according to NIOSH Method 9102 [NIOSH 2003b] with modifications for digestion. Bulk samples of material were collected from beneath the stone roof ballast on the factory roof at the exhaust fan of the sawdust collection system that was in use from 2001 until May 2003. Bulk samples were digested and analyzed for elements according to NIOSH Method 7303 [NIOSH 2003a] with modifications for digestion.

Results and Discussion[1]

Medical surveillance

Inmates

Medical surveillance began in March 2003, immediately prior to the installation of the glass breaking room, for inmates in glass breaking and disassembly, and staff. It is performed annually and consists of limited biological monitoring but no physical examinations. Biological monitoring consists of blood lead levels (BLL), blood cadmium (CdB), urine cadmium (CdU), and urine beta-2-microglobulin (B-2-M), although not all inmates involved in GBO and disassembly received all of these tests. In addition, some inmates had urine lead, blood or urine arsenic or mercury, and serum B-2-M, none of which seem to have been based upon work exposures or indicated by work history. Paper copies of test results are maintained in both the inmate's personal medical record and with UNICOR management; however, the factory manager has been unable to locate any medical surveillance results at this time. Each inmate's medical records are transferred with them; no medical records are retained at Elkton after an inmate is either transferred or released. Inmates are only informed of the results of their biological monitoring if the results are abnormal. Although start dates were not available to us for all inmates working in the GBO, it does not appear that any inmate had biological monitoring performed preplacement. Because smoking can increase cadmium and lead burdens in the body, it is important to note that smoking has been banned throughout the FCI for inmates since 2004, although staff may smoke in designated areas. The results of the available inmate biological monitoring are summarized below by area. Because measurements on individual inmates and staff were sporadic and the number tested small, no group analyses were performed.

Glass Breaking Operation

We received biological monitoring results for 26 inmates who performed glass breaking. Each inmate was tested 1 to 5 times, for a total of 54 rounds of testing. Table 1 shows inmate BLLs by year collected. The laboratory's limit of detection (LOD) for blood lead was 1.0 microgram per deciliter of whole blood (µg/dL). In general, BLLs declined over time. Five of the seven tests done in early 2003 were done in March or April and may reflect exposures to lead prior to installation of the glass breaking room, but do not reflect exposures prior to the installation of the sawdust ventilation system in 2001 because the half-life of lead in blood is too short.

There were 50 CdB tests done on inmates from 2003-2007. The laboratory's LOD for CdB was 0.5 microgram per liter (µg/L). Twenty-seven were below the LOD; the remainder ranged from 0.5-1.2 µg/L. The earliest CdB were done in June 2003. Six inmates were tested in June 2003, and three were below the LOD; the remainder ranged from 0.5-1.1 µg/L. These six CdB may

[1] See *Occupational exposure limits and health effects* in Appendix .

reflect exposures to cadmium prior to installation of the glass breaking room, but do not reflect exposures prior to the installation of the sawdust ventilation system in 2001 because the half-life of cadmium in blood is too short.

There were 28 CdU measurements. More than one laboratory was used for this analysis. At the lab most commonly used the LOD was 1 µg/L and 23 measurements were below this LOD. Other labs had lower LODs. If the CdU was above the LOD, then it was adjusted to the urinary concentration of creatinine to control for the variability in urine dilution. The five that were above the LOD ranged from 0.5 micrograms per gram of creatinine (µg/g/Cr) to 1 µg/g/Cr. These CdU measurements do integrate exposure over time because the half-life of cadmium in the urine is years to decades. However, only one of these inmates worked in GBO prior to May 2001; his CdU was less than 1 µg/L. Six inmates had urinary B-2-M measured; these ranged from less than 10 to 54 µg/g/Cr.

Glass Breaking Room Maintenance

One inmate who performed cleaning and filter change-outs in the GBO was monitored for lead and cadmium exposure from April 2003 until 2007, prior to the change in the filter change-out process. His annual BLLs ranged from 10-4 µg/dL, with a progressive decline over time. His CdBs ranged from 0.5 to 0.8 µg/L, and his CdUs were less than the LOD of 1 µg/L. Another inmate who performs maintenance in the room was monitored in 2007 and 2008. His BLL was 5 in 2007, and was not done in 2008. CdB was 0.6 µg/L in 2007, and less than the LOD of 0.5 µg/L in 2008. CdUs were less than 1 µg/L.

Chip Recovery

We reviewed biological monitoring for 14 inmates who worked in the chip recovery area; all were tested on February 16, 2007, 4 months after the operation ceased. BLLs ranged from 1-5 µg/dL. CdB was below the LOD for four inmates, and the remainder ranged from 0.5-1.1 µg/dL. All but one CdU were below the LOD, and the remaining one was 0.6 µg/g/Cr. No inmates had urine B-2-M measured.

Factory (not GBO)

We reviewed the results of biological monitoring done in April 2007 for 14 inmates who worked in the factory, but did not perform glass breaking. Two had BLLs less than the LOD, and the others ranged from 1-3 µg/dL. A BLL of 8 µg/dL was found in one inmate monitored in 2003. Seven had CdBs below the LOD, and the remainder ranged from 0.5-1.0 µg/L. Twelve had CdU below the LOD of 1 µg/L, and the other two were 0.2 and 0.6 µg/g/Cr. None had urine B-2-M performed.

Warehouse

Fourteen inmates who worked in the warehouse, but did not perform glass breaking, had biological monitoring done in February 2007, almost 4 years after the GBO ceased in the warehouse. BLLs ranged from1-5 µg/dL. Seven had CdBs below the LOD, and the remainder ranged from 0.5-0.8 µg/L. All 14 had CdU below the LOD, and none had urine B-2-M performed.

Clerks

We reviewed biological monitoring results for 2 clerks, one from the factory and one from the FSL. One had testing annually from 2003-2005, the other was tested in 2007. There were three BLLs ranging from 1-2 µg/dL. Three of four CdBs were less than the LOD of 0.5 µg/L, and one was 0.6 µg/L. Two CdUs were less than the LOD of 1 µg/L, and one B-2-M was 40 µg/g/Cr.

Results of other tests

We reviewed biological testing results for which we were unable to determine the reason the testing was done on inmates. Two inmates had serum B-2-M above normal. This test is often used to determine prognosis in hematologic malignancies and for dialysis patients. It is difficult to interpret in this setting because no medical history is available. In addition, three inmates had elevated urinary total arsenic, and one also had an elevated blood arsenic. The arsenic results were speciated and found to be organic arsenic, the type of arsenic which is found in seafood and is not considered toxic. All other tests (urine lead, blood or urine arsenic and mercury) were within normal limits.

UNICOR Staff

UNICOR staff see their private physicians for medical surveillance so their exams are not standardized. We reviewed available medical records and found that most staff members had records for CdB, CdU, urine B-2-M, and zinc protoporphyrin (ZPP). Some had physical exams documented, some had urinalysis, complete blood count, pulmonary function tests, or chest x-rays.

We reviewed the biological monitoring and medical exams provided for 10 UNICOR staff, including nine of 11 recycling technicians who had worked in electronics recycling. Each was tested between 1 and 5 times between 2003 and 2007. Their testing was done by a number of different laboratories, and thus, the LOD and range of normal for the tests varied. For example the LOD for BLL was either 1 or 3 µg/dL. Eighteen BLLs were below the LOD, and seven ranged from 1-2.5 µg/dL. One employee had a BLL of 10 µg/dL, however his BLLs the year before and after were below the LOD. His urine B-2-M was elevated at 445 µg/g/Cr, but he had normal B-2-M levels the year before and after this test result. Standard medical practice usually dictates that a physician repeat a lone elevated test result to determine whether the result is spurious (such as from lab error) or actually elevated. The tests were not repeated at the time, so laboratory error cannot be ruled out. Twenty-five CdB were done; 12 were below an LOD of 0.5

µg/L, 2 were reported as zero, and the remainder ranged from 0.2-2.1 µg/L. Twenty-one CdU were done; 13 were below the LOD of 1 µg/L and the rest ranged from 0.1-0.7 µg/L. Eighteen urine B-2-M were done between 2003 and 2007, and all were normal with the exception noted above. Twenty-two ZPPs were done between 2003 and 2007, and all were normal.

Interviews with Staff

Five staff asked to speak with us after NIOSH's public meeting with concerned Elkton staff on February 21, two of the five worked in recycling. One of the recycling staff reported having been diagnosed with iron deficiency anemia in the past year. This condition is not related to recycling work or other occupational exposures at FCI Elkton. The other reported an increase in the blood zinc level over the past year, however, when we reviewed this employee's biological monitoring results, we found that it was the ZPP that had risen, and that the levels were still well within normal limits. ZPP is not related to blood zinc. Of note, both staff noted these reported conditions in the recent past, well after construction of the glass breaking room. An employee from an adjacent area reported bipolar disorder, and one from another building reported transverse myelitis, neither of which can be related to this workplace. Finally, another employee from the adjacent area reported seeing a private physician and being tested for lead and cadmium, and that both were below the LOD.

Industrial Hygiene

Records Review

The OIG provided consultant reports, industrial hygiene sampling results, and laboratory analysis results for 13 surveys conducted at FCI Elkton between summer 2001 and November 2007. Twelve surveys were conducted by consultants to UNICOR, and one was conducted by FOH in conjunction with a NIOSH/DART evaluation. Five reports contained sampling data indicating worker exposures to cadmium at levels exceeding the OSHA action level, and two reports documented exposures above the OSHA permissible exposure limit (PEL) for cadmium. One of the reports documented lead exposure above the PEL during a now-discontinued filter change procedure.

No industrial hygiene reports, sampling data, or laboratory analysis reports were provided for the period from 1998 until August 2001. According to information provided by the OIG, it appears that there are no industrial hygiene reports for this period; thus, we have no information or data to help us assess the potential for early exposures to lead, cadmium, and possible other agents when glass breaking occurred in other locations without local exhaust ventilation. Assuming that we received reports for all industrial hygiene evaluations and/or laboratory analyses conducted from 2001 through 2007, we noted that only two evaluations were conducted prior to 2004. Two surveys were performed in 2004; no industrial hygiene evaluations were conducted in 2005, other than an OSHA inspection which resulted in a serious citation for exposure above the cadmium PEL and inadequate engineering/work practice controls.

Our review of the consultant reports found that two consultants hired by UNICOR measured worker exposures exceeding the OSHA action level for cadmium, but did not discuss the findings or the implications of exceeding the action level. This omission occurred during one of two surveys conducted in 2004, and two of five surveys in 2006. The quality of the reports, i.e., observations, discussion, recommendations, was greatly improved in 2007 when the most recent consultant and FOH independently evaluated the glass breaking process, ventilation, and work practices.

2001

A laboratory report of sample analysis, dated August 20, 2001, was provided to us. This analytical report contains no information regarding the type of sample (personal sample versus area sample), sample volume, location, the work being performed, PPE, or exposure control methods. Lead was measured in one of the two air samples that were analyzed for lead; cadmium was not detected. Wipe samples indicated quantifiable amounts of lead and cadmium on surfaces.

June 2003

A laboratory report of sample analysis, dated June 3, 2003, was provided to us. Although this analytical report contains no information regarding sample type, work processes, PPE, or exposure control methods, the report does contain a record of sample volume along with results for cadmium and lead. Based on an average sample volume of 744 liters, and assuming that sampling was conducted at the usual rate of two liters per minute, the nine samples from late May 2003 provide an estimate of airborne concentrations throughout a 370 minute sampling period. The analytical results indicate that the airborne lead concentrations were likely below the OSHA action level; however, airborne cadmium concentrations may have exceeded the OSHA PEL in five of the nine samples, and may have exceeded the action level in one other sample (range: 3-37 micrograms per cubic meter of air [$\mu g/m^3$]). It is important to note that, at best, these samples only provide an estimate of airborne concentrations at unknown sampling locations under unspecified conditions. If sampling flow rates were higher or lower than the typical rate of two liters per minute, the concentration estimates could be higher or lower than those noted here.

2004

Consultant reports were provided for two evaluations conducted during June 2004. On June 2, personal breathing zone (PBZ) samples were collected for three glass breakers and one feeder; four area samples were collected on June 2. All results were below the action level for lead and cadmium. Wipe samples determined the presence of lead and cadmium on surfaces in the work area. Sampling was repeated on June 18, and the consultant reported that samples collected on this date revealed "no overexposure;" however, results in the sample summary sheet show that a PBZ sample collected on one of three glass breakers indicated exposure to airborne cadmium at the OSHA PEL of 5 $\mu g/m^3$. Although this sample did not prove statistical exceedance of the PEL, the report should have contained a recommendation for further evaluation, and guidance regarding OSHA requirements for periodic air and medical monitoring where workers are exposed above the action level. In addition, one of four area samples indicated an airborne cadmium concentration of 5 $\mu g/m^3$. Wipe samples collected on June 18 indicated that surface contamination had been reduced in locations previously sampled on June 2. Wipe sampling was repeated on July 9; results were similar to those for the June 18 wipe samples. The consultant

measured air velocity at three locations on June 18 to assess the direction and velocity of air into and through the GBO. The consultant's report did not interpret these measurements with respect to the effectiveness of the LEV system.

2005

No consultant reports were provided for 2005. On September 8, 2005, OSHA conducted air monitoring for lead and cadmium that determined one of two glass breakers was exposed to cadmium above the PEL, and lead above the action level. UNICOR was cited for the overexposure and for inadequate engineering and work practice controls.

2006

A different environmental consulting firm was hired to conduct air sampling during glass breaking during site visits in January, February, June, July and September 2006.

PBZ sampling results for two glass breakers and two workers outside the booth did not exceed the action level for cadmium or lead on January 17. Several air velocity measurements were obtained "to determine if sufficient general ventilation is provided within the glass breaking area." No authoritative industrial hygiene references or guidelines were used to support the consultant's conclusion that adequate ventilation was provided.

Sampling and air velocity measurements were repeated on February 17. Air sampling results for this visit indicate that cadmium exposures exceeded the action level for one handler and one glass breaker. As in one of the 2004 consultant reports, this report did not note that the action level had been exceeded.

The consultant returned on June 26 and 27 to conduct air sampling and assess ventilation in the GBO and chip recovery. Sample results indicate that a glass breaker was exposed to cadmium above the PEL, and a handler was exposed above the action level. As in earlier consultant reports, the report for June 26 did not mention or discuss the significance of exceeding the action level, nor did it provide guidance regarding medical surveillance, a written compliance program, and other OSHA requirements triggered when air sampling indicates worker exposure above the PEL. Air sampling conducted on June 27 at chip recovery in the FSL did not detect lead or cadmium above the analytical LODs. The consultant also collected air samples for ethylene glycol and n-propanol at chip recovery. It is not clear why these chemicals were selected for evaluation.

The OIG provided two laboratory reports of sample analyses (both reports are dated July 10, 2006) which appear to be for wipe samples collected in GBO and chip recovery during the June evaluation. We did not find these laboratory results in the industrial hygiene reports that were provided to us. One report indicates small quantities of cadmium in five samples collected from surfaces in chip recovery (less than 4.8 μg/sample). The average quantity of lead in the five wipe samples was much greater: 1600 μg/sample (range 190 to 6800 μg/sample). Small quantities of cadmium and lead were measured in one sample collected from an inmate's hands. The other laboratory report indicates that the average quantities of cadmium and lead in six surface wipe samples collected in the GBO was 35 μg/sample and 290 μg/sample respectively. The average amount of cadmium and lead in three hand wipe samples was 40 μg/sample for both elements.

A consultant report for a July 7 survey indicates concentrations of cadmium and lead to be well below occupational exposure limits in five PBZ and five area air samples. A second report for this survey notes that cadmium and lead were measured in five surface wipe samples and three hand wipe samples. This report noted a need for more thorough cleaning of surfaces and hands.

On September 6, the consultant collected five PBZ and five area samples. All results were below OELs. Hand wipe samples from three individuals (one staff, two inmates) measured 5.8, 340, and 870 µg-cadmium on their hands. The corresponding quantities of lead in the hand wipes was 26, 250, and 710 µg-lead/sample. The average quantity of cadmium and lead in five surface wipe samples was 240 µg (range 10 to 640 µg), and 19,000 µg (range 57 to 85,000 µg) respectively.

2007

On February 27 and 28, FOH collected air, wipe, bulk dust, and waste samples in the factory, warehouse, and FSL where electronics recycling had been conducted in the past, or was currently being conducted. Air sampling during two days of glass breaking indicated that worker exposures were below applicable occupational exposure limits (OELs). The report noted that the LEV system was adequately controlling exposure at the GBO during routine operations; however, air sampling during LEV filter change-out, a maintenance function, found airborne cadmium and lead concentrations well above the PELs. This overexposure, which exceeded the respirator protection factor, resulted from poor change-out procedures that included banging the dirty filters together to knock the dust off. The results of personal air monitoring in the warehouse and FSL were well below OELs. (Note: chip removal in the FSL had been discontinued in 2006.) Wipe samples in the factory, warehouse, and FSL found significant lead and cadmium contamination on various surfaces. This report concluded that the surface contamination does not pose an "imminent inhalation threat," but could "be responded to in a prompt but well-coordinated manner." FOH noted that migration of lead- and cadmium-bearing dust from the current GBO could be reduced by installing a three-stage decontamination room.

On September 7, the third industrial hygiene consultant, for which we received reports, evaluated the GBO with PBZ sampling, surface wipe sampling, and assessment of the LEV system. Airborne cadmium was above the action level. Ventilation measurements and observations indicated apparent leakage in the LEV system. This report contained numerous recommendations regarding ventilation system repair, testing, and maintenance, as well as recommendations for improving work practices and use of PPE.

On November 6, the industrial hygiene consultant conducted a subsequent evaluation of the GBO. Although all air sampling results were below the action levels for lead and cadmium, the results for one glass breaker indicated that his exposure approached the action level for cadmium. Wipe samples found various concentrations of lead and cadmium on surfaces in the glass breaking area.

HHE Sampling, March 25, 2008

Wipe sample results are presented in Table 2. Wipe samples collected from three ceiling heating, ventilating and air-conditioning (HVAC) diffusers in ADP indicated concentrations of cadmium and lead ranging from 11-14 μg/100 cm^2 and 49-55 μg/100 cm^2 respectively. Lead and cadmium were found in a wipe sample of undisturbed dust on a ledge along the north wall of the ADP mezzanine, and in the mixed air plenum of air handler AH-3, which serves the factory tool room and ADP offices. These results indicate that undetermined concentrations of lead and cadmium migrated from the factory to ADP, possibly via the HVAC system. Given the low concentrations of airborne lead and cadmium determined by air sampling in 2007, it seems unlikely that significant migration of contaminants is occurring at this time. It is our opinion that the wipe sample results reflect much earlier workplace conditions, i.e., when glass breaking occurred in the middle of the factory with only a roof exhaust fan to remove airborne dust.

Wipe samples, collected in three air handlers serving the laundry, education, visiting room, and chapel found quantifiable concentrations of lead and cadmium. Concentrations inside these air handlers were much lower than those inside AH-3 in the ADP. The route whereby these contaminants migrated to these air handlers is not clear.

Two bulk samples of material beneath stone roof ballast on the factory roof at the exhaust fan of the sawdust collection system that was in use from 2001 until May 2003 contained 1000 and 1400 parts per million (ppm) lead (by weight), and 5000 and 7400 ppm cadmium (by weight). These samples provide evidence that glass breaking operations during the time the sawdust collection system was in use generated cadmium- and lead-bearing dust that was exhausted to the roof.

Cadmium and lead contamination was found on the return air damper of rooftop air handler AHU-5HV1, which serves the factory. Given the low contaminant concentrations indicated by air sampling conducted by FOH and the current industrial hygiene consultant, we believe contamination inside this unit primarily reflects conditions prior to construction of the present glass breaking room.

As shown in Table 2, quantifiable amounts of cadmium were present on the floor in three inmate cubicles where shoes are kept. Some lead was present in one cubicle. The presence of these metals on the floor indicates that some lead and cadmium is being tracked out of the glass breaking room. This finding is consistent with sample results showing lead on the soles of inmate and staff footwear (Table 2, samples W-27 and W-28).

Hand wipe samples following hand washing by inmate workers demonstrated lead contamination on hands ranging from approximately 1.5 to 130 μg/wipe. This demonstrates that handwashing needs to be improved.

Lead and cadmium contamination in two staff personal vehicles was generally below the limits of detection and/or quantitation; however, 3.3 μg-lead/100 cm^2 was present on the center of the steering wheel in one vehicle. This indicates a potential for take-home contamination, but the concentration is minimal.

Area air sampling results are shown in Table 3. One air sample indicated a quantifiable airborne concentration of lead and cadmium. This sample, which was collected within a few feet of the glass breaking operation (behind the strip curtain separating the GBO from the entry and change-out areas), was well-below applicable OELs. The area sample collected at the window in the GBO entry detected a trace concentration of lead and cadmium. The other six area air samples collected in the glass breaking room, factory, and ADP did not detect lead or cadmium.

Conclusions

Electronics recycling at FCI Elkton appears to have been performed from 1997 until May 2003 without adequate engineering controls, respiratory protection, medical surveillance, or industrial hygiene monitoring. Because of the lack of both biological monitoring and industrial hygiene data, we cannot determine the extent of exposure to lead and cadmium that occurred during that time frame, but descriptions of work tasks from staff and inmates indicate that exposures during that time frame were likely higher than current exposures. The current GBO is a significant improvement, but can be further enhanced to limit exposure to those performing glass breaking, as well as limiting the migration of lead and cadmium from the room into other areas. While some take-home contamination does occur, surface wipe sampling and biological monitoring suggest that take-home contamination does not pose a health threat at this time. Take-home contamination can be further reduced by changes to the GBO, work practices, and improved personal hygiene as recommended below.

We cannot determine the extent of exposure to lead that occurred in the chip recovery process because of the lack of data. Descriptions of work tasks from staff, and a BLL of 5 µg/dL in an inmate 4 months after the process ended indicate that exposure to lead during this process did occur. We found no evidence that actions were taken to prevent exposure to lead at the outset in the chip recovery process and found that no medical surveillance was performed until after the process ended.

Medical surveillance that has been carried out among inmates and staff has not complied with OSHA standards. No medical exams (including physical examinations) are done on inmates; staff receive inconsistent examinations and biological monitoring by their personal physicians; biological monitoring for lead is not done at established standard intervals; and results are not communicated to the inmates. Inappropriate biological monitoring tests have been done. Records of medical surveillance are not maintained by the employer for the appropriate length of time.

At this time, after careful review of existing records and current operations, we conclude that the only persons with current potential for exposure to either lead or cadmium over the action level are the inmates who perform glass breaking or the monthly filter change-out. We believe that medical surveillance can be discontinued for all other inmates and staff. Some former inmates and/or staff may require surveillance under the OSHA cadmium standard.

Wipe and bulk sample results indicated that lead- and cadmium-containing dust migrated out of the GBO in the past. Low levels of lead- and cadmium-containing dust on staff and inmate shoes and the floor mat outside the glass breaking room suggest that this is still occurring, although in small amounts. Contamination of inmate housing and staff vehicles is occurring, but is minimal;

we have no data regarding the extent of past contamination in these locations. Hand washing is less than optimal for some individuals, including both staff and inmates. There is legacy contamination of the factory, FSL, and warehouse, which is scheduled to be remediated. We concur with FOH that surface contamination does not present an imminent hazard at this time, and should be remediated in a "prompt but well-coordinated manner."

Recommendations

The following recommendations are provided to improve the safety and health of both the staff and inmates involved with electronics recycling at the Elkton FCI.

1. Continue to work with the current industrial hygiene consultant to increase the effectiveness of the LEV system. Improvements in the LEV system will not only reduce worker exposure to airborne contaminants, but will capture dust that would otherwise contribute to surface contamination, which could lead to an ingestion hazard (hand-to-mouth) or inhalation hazard if re-entrained. Conduct an industrial hygiene assessment to determine inmate exposure to lead and cadmium after the LEV is modified.

2. The change-out room should be reconfigured to ensure that GBO workers do not carry cadmium or lead out of the glass breaking room. Separate storage should be provided for non-work uniforms and GBO work apparel/PPE. All potentially-contaminated work clothing and PPE should remain in the "dirty" chamber of the change-out room; non-work clothing should never come in contact with work items. As a minimum requirement, workers should be required to wash hands and all potentially exposed skin after doffing PPE, before putting on uniforms when exiting the GBO. Work clothes and PPE should never be worn outside of the GBO to minimize migration of cadmium- and lead-contaminated dust to other parts of the institution. Laundry personnel should be made aware of the potential exposure to lead and cadmium from work clothes and take action to minimize exposure to themselves.

3. Ensure full compliance with all applicable OSHA standards, including the General Industry Lead standard [29 CFR 1910.1025], the Cadmium Standard [29 CFR 1910.1027], the Hazard Communication Standard [29 CFR 1910.1200], and the Respiratory Protection Standard [29 CFR 1910.134]. This includes record keeping requirements, communication requirements, compliance plans, and medical surveillance. In addition to the OSHA requirements, we recommend that the preplacement examination for cadmium exposure be identical to the periodic examinations so that baseline health status may be obtained prior to exposure.

4. Contract a board-certified, residency-trained occupational medicine physician who is familiar with OSHA regulations on exposures at the FCI to oversee the medical surveillance program. BOP may be able to find a local physician, or contract with Federal Occupational Health. This contractor should also oversee medical clearance for respirators.

5. Carefully evaluate the qualifications and expertise of any consultant who may be hired to assess occupational or environmental health and safety issues. Anyone can present him/herself as an "industrial hygienist," regardless of education, training, or expertise. One useful benchmark for vetting individuals who provide industrial hygiene services is the designation of Certified

Industrial Hygienist (CIH). Certification by the American Board of Industrial Hygiene (ABIH) ensures that prospective consultants have met ABIH standards for education, ongoing training, and experience, and have passed a rigorous ABIH certification examination. The UNICOR and/or BOP industrial hygienists can assist in the selection of your consultants.

6. Perform a detailed job hazard analysis prior to beginning any new operation or before making changes to existing operations. This will allow BOP to identify potential hazards prior to exposing staff or inmates, and to identify appropriate controls and PPE. Involve the BOP and/or UNICOR industrial hygienists in these job hazard analyses. If medical surveillance is needed then BOP should perform pre-placement evaluations of exposed staff and inmates.

7. Appoint a union safety and health representative. This individual should be a regular participant on the joint labor-management safety committee that meets quarterly. Since inmates do not have a mechanism for representation on this committee, ensure that they are informed of its proceedings and that they have a way to voice their concerns about and ideas for improving workplace safety and health.

This interim letter will be included in a final report that will include visits to two other BOP facilities. Please post a copy of this letter for 30 days at or near work areas of affected staff and inmates. Thank you for your cooperation with this evaluation. If you have any questions, please do not hesitate to contact us at 513-841-4382.

Sincerely yours,

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Tables

Table 1. Blood lead levels of inmates doing glass breaking, by year

HETA 2008-0055, Federal Bureau of Prisons, FCI Elkton, Elkton, OH

Year	Mean BLL (µg/dL)	Median BLL (µg/dL)	Range (µg/dL)	Number sampled
2003	5.6	4.5	3-9	7
2004	3.7	3.0	2-7	7
2005	3.7	3.9	2-10	12
2006	2.3	2.0	1-5	13
2007	1.7	1.5	1-4	10

HETA 2008-0055
Federal Bureau of Prisons
FCI Elkton, Elkton, OH

Table 2.
Wipe sampling results, March 25, 2008

Sample ID	Location	Surface	Approx. Elevation (feet)	Description	Area Wiped	Cadmium		Lead	
					cm^2	µg/wipe	µg/100 cm^2	µg/wipe	µg/100 cm^2
W-1	ADP	HVAC diffuser	~15	row ADP4 above workstation C116	200	27	14	110	55
W-2		desktop	2½	Workstation C116	100	nd	--	nd	--
W-3		HVAC diffuser	15	near center of room; Row ADP4 above workstation C025	200	21	11	97	49
W-4		desktop	2½	workstation C025	100	trace	--	nd	--
W-5		HVAC diffuser	15	southwest corner of ADP; Row ADP1 above workstation C007	200	28	14	110	55
W-6		desktop	2½	workstation C007	100	nd	--	nd	--

Table 2. (Continued)
Wipe sampling results, March 25, 2008

Sample ID	Location	Surface	Approx. Elevation (feet)	Description	Area Wiped	Cadmium		Lead	
					cm^2	µg/wipe	µg/100 cm^2	µg/wipe	µg/100 cm^2
W-7	Factory Mezzanine	C-beam	8	ledge along north wall	100	820	820	970	970
W-8		mixed air plenum, AH-3	n/a	serves offices along north wall from factory tool room to ADP	315	70	22	430	140
W-9	ADP Mezzanine	C-beam	8	ledge along north wall	100	53	53	55	55
W-10	Factory Roof	return air damper AHU-5HV1	n/a		not determined	1400		1200	
W-11	Mechanical Room - laundry	filter brace - return air 5-AH2	n/a	serves laundry	not determined	4.9		32	
W-12	Mechanical Room - laundry	Mixed air plenum 5-AH2	n/a	serves laundry	315	2.1	0.67	19	6.0
W-13	Mechanical Room	Outside air plenum 5-AH4	n/a	serves education	270	8.3	3.1	46	17
W-14	Mechanical Room	mixed air plenum 5-AH5	n/a	serves visiting room and chapel	100	2.7	2.7	16	16
W-15	C/D Unit D-A cube 51U	floor, inmate cubicle	0	where shoes are kept	100	0.14	0.14	nd	--
W-16		combination lock on inmate locker	1½		not determined	13		nd	
W-17	C/D Unit D-A cube 29L	floor, inmate cubicle	0	where shoes are kept	100	0.19	0.19	nd	--
W-18		combination lock on inmate locker	1½		not determined	0.19		nd	
W-19	C/D Unit D-B cube 005	floor, inmate cubicle	0	where shoes are kept	100	0.23	0.23	2.2	2.2
W-20		combination lock on inmate locker	1½		not determined	0.10		nd	
W-21	Factory	hands, inmate #1	n/a	hand wipe after washing hands at end of workday in glass breaking	not determined	28		130	
W-22		hands, inmate #2	n/a			7.2		41	
W-23		hands, inmate #3	n/a			0.23		trace	
W-24		hands, inmate #4	n/a			0.51		4.3	
W-25		hands, inmate #5	n/a			11		41	

Table 2. (Continued)
Wipe sampling results, March 25, 2008

Sample ID	Location	Surface	Approx. Elevation (feet)	Description	Area Wiped	Cadmium		Lead	
					cm^2	µg/wipe	µg/100 cm^2	µg/wipe	µg/100 cm^2
W-25	Factory (continued)	hands, inmate #5	n/a	hand wipe after washing hands at end of workday in glass breaking	not determined	11	[redacted]	41	[redacted]
W-26		hands, inmate #6	n/a			2.2	[redacted]	3.1	[redacted]
W-27		sole of right shoe, staff	n/a	worn in glass breaking	not determined	3.1	[redacted]	120	[redacted]
W-28		sole of sneaker, inmate #4	n/a	sneaker not worn while working	not determined	4.3	[redacted]	200	[redacted]
W-29		exterior, locker #2	6	locker door in glass breaking decon area	100	trace	--	nd	[redacted]
W-30		bench seat	1½	glass breaking decon area	100	0.30	0.30	9.8	9.8
W-31		floor mat	0	entry to glass breaking room	100	3.9	3.9	490	490
W-32		floor mat	0		100	7.2	7.2	1000	1000
W-39	personal vehicle (Jeep)	steering wheel	n/a	center of steering wheel	100	trace	--	3.3	3.3
W-40		steering wheel	n/a		not determined	trace	[redacted]	trace	[redacted]
W-41		driver's seat	n/a		100	trace	--	nd	--
W-42	personal vehicle (Mazda)	console-arm rest	n/a		100	0.14	0.14	trace	--
W-43		steering wheel	n/a		not determined	0.098	[redacted]	2.3	[redacted]
W-44		carpet	n/a	left side at foot rest	100	nd	--	trace	--

Table 3. Area air sampling for lead and cadmium

HETA 2008-0055, Federal Bureau of Prisons, FCI Elkton, Elkton, OH

Location	Sampling Period (minutes)	Sample Volume (liters)	Cadmium Concentration ($\mu g/m^3$)	Lead Concentration ($\mu g/m^3$)
HEPA discharge area behind glass breaking	407	810	nd	nd
At window in glass breaking	408	816	trace	trace
Stanchion next to glass breaking	376	753	0.31	4.6
Change-out area near clock	406	808	nd	nd
Mezzanine rail above glass breaking	403	802	nd	nd
At vinyl strip curtain in glass breaking entry	387	774	nd	nd
ADP, east center	380	760	nd	nd
ADP, west center	381	762	nd	nd
NIOSH REL-TWA			Ca	50
OSHA PEL-TWA			5	50
ACGIH TLV			10	50

"nd" (not detected) indicates that the sample result is below the analytical limit of detection. The limits of detection for cadmium and lead are 0.02 ug/wipe and 0.6 ug/wipe, respectively.

"trace" indicates that the sample result is between the analytical limits of detection and quantitation. The limits of quantitation for cadmium and lead are 0.077 ug/wipe and 1.9 ug/wipe, respectively.

See the Appendix for a discussion of NIOSH recommended exposure limits (RELs), OSHA permissible exposure limits (PELs), and ACGIH Threshold Limit Values (TLVs).

"Ca" indicates that NIOSH regards cadmium as a potential occupational carcinogen and that exposures should be reduced to the lowest feasible concentration.

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Appendix

Occupational exposure limits and health effects

In evaluating the hazards posed by workplace exposures, NIOSH investigators use both mandatory (legally enforceable) and recommended occupational exposure limits (OELs) for chemical, physical, and biological agents as a guide for making recommendations. OELs have been developed by Federal agencies and safety and health organizations to prevent the occurrence of adverse health effects from workplace exposures. Generally, OELs suggest levels of exposure to which most workers may be exposed up to 10 hours per day, 40 hours per week for a working lifetime without experiencing adverse health effects. However, not all workers will be protected from adverse health effects even if their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition, and/or a hypersensitivity (allergy). In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the worker to produce health effects even if the occupational exposures are controlled at the level set by the exposure limit. Also, some substances can be absorbed by direct contact with the skin and mucous membranes in addition to being inhaled, which contributes to the individual's overall exposure.

Most OELs are expressed as a time-weighted average (TWA) exposure. A TWA refers to the average exposure during a normal 8- to 10-hour workday. Some chemical substances and physical agents have recommended short-term exposure limit (STEL) or ceiling values where health effects are caused by exposures over a short-period. Unless otherwise noted, the STEL is a 15-minute TWA exposure that should not be exceeded at any time during a workday, and the ceiling limit is an exposure that should not be exceeded at any time.

In the U.S., OELs have been established by Federal agencies, professional organizations, state and local governments, and other entities. Some OELs are legally enforceable limits, while others are recommendations. The U.S. Department of Labor Occupational Safety and Health Administration's (OSHA) permissible exposure limits (PELs) (29 CFR[2] 1910 [general industry]; 29 CFR 1926 [construction industry]; and 29 CFR 1917 [maritime industry]) are legal limits enforceable in workplaces covered under the Occupational Safety and Health Act. NIOSH recommended exposure levels (RELs) are recommendations based on a critical review of the scientific and technical information available on a given hazard and the adequacy of methods to identify and control the hazard. NIOSH RELs can be found in the *NIOSH Pocket Guide to Chemical Hazards* [NIOSH 2005]. NIOSH also recommends different types of risk management practices (e.g., engineering controls, safe work practices, worker education/training, personal protective equipment, and exposure and medical monitoring) to minimize the risk of exposure and adverse health effects from these hazards. Other OELs that are commonly used and cited in the U.S. include the threshold limit values (TLVs) recommended by the American conference of Governmental Industrial Hygienists (ACGIH), a professional organization, and the Workplace

[2] *Code of Federal Regulations.* See CFR in references.

environmental exposure limits (WEELs) recommended by the American Industrial Hygiene Association, another professional organization. ACGIH TLVs are considered voluntary exposure guidelines for use by industrial hygienists and others trained in this discipline "to assist in the control of health hazards" [ACGIH 2007]. WEELs have been established for some chemicals "when no other legal or authoritative limits exist" [AIHA 2007].

Outside the U.S., OELs have been established by various agencies and organizations and include both legal and recommended limits. Since 2006, the Berufsgenossenschaftlichen Institut für Arbeitsschutz (German Institute for Occupational Safety and Health) has maintained a database of international OELs from European Union member states, Canada (Québec), Japan, Switzerland, and the U.S. [http://www.hvbg.de/e/bia/gestis/limit_values/index.html]. The database contains international limits for over 1250 hazardous substances and is updated annually.

Employers should understand that not all hazardous chemicals have specific OSHA PELs, and for some agents the legally enforceable and recommended limits may not reflect current health-based information. However, an employer is still required by OSHA to protect its employees from hazards even in the absence of a specific OSHA PEL. OSHA requires an employer to furnish employees a place of employment free from recognized hazards that cause or are likely to cause death or serious physical harm [Occupational Safety and Health Act of 1970 (Public Law 91–596, sec. 5(a)(1))]. Thus, NIOSH investigators encourage employers to make use of other OELs when making risk assessment and risk management decisions to best protect the health of their employees. NIOSH investigators also encourage the use of the traditional hierarchy of controls approach to eliminate or minimize identified workplace hazards. This includes, in order of preference, the use of: (1) substitution or elimination of the hazardous agent, (2) engineering controls (e.g., local exhaust ventilation, process enclosure, dilution ventilation), (3) administrative controls (e.g., limiting time of exposure, employee training, work practice changes, medical surveillance), and (4) personal protective equipment (e.g., respiratory protection, gloves, eye protection, hearing protection). Control banding, a qualitative risk assessment and risk management tool, is a complementary approach to protecting worker health that focuses resources on exposure controls by describing how a risk needs to be managed [http://www.cdc.gov/niosh/topics/ctrlbanding/]. This approach can be applied in situations where OELs have not been established or can be used to supplement the OELs, when available.

Lead

Occupational exposure to lead occurs via inhalation of lead-containing dust and fume and ingestion from contact with lead-contaminated surfaces. In cases where careful attention to hygiene (for example, handwashing) is not practiced, smoking cigarettes or eating may represent another source of exposure among workers who handle lead. Industrial settings associated with exposure to lead and lead compounds include smelting and refining, scrap metal recovery, automobile radiator repair, construction and demolition (including abrasive blasting), and firing range operations [ACGIH 2001]. Occupational exposures also occur among workers who apply and/or remove lead-based paint or among welders who burn or torch-cut metal structures.

Acute lead poisoning, with blood lead levels (BLLs) usually over 70 micrograms per deciliter of whole blood (µg/dL), presents with abdominal pain, hemolytic anemia, neuropathy, and has in very rare cases progressed to encephalopathy and coma [Moline and Landrigan 2005]. Symptoms of chronic lead poisoning include headache, joint and muscle aches, weakness, fatigue, irritability, depression, constipation, anorexia, and abdominal discomfort [Moline and Landrigan 2005]. Overt symptoms usually do not develop until the BLL reaches 30-40 µg/dL [Moline and Landrigan 2005]. Overexposure to lead may also result in damage to the kidneys, anemia, high blood pressure, impotence, and infertility and reduced sex drive in both sexes. Studies have shown subclinical effects on heme synthesis, renal function, and cognition at BLLs <10 µg/dL [ATSDR 2007]. Inorganic lead is reasonably anticipated to cause cancer in humans [ATSDR 2007].

In most cases, an individual's BLL is a good indication of recent exposure to lead, with a half-life (the time interval it takes for the quantity in the body to be reduced by half its initial value) of 1-2 months [Lauwerys and Hoet 2001; Moline and Landrigan 2005; NCEH 2005;]. The majority of lead in the body is stored in the bones, with a half-life of years to decades. Bone lead can be measured using x-ray techniques, but these are primarily research based and are not widely available. Elevated zinc protoporphyrin (ZPP) levels have also been used as an indicator of chronic lead intoxication, however, other factors, such as iron deficiency, can cause an elevated ZPP level, so the BLL is a more specific test for evaluating occupational lead exposure.

In 2000, NIOSH established an REL for inorganic lead of 50 micrograms per cubic meter of air (µg/m3) as an 8-hour TWA. This REL is consistent with the OSHA PEL, which is intended to maintain worker BLLs below 40 µg/dl; medical removal is required when an employee has a BLL of 60 µg/dL, or the average of the last 3 tests at 50 µg/dL or higher [29 CFR 1910.1025; 29 CFR 1962.62]. NIOSH has conducted a literature review of the health effects data on inorganic lead exposure and finds evidence that some of the adverse effects on the adult reproductive, cardiovascular, and hematologic systems, and on the development of children of exposed workers can occur at BLLs as low as 10 µg/dl [Sussell 1998]. At BLLs below 40 µg/dl, many of the health effects would not necessarily be evident by routine physical examinations but represent early stages in the development of lead toxicity. In recognition of this, voluntary standards and public health goals have established lower exposure limits to protect workers and their children. The ACGIH TLV for lead in air is 50 $\mu g/m^3$ as an 8-hour TWA, with worker BLLs to be controlled to $\leq$ 30 µg/dl. A national health goal is to eliminate all occupational exposures that result in BLLs >25 µg/dl [DHHS 2000]. The Third National Report on Human Exposure to Environmental Chemicals (TNRHEEC) found the geometric mean blood lead among non-institutionalized, civilian males in 2001-2002 was 1.78 µg/dL [National Center for Environmental Health 2005].

OSHA requires medical surveillance on any employee who is or may be exposed to an airborne concentration of lead at or above the action level, which is 30 $\mu g/m^3$ as an 8-hour TWA for more than 30 days per year [29 CFR 1910.1025]. Blood lead and ZPP levels must be done at least every 6 months, and more frequently for employees whose blood leads exceed certain levels. In

addition, a medical examination must be done prior to assignment to the area, and should include detailed history, blood pressure measurement, blood lead, ZPP, hemoglobin and hematocrit, red cell indices, and peripheral smear, blood urea nitrogen (BUN), creatinine, and a urinalysis. Additional medical exams and biological monitoring depend upon the circumstances, for example, if the blood lead exceeds a certain level.

Cadmium

Cadmium is a metal that has many industrial uses, such as in batteries, pigments, plastic stabilizers, metal coatings, and television phosphors [ACGIH 2001]. Workers may inhale cadmium dust when sanding, grinding, or scraping cadmium-metal alloys or cadmium-containing paints [ACGIH 2001]. Exposure to cadmium fume may occur when materials containing cadmium are heated to high temperatures, such as during welding and torching operations; cadmium-containing solder and welding rods are also sources of cadmium fume. In addition to inhalation, cadmium may be absorbed via ingestion; non-occupational sources of cadmium exposure include cigarette smoke and dietary intake [ACGIH 2001]. Early symptoms of cadmium exposure may include mild irritation of the upper respiratory tract, a sensation of constriction of the throat, a metallic taste and/or cough. Short-term exposure effects of cadmium inhalation include cough, chest pain, sweating, chills, shortness of breath, and weakness [Thun et al. 1991]. Short-term exposure effects of ingestion may include nausea, vomiting, diarrhea, and abdominal cramps [Thun et al. 1991]. Long-term exposure effects of cadmium may include loss of the sense of smell, ulceration of the nose, emphysema, kidney damage, mild anemia, and an increased risk of cancer of the lung, and possibly of the prostate [ATSDR 1999].

The OSHA PEL (29 CFR 1910.1027) for cadmium is 5 $\mu g/m^3$ TWA [CFR 1993]. The ACGIH has a TLV for total cadmium of 10 $\mu g/m^3$ (8-hour TWA), with worker cadmium blood level to be controlled at or below 5 µg/dL and urine level to be below 5 µg/g creatinine, and designation of cadmium as a suspected animal carcinogen [ACGIH 2007]. NIOSH recommends that cadmium be treated as a potential occupational carcinogen and that exposures be reduced to the lowest feasible concentration [NIOSH 1984].

Blood cadmium levels measured while exposure is ongoing reflect fairly recent exposure (in the past few months). The half-life is biphasic, with rapid elimination (half-life approximately 100 days) in the first phase, but much slower elimination in the second phase (half-life of several years) [Lauwerys and Hoet 2001; Franzblau 2005]. Urinary cadmium levels are reflective of body burden and have a very long half-life of 10-20 years [Lauwerys and Hoet 2001].

OSHA requires medical surveillance on any employee who is or may be exposed to an airborne concentration of cadmium at or above the action level, which is 2.5 $\mu g/m^3$ as an 8-hour TWA for more than 30 days per year [29 CFR 1910.1027]. A preplacement examination must be provided, and shall include a detailed history, and biological monitoring for urine cadmium (CdU) and beta-2-microglobulin (B-2-M), both standardized to grams of creatinine (g/Cr), and blood cadmium (CdB), standardized to liters of whole blood (lwb). OSHA defines acceptable CdB levels as < 5 µg/L, CdU as < 3 µg/g/Cr, and B-2-M as < 300 µg/g/Cr. NHANES III found geometric mean CdB of 0.4 µg/L among men in 1999-2000. The geometric mean CdU for men in 2001-2002 was 0.2 µg/g/Cr. Smokers can have CdB levels double that of nonsmokers

[Lauwerys and Hoet 2001]. Periodic surveillance is also required one year after the initial exam and at least biennially after that. Periodic surveillance shall include the biological monitoring, history and physical examination, a chest x-ray (frequency to be determined by the physician after the initial x-ray), pulmonary function tests, blood tests for BUN, complete blood count (CBC), and Cr, and a urinalysis. Men over 40 years of age require a prostate examination as well. The frequency of periodic surveillance is determined by the results of biological monitoring and medical examinations. Biological monitoring is required annually, either as part of the periodic surveillance or on its own. We recommend that the preplacement examination be identical to the periodic examinations so that baseline health status may be obtained prior to exposure. Termination of employment examinations, identical to the periodic examinations, are also required. The employer is required to provide the employee with a copy of the physician's written opinion from these exams and a copy of biological monitoring results within 2 weeks of receipt.

Biological monitoring is also required for all employees who may have been exposed at or above the action level unless the employer can demonstrate that the exposure totaled less than 60 months. In this case it must also be conducted one year after the initial testing. The need for further monitoring for previously exposed employees is then determined by the results of the biological monitoring.

Zinc

Zinc is a very common element in the earth's crust, and is found in air, soil, water, and foods. It has many industrial uses. For example, metallic zinc is used to galvanize other metals, and zinc compounds are used in paints, ceramics, rubber products, and in many drug products, like ointments, sunscreen, vitamins, and shampoos. Zinc is an essential element, which means it is required for the body to function properly. Zinc is not well absorbed through the skin, but is absorbed through the gastrointestinal system. Inhalational exposure to high levels of zinc oxide fume (generally above 75 mg/m^3) can cause metal fume fever. [ATSDR 2005]. Metal fume fever is a syndrome of cough, shortness of breath, fever, aches, chills, and a high white blood cell count that occurs within hours of exposure, and can last up to 4 days. Normal serum or plasma zinc levels are about 1 mg/mL [ATSDR 2005]. The OSHA PEL and the NIOSH REL for zinc oxide are 5 mg/m^3. This is 100 times higher than the PEL for lead, and reflects the relatively low toxicity of zinc. There is no mandated medical surveillance for workers exposed to zinc.

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DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service

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Robert A. Taft Laboratories
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February 9, 2009
HETA 2008-0055

[redacted]
Investigative Counsel
Oversight and Review Division
Office of the Inspector General
United States Department of Justice, Suite 13100
Washington D.C. 20530

Dear [redacted]:

On November 27, 2007, the National Institute for Occupational Safety and Health (NIOSH) received your request for technical assistance in your health and safety investigation of the Federal Prison Industries (UNICOR) electronics recycling program at Federal Bureau of Prisons (BOP) institutions in Elkton, Ohio; Texarkana, Texas; and Atwater, California. You asked us to assist the United States Department of Justice, Office of the Inspector General (USDOJ, OIG) in assessing the existing medical surveillance program for inmates and staff exposed to lead and cadmium during electronics recycling, and to make recommendations for future surveillance. In addition, you asked us to assess past exposures to lead and cadmium, and to investigate the potential for take home exposure. This interim letter summarizes our findings and provides recommendations to improve the safety and health of the inmates and staff at the Federal Correctional Institution (FCI) in Texarkana, Texas. These findings will be included in a final report that will contain findings from the evaluations at all three institutions identified in your request.

Background

Information available to us indicates that electronics recycling at FCI Texarkana was performed from 2001 until May 2004 without appropriate engineering controls, respiratory protection, medical surveillance, or industrial hygiene monitoring. In late 2001, the glass breaking operation (GBO) commenced in the basement of the FCI. The GBO is where cathode ray tubes (CRTs) from computer monitors or televisions are processed. As reported to us, the first GBO had been retrofitted with an exhaust ventilation system that had been used in the FCI's furniture factory. Large fans used for cooling the work area reportedly disseminated dust from the GBO throughout the basement. In the summer of 2002, the GBO was moved to an old dairy barn at the camp (the lower security part of the FCI) while a containment area was built for the GBO in the factory in the basement of the FCI. This containment consisted of wooden walls topped by a

screen, which was designed to decrease dissemination of "silver floating material" in the air from the GBO. Managers, employees, and inmates had no knowledge that lead or cadmium exposure was a potential health hazard. The GBO moved back to the FCI basement in the fall of 2002 and medical surveillance for inmates performing glass breaking and staff in recycling was begun in mid-late 2003. Recycling moved to its current location at the camp in May 2004, where a glass breaking booth was constructed. The booth is reported to have undergone various modifications since its initial construction.

At the time of the NIOSH site visits, the GBO reportedly processed 300 to 400 CRTs per day during two work shifts, which run for three hours in the morning and two hours after lunch. From a pool of approximately eight inmates, four are assigned to work as glass breakers (2) and feeders (2) during each work shift. Each inmate is allowed to work as a glass breaker for a maximum of one shift per day.

Electronics recycling at the camp consists of manual disassembly of computers and other electronics, manual chip recovery, and glass breaking. The glass breaking booth is divided into seven areas, identified as zones 1 through 7 on the enclosed diagram (See Figure 1). Except for the inmate locker area and storage closet which are enclosed by walls, the zones are separated by vinyl strip curtains suspended from the ceiling.

Two stand-alone high efficiency particulate air (HEPA) filtered ventilation units provide local exhaust ventilation (LEV) to control dust emissions at the panel and funnel glass breaking stations in zone 7. Vinyl strip curtains at the face (intake) of each HEPA unit enclose the CRT while it is manually broken. The HEPA units discharge filtered air into the glass breaking booth. Two additional HEPA ventilation units provide general air filtration to remove dust from glass booth air. One of these units is in the feeder area, and the other is along a wall in zone 7. In 2007, air-conditioning was installed in the GBO, and four large exhaust fans were installed on opposite walls of the factory (two fans on each wall).

Two inmate glass breakers, one at each workstation, use hammers to break CRTs. CRTs are provided to the breakers by two inmate feeders, who place intact CRTs onto a manual roller conveyor that allows CRTs to be rolled into the vinyl strip curtain enclosures at each of the breaking stations. At the right breaker station, the funnel glass breaker reaches through the vinyl strip curtain and breaks the funnel glass, which drops into a Gaylord box beneath the conveyor. The panel glass is then rolled into the enclosure at the panel glass station, where the panel glass breaker breaks the panel glass into pieces that drop into a second Gaylord box. The electron gun, frit, and metal components are also removed during the breaking process and are deposited into containers.

At the start of morning and afternoon shifts, glass breakers and feeders take personal protective equipment (PPE) from their lockers and don the PPE in the change-out area in zone 4. Glass breakers and feeders wear hearing protection, Tyvek® suits, Kevlar® sleeves, Kevlar® gloves, and steel-toe footwear. Glass breakers wear hooded powered air-purifying respirators (PAPRs) with HEPA filters as prescribed in the FCI Texarkana Respiratory Protection Program. Feeders (who remain in zone 6) do not wear respiratory protection, but do wear safety glasses in lieu of the protective PAPR facepiece. At the end of the shift, workers return to zone 4 where they remove the PPE. At the time of the two site visits, workers stored PAPRs and other PPE in a

single locker. Shortly after the July 2008 sampling visit, new lockers were installed so that workers can store PAPRs separately from other PPE, thereby reducing the chance that residual dust on gloves and other PPE will contaminate PAPRs.

Movement of workers and equipment within the glass booth, and between the booth and areas outside the booth, is controlled to reduce dust carryout on shoes and equipment. Glass breakers are the only workers allowed in zone 7 during glass breaking, and they remain in zone 7 throughout the work shift. The pallet jack that is used in zone 7 never leaves zone 7. Forklifts enter the booth no further than zone 5. Full Gaylord boxes are shrink-wrapped before being moved to the edge of zone 5, where the boxes are removed with a forklift.

At the end of a shift, glass breakers and feeders dry-sweep the GBO floor, then wet mop it with a dilute mixture of Simple Green® and water. A HEPA vacuum cleaner is used to remove dust from various surfaces in zone 7, and from the face of the prefilters on the HEPA units at the glass breaking stations. Workers remain in PPE while performing end-of-shift cleanup. Dry sweeping and shovels are also used to clean the floor after full Gaylord boxes are removed from the GBO.

Prefilters installed in HEPA units are changed weekly. The HEPA filter in each unit is changed annually by inmates wearing PPE. This is accomplished by removing the prefilter, HEPA vacuuming accessible surfaces, removing the HEPA filter, and sliding the filter into a plastic bag which is then double-bagged for disposal.

Assessment

We reviewed the following documents:

- Results of medical surveillance performed between 2003 and 2007 (provided by your office);
- Medical records for two inmates reported to have serious medical problems secondary to work in recycling;
- Results of biologic monitoring (provided by the medical clinic at FCI Texarkana);
- Work instructions for the GBO and maintenance;
- Rosters for inmates working in recycling that provided location and dates of work (provided by the factory manager);
- Timelines for recycling operations (provided by you);
- DOJ interviews with staff and inmates and;
- Results of industrial hygiene sampling performed by consultants to UNICOR.

We conducted a site visit on June 24-25, 2008 with you. During this site visit we held an opening conference with FCI and UNICOR management, American Federation of Government Employees (AFGE) representatives, UNICOR recycling staff, and the health services administrator and regional medical director. After the conference we toured the former recycling locations in the basement of the FCI and in the dairy barn at the camp, and the current recycling operation at the camp. We conducted informational meetings with FCI and UNICOR staff, and inmates. We also met with the safety manager, factory manager, and health services administrator. We ended the site visit with a closing conference where we presented our initial findings and recommendations.

We were told that BOP has had an industrial hygienist on staff for several years, and that UNICOR recently hired one. Neither of these individuals was present during our visit, and it is unclear what, if any role, they may have had in setting-up or monitoring the electronic recycling program.

On July 16, 2008, we conducted an industrial hygiene survey to assess worker exposures to cadmium and lead during glass breaking. Full-shift personal breathing zone (PBZ) air sampling for cadmium and lead was conducted for each worker who performed glass breaking or feeder duties on this date. Area air samples were collected inside and outside the glass breaking booth. Air samples were collected, digested, and analyzed according to NIOSH Method 7303 [NIOSH 2009].

Surface wipe samples were collected in inmate lockers, and from PAPR face shields, the table where inmates don and doff PPE, the floor where the forklift accesses the glass breaking booth, and desktops outside the glass breaking booth. These samples were collected by wiping a 100 square centimeter (cm^2) area (10 cm^2 x 10 cm^2) according to the sampling procedure outlined in NIOSH Method 9102 [NIOSH 2009]. Hand wipe samples were collected according to the dermal sampling procedure outlined in NIOSH Method 9105 [NIOSH 2009] Hand wipe samples were collected after workers had washed their hands at the end of each work shift. All wipe samples were collected using Ghost Wipes, which were digested and analyzed for elements according to NIOSH Method 9102 [NIOSH 2009] with modifications for digestion (a nitric/hydrochloric acid mix was used in place of perchloric acid).

Results and Discussion[1]

Medical surveillance

Inmates

Medical surveillance began in late 2003 for inmates in the GBO. It is performed annually by the FCI clinic and consists of limited biological monitoring, a medical and occupational history questionnaire, and respirator clearance. Preplacement testing is performed on inmates prior to being cleared to work in the GBO, with the exception of those already working there when surveillance began. The inmates are seen by a physician's assistant and their test results are discussed with them. Biological monitoring consists of blood lead levels (BLL), blood cadmium

[1] See *Occupational exposure limits and health effects* in Appendix.

(CdB), urine cadmium (CdU), urine beta-2-microglobulin (B-2-M), and zinc protoporphyrin (ZPP). Paper copies of test results are maintained in the inmate's personal medical record but not with UNICOR management. Each inmate's medical records are transferred with them; no medical records are retained at Texarkana after an inmate is either transferred or released. The results of the available inmate biological monitoring are summarized in the following sections. Because measurements on individual inmates and staff were sporadic and the number tested small, we did no group analyses of the data.

Biological monitoring results were available for 28 inmates, although not all inmates had all tests performed. Preplacement BLLs were available for 13 inmates who performed glass breaking. The laboratory's limit of detection (LOD) for blood lead was either 1.0 microgram per deciliter of whole blood (µg/dL) or 3.0 µg/dL, depending on the lab used. One of the 13 was less than the LOD of 1.0 µg/dL, and the others ranged from 1.1-5.0 µg/dL. Seventeen periodic or termination BLLs were available: seven were less than the LOD of 3.0 µg/dL and one was less than the LOD of 1.0 µg/dL. The remaining nine ranged from 1.2-2.4 µg/dL. One inmate who worked in the GBO since 2001 had a BLL in March 2004 that was less than the LOD of 3.0 µg/dL. Another inmate had a BLL of 5 µg/dL in August 2002, but his start date in GBO was listed as 2004. He likely worked in GBO at two separate times. This BLL reflects exposure prior to the installation of the current GBO in May 2004, but the others do not because the half-life of lead in blood is too short.

Results were available for 24 inmates who had preplacement CdB tests done. The laboratory's LOD for CdB was either 0.5 micrograms per liter (µg/L) or 1.0 µg/L. Seventeen were less than the LOD of 1.0 µg/L and one was less than the LOD of 0.5 µg/L. The remainder ranged from 1.1-6.6 µg/L. The two inmates with the highest levels (2.7 and 6.6) were not cleared to work in GBO. It is unclear if they were evaluated to determine why their levels were high. Twenty-eight periodic or termination CdB tests were available: 20 were less than the LOD of 1.0 µg/L and three were less than the LOD of 0.5 µg/L. The remainder ranged from 0.5-2.5 µg/L. In general, these CdB results do not reflect exposures prior to the installation of the current GBO in 2004 because the half-life of cadmium in blood is too short. However, results were available for three inmates who had worked in the GBO since 2001, although it appears one of them ceased GBO work for a while, then returned to it. The CdB in the two who apparently continued work from 2001 until the time of testing in November 2003 were 1.8 µg/L and 2.5 µg/L. Both smoked at the time. The other inmate's November 2003 testing was noted to be preplacement, and was below the LOD. This inmate was a non-smoker. We cannot determine if the higher levels in the smokers were from exposure to cadmium during glass breaking or from smoking. Smoking is known to increase CdB levels. For example, 10 inmates who smoked had CdB available; only one was less than the LOD and the others averaged 2.3 µg/L. Nonsmokers had lower CdB levels. There were 32 CdB results for nonsmokers, and 30 were less than the LOD.

Twenty-four preplacement CdU test results were available. The LOD was 0.5 µg/L and 14 measurements were below this LOD. If the CdU was above the LOD, then it was adjusted to the urinary concentration of creatinine to control for the variability in urine dilution. The five that were above the LOD ranged from 0.29 micrograms per gram of creatinine (µg/g/Cr) to 2.2 µg/g/Cr. There were 20 periodic or termination CdU results available for review. Fifteen were below the LOD, and the remaining five ranged from 0.3-1.3 µg/g/Cr. These CdU measurements integrate exposure over time because the half-life of cadmium in urine is years to decades.

However, only three of these inmates worked in GBO beginning in 2001; the highest result among these three was 0.61 µg/g/Cr.

There were 38 urinary B-2-Ms and 26 ZPPs and all were normal.

One inmate identified himself to us at the meeting as having been removed from the GBO due to abnormal test results. We obtained his results from the medical clinic, and noted that his CdB in late 2003 was 6.2 µg/L, while CdU and B-2-M were below the LOD. His BLL was 4 µg/dL. His questionnaire noted he had been working for UNICOR over 1 year at the time of these tests. There was a note in the chart to repeat the tests in 6 weeks, but this was never done. It is unclear if this represents significant exposure to cadmium or a laboratory error, especially in consideration of the low CdU result. After our visit, this inmate was retested and his CdB was 1.0 µg/L and CdU was 0.8 µg/g/Cr.

Forty-one initial or annual questionnaires were available for review. None noted any medical complaints that could be related to recycling work. Medical records were reviewed for the two inmates reported to have serious medical problems secondary to work in recycling. One died of causes unrelated to recycling work, and the other inmate's medical issues were clearly not related to recycling work, either.

UNICOR Staff

UNICOR staff see their private physicians for medical surveillance, which is paid for by UNICOR, so their exams are not standardized. There are seven staff that work in recycling, a factory manager, an accountant, and five recycling technicians. Test results were available for seven staff members, each of whom was tested between one and four times. There were emails from several staff members to the factory manager, documenting that they chose not to undergo annual physicals and testing. Sixteen BLL results were available: 14 were below the LOD of 3 µg/dL; one was below the LOD of 1 µg/dL, and one was 2.0 µg/dL. Fifteen CdU results were available: eight were less than the LOD of 0.5 µg/L and the remainder ranged from 0.3-0.7 µg/g/Cr. Fifteen CdB results were available: twelve CdB were less than the LOD of 0.5 µg/L and the remainder ranged from 0.5-1.4 µg/L. The two highest were in a smoker; the rest of the staff were non-smokers. There were 13 ZPP and 15 B-2-M results, and all were normal. Two initial or annual questionnaires were available for review. Neither noted any medical complaints that could be related to recycling work.

In summary, results of biological monitoring of both staff and inmates were generally unremarkable. It is important for medical staff to follow up on abnormal test results in a timely manner. It is standard medical practice to repeat an abnormal test result that is unexpected, for example, the elevated pre-placement CdB noted on more than one inmate. If the test result is still abnormal, then a cause for the abnormality should be sought.

Industrial Hygiene

Records Review

The OIG provided five sampling reports prepared by UNICOR consultants, a letter from the Occupational Safety and Health Administration (OSHA) summarizing OSHA sampling results, and a chart containing Federal Occupational Health (FOH) wipe sample results. No consultant reports or sampling data were provided for the first 9-10 months that glass breaking was reportedly performed in the basement of the factory (October 2001 until July or August 2002).

The first consultant report of air and wipe sampling was in October 2002, following relocation of the GBO from the dairy barn back to the FCI during the previous summer. One of the two PBZ samples collected on October 24, 2002 approached but did not exceed the OSHA action level (AL) for lead during a 480-minute sampling period. Cadmium was not detected in PBZ or area air samples. Low concentrations of lead were detected in the two area samples collected in unidentified locations. Low concentrations of cadmium and lead were detected in wipe samples. A bulk dust sample, collected from an unidentified location, contained 3810 ppm lead by weight; cadmium was not detected in the bulk sample. This report provided no description of sampling locations, the size and duties of the workforce, operations performed by workers, housekeeping procedures, the work area, LEV, other workplace controls, PPE, or housekeeping procedures. Based on the limited data obtained on this date, the consultant concluded that the air concentrations did "not pose an immediate health threat to personnel working in this operation," and recommended using a HEPA vacuum cleaner and wet methods to clean surfaces before installing a ventilation system or modifying the work area.

A different consultant conducted air and wipe sampling for barium, beryllium, cadmium, and lead during 1-day site visits in August 2004, May 2005, December 2006, and December 2007. The report for each of these visits consisted of a boilerplate letter with several appendices containing sampling data. Ventilation assessments, consisting of face velocity measurements at HEPA units and smoke tube visualization of air flow, were conducted during the 2006 and 2007 visits; sound level meter readings were obtained in 2006. These reports contain no recommendations or industrial hygiene guidance, and provide very little descriptive information beyond sampling results.

Reports for site visits conducted in 2004 through 2006 indicate that all barium results were below occupational exposure limits (OELs) established by NIOSH, OSHA, and the American Conference of Governmental Industrial Hygienists (ACGIH®). Beryllium was not detected in any of the samples for this period. Although reported airborne concentrations of lead and cadmium were below OELs, the OSHA AL for cadmium was exceeded in 2004. (Note: the consultant incorrectly reported that the cadmium permissible exposure limit (PEL) had been exceeded in 2004.) It should be noted that NIOSH regards cadmium as a potential occupational carcinogen; therefore, NIOSH recommends that occupational exposure to cadmium be limited to the lowest feasible concentration. Low concentrations of lead and cadmium were detected in most surface wipe samples collected in 2004-2006. Post-shift hand wipe samples collected before and after hand washing indicate that hand washing reduced the amount of metals on workers' hands.

On December 14, 2006, OSHA conducted air sampling for metals during glass breaking and teardown. The results for all metals, including lead and cadmium, were reported to be below the LOD. Likewise, no metals were detected in surface wipe samples collected from the front surfaces and buttons of snack and soda machines in the break area of "the inside facility."

Surface wipe samples collected by FOH in March 2007 detected lead and cadmium on a number of surfaces in the camp glass breaking area. Wipe samples collected behind and on top of HEPA units and "near disassembly tables" indicated lead concentrations of 2,000 to 17,000 micrograms of lead per square foot ($\mu g/ft^2$). Cadmium concentrations in these locations were 200 $\mu g/ft^2$ to 2,700 $\mu g/ft^2$. Lower concentrations were found in other locations, e.g., on top of worker lockers. Wipe samples collected from a cable box in the former FCI glass breaking area indicated lead and cadmium concentrations of 3,300 and 7,700 $\mu g/ft^2$, respectively. Wipe samples collected in both glass breaking areas indicated the presence of lead and cadmium in dust.

NIOSH Exposure Assessment, July 16, 2008

Airborne concentrations of lead and cadmium are presented in Table 1, on page 11 of this letter. These concentrations are calculated over the actual sampling periods, i.e., these results are not reported as 8-hour time-weighted average (8-hr TWA) concentrations.

PBZ samples collected during morning and afternoon shifts on July 16, 2008, indicate that worker exposures were well-below the OSHA ALs for cadmium and lead. Area air samples, collected outside the glass breaking booth during glass breaking did not detect lead or cadmium above the minimum detectable concentrations for either of these elements. Air samples indicate that the HEPA units were effective at removing cadmium- and lead-bearing dust at the point of generation.

The results of wipe samples collected on July 16, 2008 results are presented in Table 2 on page 12. Wipe samples collected from inmate lockers and the table in the change-out area indicated concentrations of cadmium and lead ranging up to 0.89 $\mu g/100\ cm^2$ and up to 59 $\mu g/100\ cm^2$, respectively. Although concentrations inside lockers were generally low, the highest lead concentrations in locker #9 and on the change-out table indicate that some lead is being transported from the glass breaking area.

Wipe samples collected from face shields of PAPRs in two lockers (including locker #9) detected very little contamination. However, it appeared that the potential existed for spreading contamination from other PPE, such as Kevlar gloves and sleeves, to PAPRs stored in lockers. As noted above, new lockers for storing PAPRs separately from reuseable PPE were installed after the NIOSH evaluation.

Wipe samples collected from the floor in and near the forklift traffic area where Gaylord boxes are removed from the glass breaking booth, indicate that some lead and cadmium contamination is being carried out of the glass breaking booth despite work practice controls, such as restricting use of the glass breaking booth pallet jack to zone 7 and not allowing the forklift to enter the booth beyond zone 5. This suggests that although these work practice controls should help limit

the amount of carry-out contamination, some lead- and cadmium- containing dust is still being carried out of the glass breaking booth.

Low, but quantifiable concentrations of cadmium and lead were present on the inmate clerk's desk which is located a few feet from the forklift traffic area. A trace amount of lead was detected on a desk in the UNICOR staff office. Although these results do not represent a serious health hazard, they show a need to maintain good housekeeping throughout the glass breaking area.

Hand wipe samples, collected at the end of each shift after hand washing, suggest that hand washing removes most, but not all contaminants. Glass breakers should be encouraged to wash hands carefully to remove as much contamination as possible, especially before going to lunch.

Conclusions

Electronics recycling at FCI Texarkana appears to have been performed from late 2001 until May 2004 without appropriate engineering controls, respiratory protection, medical surveillance, or industrial hygiene monitoring. Because of the sparse biological monitoring and industrial hygiene data, we cannot determine the extent of exposure to lead and cadmium that occurred during that time. Descriptions of work tasks from staff and inmates indicate that exposures during that time frame were likely higher than current exposures. Based on information provided to us, we believe that the current GBO is a significant improvement with respect to controlling worker exposures to cadmium and lead.

Exposures since May 2004 are sufficiently low that the OSHA mandated medical surveillance has not been required since that time. In addition, the results of medical surveillance conducted since 2003 on both inmates and staff were generally unremarkable. It is not possible to determine whether the exposures were high enough to trigger the standard prior to that time. Inmates are advised of the results of their monitoring and do see the physician's assistant; however, records of medical surveillance are not maintained by the employer for the appropriate length of time. Some staff members have refused to participate in medical surveillance paid for by UNICOR at their personal physicians

At this time, after careful review of existing records and current operations, we conclude that medical surveillance can be discontinued for inmates and staff who work in electronics recycling and GBO. UNICOR may choose to continue to perform the limited biological monitoring that is currently in place as an additional safeguard against excessive exposure and to provide reassurance to inmates and staff.

Recommendations

The following recommendations are provided to improve the safety and health of both the staff and inmates involved with electronics recycling at the FCI Texarkana.:

1. Although engineering controls and work practices in the current GBO appear to provide reasonably effective control of worker exposure to cadmium and lead, UNICOR needs to

maintain an ongoing program of environmental monitoring to confirm that engineering and work practice controls are sufficiently protective. Environmental monitoring also provides data needed to determine which provisions of the OSHA cadmium and lead standards should be applied for the GBO.

2. While air sampling in the GBO suggests that the level of protection afforded by PAPRs may not be needed, we feel that continued use of PAPRs provides added protection against exposure to lead- and cadmium- containing dust. Additional periodic air sampling should be conducted to help ensure that exposures remain consistently below all applicable OELs before considering a reduction in the level of respiratory protection in the GBO.

3. Ensure full compliance with all applicable OSHA standards, including the General Industry Lead Standard [29 CFR 1910.1025], the Cadmium Standard [29 CFR 1910.1027], the Hazard Communication Standard [29 CFR 1910.1200], and the Respiratory Protection Standard [29 CFR 1910.134]. This includes record keeping requirements, communication requirements, compliance plans, and medical surveillance.

4. Discontinue dry sweeping. Use a floor squeegee to carefully collect large pieces of debris that cannot be effectively vacuumed from the floor. Whenever possible, use a HEPA-filtered vacuum cleaner and/or wet methods for removing dust from all other surfaces.

5. Ensure that separate storage is provided for non-work uniforms and GBO work apparel/PPE. All potentially-contaminated work clothing and PPE should remain in the "dirty" chamber of the change-out room; non-work clothing should never come in contact with work items. As a minimum requirement, workers should be required to wash hands and all potentially exposed skin after doffing PPE and before putting on uniforms when exiting the GBO. To minimize migration of cadmium-and-lead-contaminated dust to other parts of the institution, work clothes and PPE should never be worn outside the GBO. Laundry personnel should be made aware of the potential exposure to lead and cadmium from work clothes, and take action to minimize exposure to themselves.

6. Carefully evaluate the qualifications and expertise of consultants who are hired to assess occupational or environmental health and safety issues. Anyone can present him/herself as an "industrial hygienist," regardless of education, training, or expertise. One useful benchmark for vetting individuals who provide industrial hygiene services is the designation of Certified Industrial Hygienist (CIH). Certification by the American Board of Industrial Hygiene (ABIH) ensures that prospective consultants have met ABIH standards for education, ongoing training, and experience, and have passed a rigorous ABIH certification examination. The UNICOR and/or BOP industrial hygienists can assist in the selection of your consultants.

7. Perform a detailed job hazard analysis prior to beginning any new operation or before making changes to existing operations. This will allow BOP to identify potential hazards prior to exposing staff or inmates, and to identify appropriate controls and PPE. Involve the BOP and/or UNICOR industrial hygienists in these job hazard analyses. If medical surveillance is needed then BOP should perform pre-placement evaluations of exposed staff and inmates. This medical surveillance should be overseen by an occupational medicine physician.

8. Appoint a union safety and health representative. This individual should be a regular participant on the joint labor-management safety committee that meets quarterly. Since inmates do not have a mechanism for representation on this committee, ensure that they are informed of its proceedings and that they have a way to voice their concerns about and ideas for improving workplace safety and health.

This interim letter will be included in a final report that will include visits to two other BOP facilities. Please post a copy of this letter for 30 days at or near work areas of affected staff and inmates. Thank you for your cooperation with this evaluation. If you have any questions, please do not hesitate to contact us at (513) 841-4382.

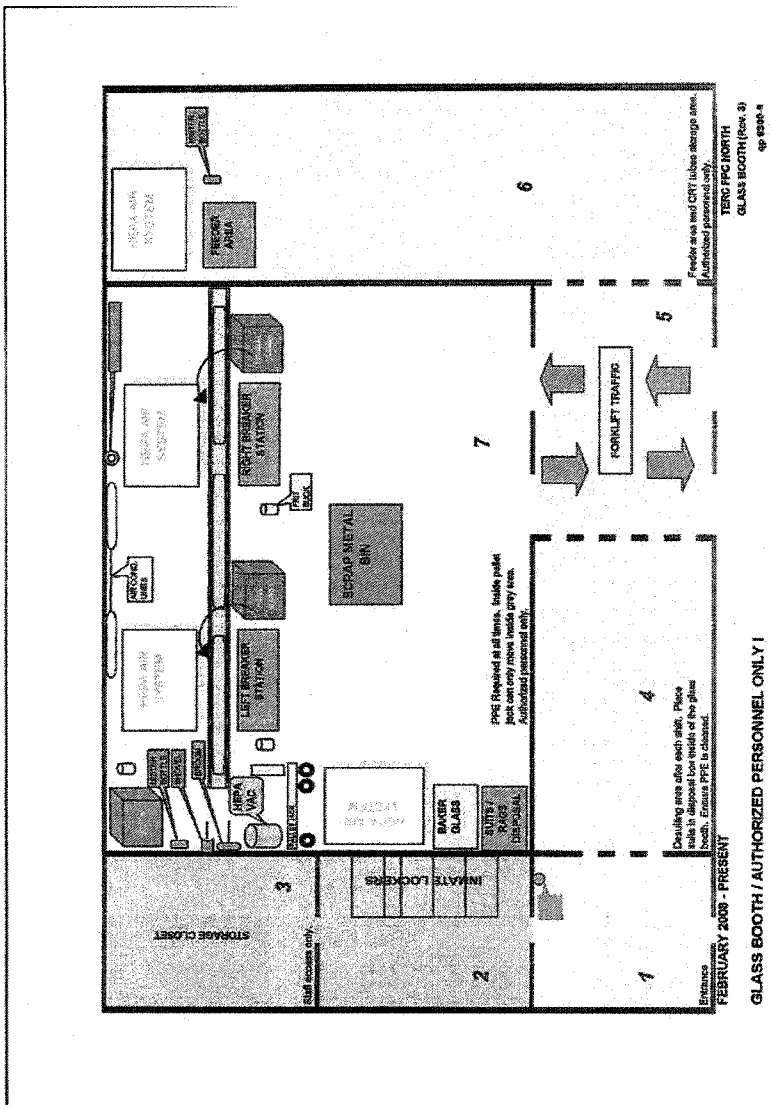
Sincerely yours,

Elena H. Page, M.D., M.P.H.
Medical Officer

David Sylvain, M.S., C.I.H.
Industrial Hygienist
Hazard Evaluations and Technical Assistance Branch
Division of Surveillance, Hazard Evaluations and Field Studies

cc:
Keith Roy, Warden, FCI Texarkana
Wade Stovall, President, AFGE Local 2459
Paul Laird, Assistant Director, UNICOR

Figure 1.


GLASS BOOTH / AUTHORIZED PERSONNEL ONLY !
FEBRUARY 2008 - PRESENT
Entrance
1
Donning area after each shift. Place suits in disposal box inside of the glass booth. Ensure PPE is cleaned.
4
PPE Required at all times. Inside pallet jack can only move inside grey area. Authorized personnel only.
2
INMATE LOCKERS
Staff access only.
3
STORAGE CLOSET
BAGER GLASS
SUITS / RAGS DISPOSAL
HEPA VAC
LEFT BREAKER STATION
RIGHT BREAKER STATION
SCRAP METAL BIN
7
FORKLIFT TRAFFIC
5
Feeder area and CRT indoor storage area. Authorized personnel only.
TERC FPC NORTH GLASS BOOTH (Area 3)
6
FEEDER AREA

Tables

Table 1
Air sampling, July 16, 2008
Glass Breaking Area

HETA 2008-0055
Federal Bureau of Prisons
FCI Texarkana

Location	Sampling Period (minutes)	Sample Volume (liters)	Cadmium ($\mu g/m^3$)	Lead ($\mu g/m^3$)
PBZ*—funnel glass breaker, a.m.	174	345	1.5	3.9
PBZ—panel glass breaker, a.m.	175	350	1.7	6.0
PBZ—feeder, a.m.	174	347	trace¶	trace
PBZ—feeder, a.m.	173	344	trace	trace
PBZ—funnel glass breaker, p.m.	129	256	1.3	7.0
PBZ—panel glass breaker, p.m.	127	253	0.59	4.0
PBZ—feeder, p.m.	125	249	trace	trace
PBZ—feeder,p.m.	124	247	trace	4.5
Area†—top of air handler #4	397	793	0.24	3.0
Area— table in change-out area	426	844	0.25	1.5
Area—forklift traffic area, right side, approx. 5.5' above floor	421	838	0.13	1.8
Area—inmate clerk desk, approx. 3.5' from forklift entry	414	820	nd**	nd
Area—approx. 10' from feeder area, 3' above floor	404	801	nd	nd
Minimum detectable concentration (MDC)‡ – PBZ			0.07	1.
Minimum quantifiable concentration (MQC)§ – PBZ			0.21	2.9
Minimum detectable concentration (MDC) – Area			0.02	0.4
NIOSH REL-TWA			Ca††	50
OSHA PEL-TWA			5	50
ACGIH TLV®			10	50

* PBZ—Personal breathing zone sample

† Area—Area sample

‡ MDC—Minimum detectable concentration. MDC is determined by the analytical limit of detection (LOD) for an analyte and the average sample volume. LOD for cadmium and lead are 0.02 ug/sample and 0.3 ug/sample, respectively. The average sample volumes for PBZ and area samples are 299 liters and 819 liters respectively.

§ MQC—Minimum quantifiable concentration. MQC is determined by the analytical limit of quantitation (LOQ) for an analyte and the average sample volume. LOQ for cadmium and lead are 0.063 ug/sample and 0.86 ug/sample, respectively.

¶ trace—Sample result is between the MDC and MQC.

** nd (not detected)—Sample result is below the MDC.

†† Ca—NIOSH regards cadmium as a potential occupational carcinogen and that exposures should be reduced to the lowest feasible concentration.

See the Appendix for a discussion of NIOSH recommended exposure limits (RELs), OSHA permissible exposure limits (PELs), and ACGIH Threshold Limit Values (TLVs®).

Table 2
Surface wipe sampling, July 16, 2008
Glass Breaking Area

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Surface	Description	Area Wiped	Cadmium	Lead
[redacted]		cm^2	µg/wipe	µg/wipe
Inmate "A" locker	bottom surface of locker	100	0.89	9.4
Inmate "B" locker	bottom surface of locker	100	0.44	31.
Inmate locker #7	bottom surface of locker #7	100	trace	8.9
Inmate "C" locker #9	bottom surface of locker #9	100	0.33	59.
Inmate "B" PAPR face shield	inside surface	100	trace*	1.8
Inmate "C" PAPR face shield	inside surface; in locker #9	100	nd†	trace
Change out table		100	2.5	57.
Floor	approx. 4' outside forklift entry	100	1.1	60.
Inmate clerk desk	near forklift entry to booth	100	0.43	6.4
Floor	forklift traffic area	100	1.6	90.
Staff desk	in office	100	nd	trace
Inmate "B" hands	feeder (morning)	-	0.41	4.3
Inmate "A" hands	panel glass breaker (morning)	-	3.1	9.5
Inmate hands	funnel glass breaker(morning)	-	3.5	17.
Inmate hands	feeder (morning)	-	0.35	4.1
Inmate hands	feeder (afternoon)	-	trace	1.9
Inmate "A" hands	feeder (afternoon)	-	0.40	3.4
Inmate "C" hands	funnel glass breaker (afternoon)	-	2.4	21.
Inmate "B" hands	panel glass breaker(afternoon)	-	1.2	16.

Inmates "A," "B," and "C," are three individual workers for whom multiple samples were collected.

* trace—Sample result is between the analytical limits of detection and quantitation. The limits of quantitation for cadmium and lead are 0.29 ug/sample and 1.3 ug/sample, respectively.

† nd (not detected)—Sample result is below the analytical limit of detection. The limits of detection for cadmium and lead are 0.09 ug/sample and 0.4 ug/sample, respectively.

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Appendix

Occupational Exposure Limits and Health effects

In evaluating the hazards posed by workplace exposures, NIOSH investigators use both mandatory (legally enforceable) and recommended occupational exposure limits (OELs) for chemical, physical, and biological agents as a guide for making recommendations. OELs have been developed by Federal agencies and safety and health organizations to prevent the occurrence of adverse health effects from workplace exposures. Generally, OELs suggest levels of exposure to which most workers may be exposed up to 10 hours per day, 40 hours per week for a working lifetime without experiencing adverse health effects. However, not all workers will be protected from adverse health effects even if their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition, and/or a hypersensitivity (allergy). In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the worker to produce health effects even if the occupational exposures are controlled at the level set by the exposure limit. Also, some substances can be absorbed by direct contact with the skin and mucous membranes in addition to being inhaled, which contributes to the individual's overall exposure.

Most OELs are expressed as a time-weighted average (TWA) exposure. A TWA refers to the average exposure during a normal 8- to 10-hour workday. Some chemical substances and physical agents have recommended short-term exposure limit (STEL) or ceiling values where health effects are caused by exposures over a short-period. Unless otherwise noted, the STEL is a 15-minute TWA exposure that should not be exceeded at any time during a workday, and the ceiling limit is an exposure that should not be exceeded at any time.

In the U.S., OELs have been established by Federal agencies, professional organizations, state and local governments, and other entities. Some OELs are legally enforceable limits, while others are recommendations. The U.S. Department of Labor Occupational Safety and Health Administration's (OSHA) permissible exposure limits (PELs) (29 CFR[2] 1910 [general industry]; 29 CFR 1926 [construction industry]; and 29 CFR 1917 [maritime industry]) are legal limits enforceable in workplaces covered under the Occupational Safety and Health Act. NIOSH

[2] *Code of Federal Regulations.* See CFR in references.

recommended exposure levels (RELs) are recommendations based on a critical review of the scientific and technical information available on a given hazard and the adequacy of methods to identify and control the hazard. NIOSH RELs can be found in the *NIOSH Pocket Guide to Chemical Hazards* [NIOSH 2005]. NIOSH also recommends different types of risk management practices (e.g., engineering controls, safe work practices, worker education/training, personal protective equipment, and exposure and medical monitoring) to minimize the risk of exposure and adverse health effects from these hazards. Other OELs that are commonly used and cited in the U.S. include the threshold limit values (TLVs) recommended by the American conference of Governmental Industrial Hygienists (ACGIH), a professional organization, and the Workplace environmental exposure limits (WEELs) recommended by the American Industrial Hygiene Association, another professional organization. ACGIH TLVs are considered voluntary exposure guidelines for use by industrial hygienists and others trained in this discipline "to assist in the control of health hazards" [ACGIH 2008]. WEELs have been established for some chemicals "when no other legal or authoritative limits exist" [AIHA 2007].

Outside the U.S., OELs have been established by various agencies and organizations and include both legal and recommended limits. Since 2006, the Berufsgenossenschaftlichen Institut für Arbeitsschutz (German Institute for Occupational Safety and Health) has maintained a database of international OELs from European Union member states, Canada (Québec), Japan, Switzerland, and the U.S. [http://www.hvbg.de/e/bia/gestis/limit_values/index.html]. The database contains international limits for over 1250 hazardous substances and is updated annually.

Employers should understand that not all hazardous chemicals have specific OSHA PELs, and for some agents the legally enforceable and recommended limits may not reflect current health-based information. However, an employer is still required by OSHA to protect its employees from hazards even in the absence of a specific OSHA PEL. OSHA requires an employer to furnish employees a place of employment free from recognized hazards that cause or are likely to cause death or serious physical harm [Occupational Safety and Health Act of 1970 (Public Law 91–596, sec. 5(a)(1))]. Thus, NIOSH investigators encourage employers to make use of other OELs when making risk assessment and risk management decisions to best protect the health of their employees. NIOSH investigators also encourage the use of the traditional hierarchy of controls approach to eliminate or minimize identified workplace hazards. This includes, in order of preference, the use of: (1) substitution or elimination of the hazardous agent, (2) engineering controls (e.g., local exhaust ventilation, process enclosure, dilution ventilation), (3) administrative controls (e.g., limiting time of exposure, employee training, work practice changes, medical surveillance), and (4) personal protective equipment (e.g., respiratory protection, gloves, eye protection, hearing protection). Control banding, a qualitative risk assessment and risk management tool, is a complementary approach to protecting worker health that focuses resources on exposure controls by describing how a risk needs to be managed [http://www.cdc.gov/niosh/topics/ctrlbanding/]. This approach can be applied in situations where OELs have not been established or can be used to supplement the OELs, when available.

Lead

Occupational exposure to lead occurs via inhalation of lead-containing dust and fume and ingestion of lead particles from contact with lead-contaminated surfaces. In cases where careful attention to hygiene (for example, handwashing) is not practiced, smoking cigarettes or eating may represent another route of exposure among workers who handle lead and then transfer it to their mouth through hand contamination. Industrial settings associated with exposure to lead and lead compounds include smelting and refining, scrap metal recovery, automobile radiator repair, construction and demolition (including abrasive blasting), and firing range operations [ACGIH 2001]. Occupational exposures also occur among workers who apply and/or remove lead-based paint or among welders who burn or torch-cut metal structures.

Acute lead poisoning, caused by intense occupational exposure to lead over a brief period of time can cause a syndrome of abdominal pain, fatigue, constipation, and in some cases alteration of central nervous system function [Moline and Landrigan 2005]. Symptoms of chronic lead poisoning include headache, joint and muscle aches, weakness, fatigue, irritability, depression, constipation, anorexia, and abdominal discomfort [Moline and Landrigan 2005]. These symptoms usually do not develop until the blood lead level (BLL) reaches 30-40 micrograms per deciliter of whole blood (µg/dL)[Moline and Landrigan 2005]. Overexposure to lead may also result in damage to the kidneys, anemia, high blood pressure, impotence, and infertility and reduced sex drive in both sexes. Studies have shown subclinical effects on heme synthesis, renal function, and cognition at BLLs <10 µg/dL [ATSDR 2007]. Inorganic lead is reasonably anticipated to cause cancer in humans [ATSDR 2007].

In most cases, an individual's BLL is a good indication of recent exposure to lead, with a half-life (the time interval it takes for the quantity in the body to be reduced by half its initial value) of 1-2 months [Lauwerys and Hoet 2001; Moline and Landrigan 2005; NCEH 2005;]. The majority of lead in the body is stored in the bones, with a half-life of years to decades. Bone lead can be measured using x-ray techniques, but these are primarily research based and are not widely available. Elevated zinc protoporphyrin (ZPP) levels have also been used as an indicator of chronic lead intoxication, however, other factors, such as iron deficiency, can cause an elevated ZPP level, so the BLL is a more specific test for evaluating occupational lead exposure.

In 2000, NIOSH established an REL for inorganic lead of 50 micrograms per cubic meter of air (µg/m3) as an 8-hour TWA. This REL is consistent with the OSHA PEL, which is intended to maintain worker BLLs below 40 µg/dl; medical removal is required when an employee has a BLL of 60 µg/dL, or the average of the last 3 tests at 50 µg/dL or higher [29 CFR 1910.1025; 29 CFR 1962.62]. NIOSH has conducted a literature review of the health effects data on inorganic lead exposure and finds evidence that some of the adverse effects on the adult reproductive, cardiovascular, and hematologic systems, and on the development of children of exposed workers can occur at BLLs as low as 10 µg/dl [Sussell 1998]. At BLLs below 40 µg/dl, many of the health effects would not necessarily be evident by routine physical examinations but represent early stages in the development of lead toxicity. In recognition of this, voluntary standards and public health goals have established lower exposure limits to protect workers and their children. The ACGIH TLV for lead in air is 50 $\mu g/m^3$ as an 8-hour TWA, with worker

BLLs to be controlled to ≤ 30 µg/dl. A national health goal is to eliminate all occupational exposures that result in BLLs >25 µg/dl [DHHS 2000]. The Third National Report on Human Exposure to Environmental Chemicals (TNRHEEC) found the geometric mean blood lead among non-institutionalized, civilian males in 2001-2002 was 1.78 µg/dL [NCEH 2005].

OSHA requires medical surveillance on any employee who is or may be exposed to an airborne concentration of lead at or above the action level, which is 30 $\mu g/m^3$ as an 8-hour TWA for more than 30 days per year [29 CFR 1910.1025]. Blood lead and ZPP levels must be done at least every 6 months, and more frequently for employees whose blood leads exceed certain levels. In addition, a medical examination must be done prior to assignment to the area, and should include detailed history, blood pressure measurement, blood lead, ZPP, hemoglobin and hematocrit, red cell indices, and peripheral smear, blood urea nitrogen (BUN), creatinine, and a urinalysis. Additional medical exams and biological monitoring depend upon the circumstances, for example, if the blood lead exceeds a certain level.

Cadmium

Cadmium is a metal that has many industrial uses, such as in batteries, pigments, plastic stabilizers, metal coatings, and television phosphors [ACGIH 2001]. Workers may inhale cadmium dust when sanding, grinding, or scraping cadmium-metal alloys or cadmium-containing paints [ACGIH 2001]. Exposure to cadmium fume may occur when materials containing cadmium are heated to high temperatures, such as during welding and torching operations; cadmium-containing solder and welding rods are also sources of cadmium fume. In addition to inhalation, cadmium may be absorbed via ingestion; non-occupational sources of cadmium exposure include cigarette smoke and dietary intake [ACGIH 2001]. Early symptoms of cadmium exposure may include mild irritation of the upper respiratory tract, a sensation of constriction of the throat, a metallic taste and/or cough. Short-term exposure effects of cadmium inhalation include cough, chest pain, sweating, chills, shortness of breath, and weakness [Thun et al. 1991]. Short-term exposure effects of ingestion may include nausea, vomiting, diarrhea, and abdominal cramps [Thun et al. 1991]. Long-term exposure effects of cadmium may include loss of the sense of smell, ulceration of the nose, emphysema, kidney damage, mild anemia, and an increased risk of cancer of the lung, and possibly of the prostate [ATSDR 1999].

The OSHA PEL for cadmium is 5 $\mu g/m^3$ TWA [29 CFR 1910.1027]. The ACGIH has a TLV for total cadmium of 10 $\mu g/m^3$ (8-hour TWA), with worker cadmium blood level to be controlled at or below 5 µg/dL and urine level to be below 5 µg/g creatinine, and designation of cadmium as a suspected human carcinogen [ACGIH 2008]. NIOSH recommends that cadmium be treated as a potential occupational carcinogen and that exposures be reduced to the lowest feasible concentration [NIOSH 1984].

Blood cadmium levels measured while exposure is ongoing reflect fairly recent exposure (in the past few months). The half-life is biphasic, with rapid elimination (half-life approximately 100 days) in the first phase, but much slower elimination in the second phase (half-life of several years) [Lauwerys and Hoet 2001; Franzblau 2005]. Urinary cadmium levels are reflective of body burden and have a very long half-life of 10-20 years [Lauwerys and Hoet 2001].

OSHA requires medical surveillance on any employee who is or may be exposed to an airborne concentration of cadmium at or above the action level, which is 2.5 $\mu g/m^3$ as an 8-hour TWA for more than 30 days per year [29 CFR 1910.1027]. A preplacement examination must be provided, and shall include a detailed history, and biological monitoring for urine cadmium (CdU) and beta-2-microglobulin (B-2-M), both standardized to grams of creatinine (g/Cr), and blood cadmium (CdB), standardized to liters of whole blood (lwb). OSHA defines acceptable CdB levels as < 5 μg/L, CdU as < 3 μg/g/Cr, and B-2-M as < 300 μg/g/Cr. NHANES III found geometric mean CdB of 0.4 μg/L among men in 1999-2000. The geometric mean CdU for men in 2001-2002 was 0.2 μg/g/Cr. Smokers can have CdB levels double that of nonsmokers [Lauwerys and Hoet 2001]. Periodic surveillance is also required one year after the initial exam and at least biennially after that. Periodic surveillance shall include the biological monitoring, history and physical examination, a chest x-ray (frequency to be determined by the physician after the initial x-ray), pulmonary function tests, blood tests for BUN, complete blood count (CBC), and Cr, and a urinalysis. Men over 40 years of age require a prostate examination as well. The frequency of periodic surveillance is determined by the results of biological monitoring and medical examinations. Biological monitoring is required annually, either as part of the periodic surveillance or on its own. We recommend that the preplacement examination be identical to the periodic examinations so that baseline health status may be obtained prior to exposure. Termination of employment examinations, identical to the periodic examinations, are also required. The employer is required to provide the employee with a copy of the physician's written opinion from these exams and a copy of biological monitoring results within 2 weeks of receipt.

Biological monitoring is also required for all employees who may have been exposed at or above the action level unless the employer can demonstrate that the exposure totaled less than 60 months. In this case it must also be conducted one year after the initial testing. The need for further monitoring for previously exposed employees is then determined by the results of the biological monitoring.

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DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service

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June 1, 2009
HETA 2008-0055

[redacted]
Investigative Counsel
Oversight and Review Division
Office of the Inspector General
United States Department of Justice, Suite 13100
Washington D.C. 20530

Dear [redacted]:

On November 27, 2007, the National Institute for Occupational Safety and Health (NIOSH) received your request for technical assistance in your health and safety investigation of the Federal Prison Industries (UNICOR) electronics recycling program at Federal Bureau of Prisons (BOP) institutions in Elkton, Ohio; Texarkana, Texas; and Atwater, California. You asked us to assist the United States Department of Justice, Office of the Inspector General (USDOJ, OIG) in assessing the existing medical surveillance program for inmates and staff exposed to lead and cadmium during electronics recycling, and to make recommendations for future surveillance. In addition, you asked us to assess past exposures to lead and cadmium, and to investigate the potential for take home exposure. You later asked us to perform a similar evaluation for the BOP institution in Marianna, Florida. We conducted a site visit at the Marianna BOP institution on February 17–18, 2009. This interim letter summarizes our findings and provides recommendations to improve the safety and health of the inmates and staff at the Federal Correctional Institution in Marianna, Florida. These findings will be included in a final report that will summarize the evaluations at all four institutions.

Background

The Federal Correctional Institution (FCI) in Marianna, Florida, consists of a medium security facility housing male inmates, and an adjacent prison camp housing minimum security female offenders. Electronics disassembly and refurbishment began in 1996 as a UNICOR pilot project and then as a small operation at the camp. Glass breaking was not performed, and televisions and computer monitors were shipped offsite for recycling. As the operation grew, it was moved to an offsite leased building (known as the blue building). In approximately 1999, a demilitarization (demil) operation was started at the camp. This involved disassembly and refurbishment of electronics from local military bases. UNICOR staff was required to be certified in demil to work

in that area due to security reasons. The demil operation was closed after a couple of years. Electronics disassembly and refurbishment moved into another offsite leased building in 2001. (known as the gold building) after recycling operations were discontinued at the blue building. After the furniture factory closed in the FCI in late 2002, the recycling operation was moved into the FCI from the gold building. In late 2005, the glass breaking operation (GBO) commenced at the camp. Prior to beginning this operation, the safety officer conducted a job hazard analysis, and inmates were medically cleared to work in the area. The inmates had preplacement biological monitoring and respirator clearance performed. The GBO was where cathode ray tubes (CRTs) from computer monitors or televisions were processed. The GBO ceased operation in May 2008. At the time of our visit, only refurbishment and "sanitization" of computers took place at the camp. Sanitization involves checking equipment for contraband prior to sending it to the FCI factory for disassembly. Electronics recycling at the FCI factory consists of manual disassembly of computers and other electronics, and manual chip recovery.

Assessment

We reviewed the following documents:

- Results of biological monitoring performed between 2005 and 2008 (provided by your office and the Health Services Administrator).
- Medical records and report from the medical examiner for a staff member who died in 2008 after being medically retired from work (provided by the lawyer for her estate).
- Medical records for two staff members and one inmate (provided by you).
- Work instructions for the GBO and maintenance.
- Rosters for inmates working in the GBO that provided dates of work (provided by the factory manager).
- DOJ interviews with staff and inmates.
- Results of industrial hygiene sampling performed by a consultant to UNICOR.
- Occupational Safety and Health Administration (OSHA) report and an internal memorandum describing an OSHA inspection of electronics recycling at FCI Marianna.
- Final report of the industrial hygiene assessment performed by the NIOSH Division of Applied Research and Technology (DART).
- Draft Federal Occupational Health (FOH) report of environmental, safety, and health information related to electronics recycling at FCI Marianna.

Prior to the NIOSH site visit on February 17-18, 2009, we interviewed the factory manager, Health Services Administrator, American Federation of Government Employees (AFGE) Local

4036 President and the AFGE UNICOR representative. During the site visit we held an opening conference with FCI and UNICOR management, AFGE representatives, the UNICOR factory manager, and the Health Services Administrator. After the conference we toured the recycling locations in the FCI and at the camp. We conducted informational meetings with FCI and UNICOR staff, and camp inmates. We met with concerned staff and inmates individually to do medical interviews and address their concerns. We also met with current and former staff and inmates individually at our hotel in the evenings to do medical interviews and address their concerns. We ended the site visit with a closing conference where we presented our initial findings and recommendations. After the site visit we interviewed the Radiation Safety Officer and a representative of the Defense Reutilization Marketing Office (DRMO) at Eglin Air Force Base, Florida.

Results and Discussion[1]

Medical surveillance

Inmates

Medical surveillance began in late 2005 for inmates in the GBO. It is performed annually by the FCI clinic and consists of biological monitoring for blood lead levels (BLL), blood cadmium (CdB), urine cadmium (CdU), urine beta-2-microglobulin (B-2-M), and zinc protoporphyrin (ZPP). Preplacement testing is performed on inmates prior to being cleared to work in the GBO. The inmates are seen by a physician's assistant and their test results are discussed with them. Paper copies of test results are maintained in the inmate's personal medical record but not with UNICOR management. Each inmate's medical records are transferred with them; no medical records are retained at Marianna after an inmate is either transferred or released. The results of the available inmate biological monitoring are summarized in the following sections.

Preplacement BLLs were available for 14 inmates who performed glass breaking. The mean BLL was 1.17 micrograms per deciliter of whole blood (µg/dL) (range: 0.5-2.1 µg/dL). Four periodic or termination BLLs were available. The mean BLL for these four was 1.35 µg/dL (range: 0.4-2.2 µg/dL).

Results were available for 11 inmates who had preplacement CdB tests done. The mean CdB concentration was 1.28 micrograms per liter (µg/L) (range: 0.1-4.0 µg/L). The mean CdB concentration for the seven inmates known to be smokers was 1.73 µg/L (range: 0.2-4.0 µg/L) and for the three known to be nonsmokers was 0.3 µg/L (range: 0.1-0.6 µg/L). Smoking is known to increase CdB levels, sometimes dramatically. Four periodic or termination CdB tests were available and the mean CdB concentration was 0.5 µg/L (range: 0.4-0.6 µg/L). Smoking for inmates was banned between the preplacement and follow-up tests.

Fourteen preplacement CdU test results were available. The mean CdU concentration was 0.62 micrograms per gram of creatinine (µg/g/Cr) (range 0.2-1.7 µg/g/Cr). There were four periodic or termination CdU results available for review. The mean CdU concentration was 0.55 µg/g/Cr

[1] See *Occupational exposure limits and health effects* in Appendix.

(range: 0.3-0.8 µg/g/Cr). There were 12 urinary B-2-Ms, all of which were normal, and 16 ZPPs, one of which was elevated. The rest were normal. Some inmates had urine lead and zinc levels performed (these tests were not indicated or necessary based on the inmates' workplace exposures, however, the results were normal).

UNICOR Staff

The FCI clinic performs the same biological monitoring for UNICOR staff as for inmates. Test results were available for seven staff members, each of whom was tested once. Three were tested in April 2005 and four in March 2007. The mean BLL was 1.2 µg/dL (range: 0.3-2.7 µg/dL). The mean CdB concentration was 0.2 µg/L (range: 0-0.5 µg/L). The mean CdU concentration was 0.43 µg/g/Cr (range: 0.2-1.2 µg/g/Cr). There were six B-2-M results, and all were normal. There were six ZPP results and one was elevated.

In summary, results of biological monitoring of both staff and inmates were unremarkable.

Medical Records Review

Extensive medical records were reviewed for one former staff member who was never assigned to recycling, one current staff member who worked overtime in recycling in the past, and an inmate who apparently never worked in glass breaking, but did work in recycling. We also received extensive records on a staff member who died in 2008 after being medically retired. The inmate's records documented a variety of nonoccupational health problems. The records of the two living staff members also document a number of nonoccupational health problems. Both medical records document that the patients relate their problems to exposures from electronics recycling, including ionizing radiation, however, in the records the physicians do not attribute the medical problems to recycling exposures. Both had skin problems: one person's was documented prior to work in recycling. Both sent photos, which we reviewed and also sent to an occupational dermatologist for review. One had skin biopsies done. Neither had skin conditions related to work in recycling or proximity to recycling, or ionizing radiation. The staff member who died had a medical problem that was unrelated to any work exposures. There was nothing documented by the health care providers in the medical or death records relating any health problems to recycling exposures. Our review of all these records revealed no evidence of any health problems to recycling exposures or ionizing radiation, either.

Public Meeting and Interviews with Staff

During our public meeting with staff, allegations of exposure to ionizing radiation were raised. Staff reported that items arrived from military bases and that the "radiation alarms" had gone off when the trucks left the base on occasion. Some also noted that some items were marked with skull and crossbones. Some staff members reported that CRTs were broken on purpose inside enclosed semi-trailers in the past, prior to the installation of the GBO. Others denied these allegations to us.

Fourteen staff asked to speak with us after our public meeting with concerned Marianna staff on February 18. None worked in electronics recycling. Some reported that they did pat-downs on inmates who worked in recycling or interacted with inmates from recycling in other ways. Medical problems reported were varied, and included shingles, hypertension, sleep apnea, narcolepsy, hypothyroidism, occasional sores on the scalp, poor memory, chronic fatigue after an episode of severe flu-like symptoms, non-melanoma skin cancer, pleurisy, cellulitis (skin infection), bronchiolitis obliterans organizing pneumonia, night sweats, and insomnia. One person had elevated liver enzymes that resolved without treatment, one had a mildly elevated blood selenium level, and one had an elevated urinary arsenic that was normal upon retesting after abstinence from seafood. This arsenic level was not speciated. None of the reported health effects are related to potential exposures from electronics recycling.

Public Meeting and Interviews with Inmates

Several inmates expressed concern about exposure to heavy metals when a monitor was accidentally broken. It was stated that this occurred about twice a week. Some inmates reported that posted procedures were not followed when cleaning up these breakages; however, one inmate reported always following posted procedures. During the NIOSH site visit, no inmates reported breaking glass on purpose outside the booth, either currently or in the past.

Twelve inmates at the camp asked to speak with us after our public meeting with concerned Marianna inmates on February 18. All had worked in recycling at some time, with time frames beginning as early as 2000. None had performed glass breaking. Several wished to know if they should be tested for exposure to lead or cadmium. Medical issues reported were again varied, and included sun damage to the skin on the hands, recurrent urinary tract and respiratory infections, fungal pneumonia, deep venous thrombosis, neck and back spasms, rash on neck, headache, hypertension, cough, and Grave's Disease. None of the reported health effects are related to potential exposures from electronics recycling.

Interviews at the Hotel

Nine people came to the hotel to be interviewed by us. Two were former UNICOR staff assigned to recycling. One was a FCI staff member who did overtime for a brief period in recycling. Four were former staff members who did not work in recycling. Two were former inmates, neither of whom was assigned to recycling. Reported health effects included swollen joints, rash at the waistband, irritability, anxiety, arthritis, hypertension, hyperlipidemia, having the gallbladder removed, poison ivy, sinus infections, recurrent urinary tract infection, hysterectomy, twitching and tingling sensations, white matter lesions in the brain on magnetic resonance imaging, skin lesions, stabbing chest pain, organic brain syndrome secondary to a motor vehicle accident, and asthma. Some individuals reported family members with health problems, including septicemia and secondary acute renal failure, interstitial cystitis, breast and bladder cancer. None of the reported health effects can be related to exposures from recycling of electronics.

Interviews with Eglin AFB Personnel

Both the Radiation Safety Officer and the DRMO representative had been working at Eglin since the time that electronics recycling began at Marianna in the mid-1990s. They reported that Eglin received materials for disposal or disposition from military bases in the southeastern United States. When items are received in DRMO, they are looked up by stock number. If there is any indication that items contain radioactive materials, these items are segregated and the Radiation Safety Officer is notified. The Radiation Safety Officer chooses the appropriate meter for the type of radiation and goes to DRMO to evaluate the items. If they are found to be radioactive, they are either returned to the sender for proper disposal or sent to Battle Creek, Michigan for disposal. No radioactive items are supposed to be disposed of in any other manner.

Industrial Hygiene

Records Review

The OIG provided an environmental monitoring report prepared by KAM Environmental, Inc., and OSHA documents describing an inspection of the GBO on November 7-8, 2006. The KAM report contains sampling data and descriptive information for a site visit conducted on January 19, 2006. This appears to be the only site visit conducted by a UNICOR consultant at the GBO. No industrial hygiene reports or sampling data were provided for any electronics recycling operations at FCI Marianna for the period prior to January 2006.

The KAM report notes that personal air sampling was conducted for two glass breakers and two glass breaker assistants. Air samples were analyzed for barium, beryllium, cadmium, and lead according to Environmental Protection Agency method 6010B. All results were reported to be below the analytical limits of detection for this method, which indicates that eight-hour time-weighted average exposures were below the action levels (ALs) and permissible exposure limits (PELs) established by OSHA. Short-duration samples (30-minutes, maximum) were not collected to determine if the OSHA ceiling limit for beryllium was exceeded. (Based on sampling results at other FCIs, we believe it is unlikely that a hazardous concentration of beryllium would have been present at FCI Marianna.) Workers in the glass booth wore powered air-purifying respirators (PAPRs), "disposable suits," hoods with face shields, steel-toe boots, and heavy work gloves. The report provided no information indicating how personal protective equipment (PPE) is donned or doffed, nor did the report provide a description of work activities during the sampling period.

The KAM consultant collected eight surface wipe samples and four hand wipe samples that were analyzed for cadmium and lead. As we found during our review of most consultant reports from other FCIs, this report did not clearly describe what the sample results represented. It appears that two of the "hand wipe" samples were actually collected from gloves worn by a breaker and assistant breaker, and two samples were obtained from each worker's hands. The latter samples appear to indicate that lead was not detected on workers' skin, while cadmium was detected on the hand of one glass breaker. Cadmium and lead were detected on work surfaces and equipment, including the pallet jack, booth table, booth floor, and workers' gloves. Cadmium

and lead were detected outside the booth on the "outdoor floor or walkway to building" (noted in the hand-written chain-of-custody sheet).

The KAM consultant concluded that this is a "clean, efficient, and safe operation when considering the nature of the work performed." The report noted that airborne exposures were not "significant;" however, wipe samples indicate a need for better control of lead on hands, as well as housekeeping improvements to reduce the tracking of lead out of the work area. The consultant provided several recommendations for improving worker hygiene and workplace housekeeping.

The OSHA inspection report, which was provided to the warden, and the internal memorandum from OSHA Region 4 Administrator Cindy Coe Laseter describe the glass breaking operation in detail. Personal air monitoring for barium, beryllium, cadmium, and lead was conducted for two glass breakers, two feeders, and one helper. With the exception of one cadmium sample, the results of all personal samples were below the limit of detection. The results of the cadmium sample were well-below the OSHA AL for cadmium. Lead and cadmium were detected in wipe samples collected from PPE and surfaces in the work area, too.

In addition to the sample results, the OSHA inspection report indicated that:

- Glass breakers wore PPE as described by the KAM consultant (above).
- Feeders' PPE differed from that worn by glass breakers in that feeders wore nuisance dust masks.
- "Full compliance with the OSHA respiratory standard was reviewed. An OSHA violation could not be substantiated at this time."
- Glass breakers used pump-up sprayers to moisten glass and surfaces to control dust.
- High efficiency powered air (HEPA)-filtered vacuum cleaners were used to clean the surfaces of boxes of broken glass before boxes are removed from the booth; however, colorimetric tests to ascertain the effectiveness of cleaning were not done. (No violation could be substantiated at this time.)
- Worker rotation was used "to help minimize the inmates' exposure, and to change work locations to allow everyone the chance to experience each job duty." (No violation was noted.)
- Engineering controls were utilized (Atmos-Tech Industries HEPA units).
- Glass breakers wore PPE while cleaning the GBO with brooms, dust pans, and HEPA vacuums at the end of the work shift or at the end of the day.
- Clean-up/sanitation facilities were provided for GBO workers, i.e., rest room with soap and water.

- Eating and/or drinking were prohibited in the glass breaking building. Inmates were trained in the hazards of heavy metals and the importance of good hygiene.

- Inmates used HEPA vacuum cleaners to remove dust from clothing and shoes before exiting the glass breaking building.

Written recommendations from OSHA to the warden:

- Continue using hooded PAPRs even though air sampling results were below ALs and PELs.

- Tape wrists and other openings in PPE.

- Ensure that the PAPR hood completely covers the neck and shoulders.

- Ensure that respirators are clean and free of heavy metals.

- Perform a baseline noise survey.

- Ensure that the correct HEPA filter is used in Vacuum #3.

- Perform "quality assurance checks" to ensure that boxes leaving the glass breaking building are clean, and do not expose the inmate population to lead and cadmium.

- Perform "quality assurance checks" of other items "which are exposing employees to possible ingestion hazards. (This recommendation did not identify the "items of possible environmental contamination..")

- Perform a heat stress evaluation.

NIOSH/DART and FOH conducted environmental, safety, and health assessments of electronics equipment recycling operations at FCI Marianna in August, 2007. The results of air sampling conducted by NIOSH/DART during routine and non-routine operations on August 8 and 9, 2007 indicated that worker exposures to metals did not exceed occupational exposure limits (OELs). However, the feeders' exposures to cadmium were unexpectedly high on August 8. On that day, cadmium exposures for the two feeders were 6.8 $\mu g/m^3$ and 3.8 $\mu g/m^3$ for the 143-minute sampling period. Those concentrations were much greater than the air sampling results reported for glass breakers on either of the two sampling dates, as well as the results for feeders on August 9. If work on August 8 had not been terminated early due to excessive heat, and the CRTs were processed at the same rate for the remainder of the shift, it is possible that one of the feeders would have been exposed to an 8-hour TWA cadmium concentration above the AL on that day. The difference between the feeders' results on the two days suggests that 1) there was considerable day-to-day variability in worker exposures, and 2) engineering controls at Marianna did not always control airborne dust effectively.

Lead, cadmium and other heavy metals were detected in the surface wipe and bulk dust samples.

Environmental heat monitoring and estimates of work rate indicated that some workers in this facility were exposed to heat stress (e.g., above the American Conference of Governmental Industrial Hygienists (ACGIH®) threshold limit value or at risk of heat stress (e.g., exceeding the ACGIH AL) during this assessment.

Recommendations provided by NIOSH/DART include:

- Implementing a site-specific health and safety program at Marianna that includes a heat stress program.
- Evaluating the respiratory protection program to ensure that it complies with OSHA regulations.
- Focusing on practices to prevent accidental ingestion of lead and other metals, such as housekeeping to reduce surface contamination and hand washing to prevent hand-to-mouth transfer of contaminants.
- Evaluating the feasibility of providing and laundering work clothing for all workers in the recycling facility.
- Equipping change rooms with separate storage facilities for work clothing and for street clothes to prevent cross-contamination.
- Evaluating all UNICOR operations in regard to health, safety and the environment.
- Providing a comprehensive program within the BOP to assure both staff and inmates a safe and healthy workplace.

FOH characterized legacy contamination at the blue and gold buildings where electronics recycling was performed between 1998 and August 2002. Wipe samples collected on beams and ductwork in these buildings detected average lead concentrations of 1600 micrograms per square foot ($\mu g/ft^2$) in the blue building, and 610 $\mu g/ft^2$ in the gold building. Cadmium in these samples was reported to be 220 $\mu g/ft^2$ in the blue building, and 92 $\mu g/ft^2$ in the gold building. Four samples collected from the floor in each building indicated lead and cadmium concentrations were one to two orders of magnitude less at floor level than on beams and ductwork. The specific sources and/or operations that generated this contamination have not been determined.

Conclusions

Limited exposure monitoring data suggests that exposures to metals in the FCI GBO may have been sufficiently low such that the OSHA mandated medical surveillance has not been required. In addition, the results of medical surveillance conducted on inmates and staff were unremarkable. However, we believe that if the GBO reopens, UNICOR should continue to

perform the limited biological monitoring that is currently in place as an additional safeguard against excessive exposure and to provide reassurance to inmates and staff. There is no need to perform any medical surveillance if the GBO remains closed. Exposure to metals from electronics refurbishment and disassembly are minimal and do not pose a risk to the health of staff or inmates. There is no evidence to support allegations of exposure to ionizing radiation. There were conflicting reports about whether or not monitors were routinely broken in the back of semi-trailers, however, none of the health effects reported are due to exposure to lead, cadmium, or other exposures that would occur from the breaking of monitor glass.

Recommendations

The following recommendations are provided to improve the safety and health of both the staff and inmates involved with electronics recycling at the FCI Marianna.

1. Although engineering controls and work practices in the current GBO appear to provide effective control of worker exposure to cadmium and lead based upon review of industrial hygiene sampling, comply with the recommendations from NIOSH/DART for improvements to the GBO booth if the GBO reopens. Exposure to feeders should be well characterized, and if similar to breakers, additional engineering controls will be necessary.

2. UNICOR needs to maintain an ongoing program of environmental monitoring to confirm that engineering and work practice controls are sufficiently protective. Environmental monitoring also provides data needed to determine which provisions of the OSHA cadmium and lead standards should be applied for the GBO.

3. While air sampling in the GBO suggests that the level of protection afforded by PAPRs may not be needed, we feel that continued use of PAPRs does have benefits in this setting. Loose fitting PAPRs are comfortable and provide cooling in the potentially hot work environment. In addition, fit testing is not required. Additional periodic air sampling should be conducted to help ensure that exposures remain consistently below all applicable OELs before considering a reduction in the level of respiratory protection in the GBO.

4. Ensure that inmates follow posted procedures for handling accidental breakages of monitors.

5. Ensure full compliance with all applicable OSHA standards, including the General Industry Lead Standard [29 CFR 1910.1025], the Cadmium Standard [29 CFR 1910.1027], the Hazard Communication Standard [29 CFR 1910.1200], and the Respiratory Protection Standard [29 CFR 1910.134]. This includes record keeping requirements, communication requirements, compliance plans, and medical surveillance.

6. Carefully evaluate the qualifications and expertise of consultants who are hired to assess occupational or environmental health and safety issues. One useful benchmark for vetting individuals who provide industrial hygiene services is the designation of Certified Industrial Hygienist (CIH). Certification by the American Board of Industrial Hygiene (ABIH) ensures that prospective consultants have met ABIH standards for education, ongoing training, and

experience, and have passed a rigorous ABIH certification examination. The UNICOR and/or BOP industrial hygienists can assist in the selection of your consultants.

7. Perform a detailed job hazard analysis prior to beginning any new operation or before making changes to existing operations. This will allow UNICOR and BOP to identify potential hazards prior to exposing staff or inmates, and to identify appropriate controls and PPE. Involve the UNICOR and/or BOP industrial hygienists in these job hazard analyses. If medical surveillance is needed then UNICOR and BOP should perform pre-placement evaluations of exposed staff and inmates. This medical surveillance should be overseen by an occupational medicine physician.

8. Appoint a union safety and health representative. This individual should be a regular participant on the joint labor-management safety committee that meets quarterly. Since inmates do not have a mechanism for representation on this committee, ensure that they are informed of its proceedings and that they have a way to voice their concerns about and ideas for improving workplace safety and health.

This interim letter will be included in a final report that will include evaluations at three other BOP facilities. Please post a copy of this letter for 30 days at or near work areas of affected staff and inmates. Thank you for your cooperation with this evaluation. If you have any questions, please do not hesitate to contact us at (513) 841-4382.

Sincerely yours,

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Medical Officer

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cc:
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Paul Laird, Assistant Director, UNICOR

Appendix

Occupational Exposure Limits and Health effects

In evaluating the hazards posed by workplace exposures, National Institute for Occupational Safety and Health investigators use both mandatory (legally enforceable) and recommended occupational exposure limits (OELs) for chemical, physical, and biological agents as a guide for making recommendations. OELs have been developed by Federal agencies and safety and health organizations to prevent the occurrence of adverse health effects from workplace exposures. Generally, OELs suggest levels of exposure to which most workers may be exposed up to 10 hours per day, 40 hours per week for a working lifetime without experiencing adverse health effects. However, not all workers will be protected from adverse health effects even if their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition, and/or a hypersensitivity (allergy). In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the worker to produce health effects even if the occupational exposures are controlled at the level set by the exposure limit. Also, some substances can be absorbed by direct contact with the skin and mucous membranes in addition to being inhaled, which contributes to the individual's overall exposure.

Most OELs are expressed as a time-weighted average (TWA) exposure. A TWA refers to the average exposure during a normal 8- to 10-hour workday. Some chemical substances and physical agents have recommended short-term exposure limit (STEL) or ceiling values where health effects are caused by exposures over a short-period. Unless otherwise noted, the STEL is a 15-minute TWA exposure that should not be exceeded at any time during a workday, and the ceiling limit is an exposure that should not be exceeded at any time.

In the U.S., OELs have been established by Federal agencies, professional organizations, state and local governments, and other entities. Some OELs are legally enforceable limits, while others are recommendations. The U.S. Department of Labor Occupational Safety and Health Administration's (OSHA) permissible exposure limits (PELs) (29 CFR[2] 1910 [general industry]; 29 CFR 1926 [construction industry]; and 29 CFR 1917 [maritime industry]) are legal limits enforceable in workplaces covered under the Occupational Safety and Health Act. NIOSH recommended exposure levels (RELs) are recommendations based on a critical review of the scientific and technical information available on a given hazard and the adequacy of methods to identify and control the hazard. NIOSH RELs can be found in the *NIOSH Pocket Guide to Chemical Hazards* [NIOSH 2005]. NIOSH also recommends different types of risk management practices (e.g., engineering controls, safe work practices, worker education/training, personal protective equipment, and exposure and medical monitoring) to minimize the risk of exposure and adverse health effects from these hazards. Other OELs that are commonly used and cited in the U.S. include the threshold limit values (TLVs) recommended by the American Conference of Governmental Industrial Hygienists (ACGIH), a professional organization, and the Workplace environmental exposure limits recommended by the American Industrial Hygiene Association, another professional organization. ACGIH TLVs are considered voluntary exposure guidelines

[2] *Code of Federal Regulations*. See CFR in references.

for use by industrial hygienists and others trained in this discipline "to assist in the control of health hazards" [ACGIH 2009]. WEELs have been established for some chemicals "when no other legal or authoritative limits exist" [AIHA 2008].

Outside the U.S., OELs have been established by various agencies and organizations and include both legal and recommended limits. Since 2006, the Berufsgenossenschaftlichen Institut für Arbeitsschutz (German Institute for Occupational Safety and Health) has maintained a database of international OELs from European Union member states, Canada (Québec), Japan, Switzerland, and the U.S. [http://www.hvbg.de/e/bia/gestis/limit_values/index.html]. The database contains international limits for over 1250 hazardous substances and is updated annually.

Employers should understand that not all hazardous chemicals have specific OSHA PELs, and for some agents the legally enforceable and recommended limits may not reflect current health-based information. However, an employer is still required by OSHA to protect its employees from hazards even in the absence of a specific OSHA PEL. OSHA requires an employer to furnish employees a place of employment free from recognized hazards that cause or are likely to cause death or serious physical harm [Occupational Safety and Health Act of 1970 (Public Law 91–596, sec. 5(a)(1))]. Thus, NIOSH investigators encourage employers to make use of other OELs when making risk assessment and risk management decisions to best protect the health of their employees. NIOSH investigators also encourage the use of the traditional hierarchy of controls approach to eliminate or minimize identified workplace hazards. This includes, in order of preference, the use of: (1) substitution or elimination of the hazardous agent, (2) engineering controls (e.g., local exhaust ventilation, process enclosure, dilution ventilation), (3) administrative controls (e.g., limiting time of exposure, employee training, work practice changes, medical surveillance), and (4) personal protective equipment (e.g., respiratory protection, gloves, eye protection, hearing protection). Control banding, a qualitative risk assessment and risk management tool, is a complementary approach to protecting worker health that focuses resources on exposure controls by describing how a risk needs to be managed [http://www.cdc.gov/niosh/topics/ctrlbanding/]. This approach can be applied in situations where OELs have not been established or can be used to supplement the OELs, when available.

Lead

Occupational exposure to inorganic lead occurs via inhalation of lead-containing dust and fume and ingestion of lead particles from contact with lead-contaminated surfaces. In cases where careful attention to hygiene (for example, handwashing) is not practiced, smoking cigarettes or eating may represent another route of exposure among workers who handle lead and then transfer it to their mouth through hand contamination. Industrial settings associated with exposure to lead and lead compounds include smelting and refining, scrap metal recovery, automobile radiator repair, construction and demolition (including abrasive blasting), and firing range operations [ACGIH 2007]. Occupational exposures also occur among workers who apply and/or remove lead-based paint or among welders who burn or torch-cut metal structures.

Acute lead poisoning, caused by intense occupational exposure to lead over a brief period of time can cause a syndrome of abdominal pain, fatigue, constipation, and in some cases alteration of

central nervous system function [Moline and Landrigan 2005]. Symptoms of chronic lead poisoning include headache, joint and muscle aches, weakness, fatigue, irritability, depression, constipation, anorexia, and abdominal discomfort [Moline and Landrigan 2005]. These symptoms usually do not develop until the blood lead level (BLL) reaches at least 30-40 micrograms per deciliter of whole blood (µg/dL) [Moline and Landrigan 2005]. Psychiatric symptoms such as depression, anxiety and irritability appear to be related to high levels of current lead exposure, while decrements in cognitive function are related to both recent and cumulative dose [Schwartz and Stewart 2007]. One study documented a significant positive relationship between white matter lesion of the brain noted on magnetic resonance imaging (MRI) and tibia lead levels in former organolead workers [Stewart et al. 2006]. However, the strongest predictors of white matter lesions are sex, age, blood pressure, education, smoking history, alcohol consumption, and ApoE genotype [Stewart et al. 2006]. Overexposure to lead may result in damage to the kidneys, anemia, high blood pressure, impotence, and infertility and reduced sex drive in both sexes. Studies have shown subclinical effects on heme synthesis, renal function, and cognition at BLLs <10 µg/dL [ATSDR 2007]. Inorganic lead is reasonably anticipated to cause cancer in humans [ATSDR 2007].

In most cases, an individual's BLL is a good indication of recent exposure to lead, with a half-life (the time interval it takes for the quantity in the body to be reduced by half its initial value) of 1-2 months [Lauwerys and Hoet 2001; Moline and Landrigan 2005; NCEH 2005]. The majority of lead in the body is stored in the bones, with a half-life of years to decades. Bone lead can be measured using K-shell x-ray fluorescence instruments, but these are primarily research based and are not widely available. Elevated zinc protoporphyrin (ZPP) levels have also been used as an indicator of chronic lead intoxication, however, other factors, such as iron deficiency, can cause an elevated ZPP level, so the BLL is a more specific test for evaluating occupational lead exposure.

The NIOSH REL for inorganic lead is 50 micrograms per cubic meter of air (µg/m^3) as an 8-hour TWA. This REL is consistent with the OSHA PEL, which is intended to maintain worker BLLs below 40 µg/dL; medical removal is required when an employee has a BLL of 60 µg/dL, or the average of the last 3 tests at 50 µg/dL or higher [29 CFR 1910.1025; 29 CFR 1962.62]. This is intended to prevent overt symptoms of lead poisoning, but is not sufficient to protect workers from more subtle adverse health effects like hypertension, renal dysfunction, and reproductive and cognitive effects [Schwartz and Stewart 2007; Schwartz and Hu 2007; Brown-Williams et al. 2009]. Adverse effects on the adult reproductive, cardiovascular, and hematologic systems, and on the development of children of exposed workers, can occur at BLLs as low as 10 µg/dL [Sussell 1998]. At BLLs below 40 µg/dL, many of the health effects would not necessarily be evident by routine physical examinations but represent early stages in the development of lead toxicity. In recognition of this, voluntary standards and public health goals have established lower exposure limits to protect workers and their children. The ACGIH TLV for lead in air is 50 µg/m^3 as an 8-hour TWA, with worker BLLs to be controlled to ≤ 30 µg/dL [ACGIH 2009]. A national health goal is to eliminate all occupational exposures that result in BLLs >25 µg/dL [DHHS 2000]. A panel of experts recently published guidelines for the management of adult lead exposure intended to prevent both acute and chronic effects of lead poisoning [Kosnett et al. 2007]. They recommended that an employee be removed from exposure if a single BLL exceeds 30 µg/dL, or if two measurements taken over 4 weeks exceed 20 µg/dL. Removal should be considered if control measures over an extended period do not decrease BLLs to < 10 µg/dL. The

panel also recommended quarterly BLL testing if the BLL is between 10-19 µg/dL, and semiannual testing if the BLL is < 10 µg/dL. Pregnant women should avoid BLLs > 5 µg/dl. The Third National Report on Human Exposure to Environmental Chemicals (TNRHEEC) found the geometric mean blood lead among non-institutionalized, civilian males in 2001-2002 was 1.78 µg/dL [NCEH 2005]. However, widespread contamination of the environment from leaded gasoline in the past led to significant lead exposure among the general population. This contamination peaked between 1950 and the early 1970s. The average blood lead in Americans in 1965 was over 20 µg/dL [Patterson 1965]. Therefore, persons born prior to the 1970s may have substantial body burdens of lead.

OSHA requires medical surveillance on any employee who is or may be exposed to an airborne concentration of lead at or above the action level, which is 30 $\mu g/m^3$ as an 8-hour TWA ,for more than 30 days per year [29 CFR 1910.1025]. Blood lead and ZPP levels must be done at least every 6 months, and more frequently for employees whose blood leads exceed certain levels. In addition, a medical examination must be done prior to assignment to the area, and should include detailed history, blood pressure measurement, blood lead, ZPP, hemoglobin and hematocrit, red cell indices, and peripheral smear, blood urea nitrogen (BUN), creatinine, and a urinalysis. Additional medical exams and biological monitoring depend upon the circumstances, for example, if the blood lead exceeds a certain level.

Cadmium

Cadmium is a metal that has many industrial uses, such as in batteries, pigments, plastic stabilizers, metal coatings, and television phosphors [ACGIH 2007]. Workers may inhale cadmium dust when sanding, grinding, or scraping cadmium-metal alloys or cadmium-containing paints [ACGIH 2007]. Exposure to cadmium fume may occur when materials containing cadmium are heated to high temperatures, such as during welding and torching operations; cadmium-containing solder and welding rods are also sources of cadmium fume. In addition to inhalation, cadmium may be absorbed via ingestion; non-occupational sources of cadmium exposure include cigarette smoke and dietary intake [ACGIH 2007]. Early symptoms of cadmium exposure may include mild irritation of the upper respiratory tract, a sensation of constriction of the throat, a metallic taste and/or cough. Short-term exposure effects of cadmium inhalation include cough, chest pain, sweating, chills, shortness of breath, and weakness [Thun et al. 1991]. Short-term exposure effects of ingestion may include nausea, vomiting, diarrhea, and abdominal cramps [Thun et al. 1991]. Long-term exposure effects of cadmium may include loss of the sense of smell, ulceration of the nose, emphysema, kidney damage, mild anemia, and an increased risk of cancer of the lung, and possibly of the prostate [ATSDR 1999].

The OSHA PEL for cadmium is 5 $\mu g/m^3$ as an 8-hour TWA [29 CFR 1910.1027]. The ACGIH has a TLV for total cadmium of 10 $\mu g/m^3$ (8-hour TWA), with worker cadmium blood level to be controlled at or below 5 micrograms per liter (µg/L) and urine level to be below 5 micrograms per gram creatinine (µg/g/Cr), and designation of cadmium as a suspected human carcinogen [ACGIH 2009]. NIOSH recommends that cadmium be treated as a potential occupational carcinogen and that exposures be reduced to the lowest feasible concentration [NIOSH 1984].

Blood cadmium levels measured while exposure is ongoing reflect fairly recent exposure (in the past few months). The half-life is biphasic, with rapid elimination (half-life approximately 100 days) in the first phase, but much slower elimination in the second phase (half-life of several years) [Lauwerys and Hoet 2001; Franzblau 2005]. Urinary cadmium levels are reflective of body burden and have a very long half-life of 10-20 years [Lauwerys and Hoet 2001].

OSHA requires medical surveillance on any employee who is or may be exposed to an airborne concentration of cadmium at or above the action level, which is 2.5 $\mu g/m^3$ as an 8-hour TWA, for more than 30 days per year [29 CFR 1910.1027]. A preplacement examination must be provided, and shall include a detailed history, and biological monitoring for urine cadmium (CdU) and beta-2-microglobulin (B-2-M), both standardized to grams of creatinine (g/Cr), and blood cadmium (CdB), standardized to liters of whole blood. OSHA defines acceptable CdB levels as < 5 µg/L, CdU as < 3 µg/g/Cr, and B-2-M as < 300 µg/g/Cr. TNRHEEC found geometric mean CdB of 0.4 µg/L among men in 1999-2000. Smokers can have CdB levels much higher than nonsmokers, with levels up to 6.1 µg/L [Martin et al. 2009]. The geometric mean CdU for men in 2001-2002 was 0.2 µg/g/Cr in NHANES III. Periodic surveillance is also required one year after the initial exam and at least biennially after that. Periodic surveillance shall include the biological monitoring, history and physical examination, a chest x-ray (frequency to be determined by the physician after the initial x-ray), pulmonary function tests, blood tests for BUN, complete blood count, and Cr, and a urinalysis. Men over 40 years of age require a prostate examination as well. The frequency of periodic surveillance is determined by the results of biological monitoring and medical examinations. Biological monitoring is required annually, either as part of the periodic surveillance or on its own. We recommend that the preplacement examination be identical to the periodic examinations so that baseline health status may be obtained prior to exposure. Termination of employment examinations, identical to the periodic examinations, are also required. The employer is required to provide the employee with a copy of the physician's written opinion from these exams and a copy of biological monitoring results within 2 weeks of receipt.

Biological monitoring is also required for all employees who may have been exposed at or above the action level unless the employer can demonstrate that the exposure totaled less than 60 months. In this case it must also be conducted one year after the initial testing. The need for further monitoring for previously exposed employees is then determined by the results of the biological monitoring.

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DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service

National Institute for Occupational
Safety and Health
Robert A. Taft Laboratories
4676 Columbia Parkway
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June 25, 2009

HETA 2008-0055

[redacted]

Investigative Counsel

Oversight and Review Division

Office of the Inspector General

United States Department of Justice, Suite 13100

Washington D.C. 20530

Dear [redacted]:

On November 27, 2007, the National Institute for Occupational Safety and Health (NIOSH) received your request for technical assistance in your health and safety investigation of the Federal Prison Industries (UNICOR) electronics recycling program at Federal Bureau of Prisons (BOP) institutions in Elkton, Ohio; Texarkana, Texas; and Atwater, California. You asked us to assist the United States Department of Justice, Office of the Inspector General (USDOJ, OIG) in assessing the existing medical surveillance program for inmates and staff exposed to lead and cadmium during electronics recycling, and to make recommendations for future surveillance. In

addition, you asked us to assess past exposures to lead and cadmium, and to investigate the potential for "take home" exposure. You later asked us to perform a similar evaluation for the BOP institution in Marianna, Florida. We conducted a site visit at the Atwater BOP institution on October 15, 2008. This interim letter summarizes our findings and provides recommendations to improve the safety and health of the inmates and staff at the United States Penitentiary (USP) in Atwater, California. These findings will be included in a final report that will summarize the evaluations at all four institutions we evaluated.

Inmates were exposed to cadmium and lead above occupational exposure limits during the glass breaking operation (GBO) from 2002-2003. It appears that inmates worked without adequate respiratory protection from April 2002 until July 2002. Exposures seem to have been better controlled with the relocation of the GBO to the spray booth, however, one sample taken after the relocation demonstrated significant cadmium exposure.

Background

The USP in Atwater, California, is a high security facility housing adult male offenders. The institution also includes a minimum security satellite camp. Information provided to us indicates that the UNICOR computer recycling program began at USP Atwater in April 2002. In May 2002, a "3-stage powder booth" was installed for the GBO. Glass breaking continued for 2 months before being suspended pending the results of biological testing for lead, cadmium, and barium. It appears that respirator fit testing was conducted at about the time when glass breaking resumed in mid to late July 2002. An environmental consultant to UNICOR developed a written cadmium and lead compliance plan in August 2002, after air sampling indicated that airborne lead and cadmium concentrations exceeded Occupational Safety and Health Administration

(OSHA) permissible exposure limits (PELs). Glass breaking continued, and in December 2002, UNICOR installed what they termed a "ventilation system that exceeded OSHA standards." In June 2003, the GBO was relocated to take advantage of an existing spray booth on a loading dock. With the exception of several periods when glass breaking was reportedly suspended, glass breaking continued until March 2005 when all glass breaking operations ceased. Throughout this period, UNICOR provided biological monitoring, air sampling, and respirator fit-testing.

Assessment

We reviewed the following documents:

- Results of biological monitoring performed between 2002 and 2008 (provided by your office, the USP clinic, and the factory manager).
- Medical records from seven staff members (provided by your office).
- Work instructions for the GBO and maintenance.
- Rosters for inmates working in the GBO (provided by the factory manager).
- DOJ interviews with staff and inmates.
- Results of industrial hygiene sampling performed by a consultant to UNICOR.

During the site visit on October 15, 2008, we held an opening conference with USP and UNICOR management, American Federation of Government Employees (AFGE) representatives, and the UNICOR factory manager. After the conference we toured the former recycling location in the USP. We met with two inmates individually who had worked in the GBO from its inception to do medical interviews. We spoke to the laundry manager who was

concerned about exposures to his staff. We ended the site visit with a closing conference where we presented our initial findings and recommendations.

Results and Discussion[1]

Medical surveillance

Inmates

Biological monitoring is performed by the USP clinic and consists of blood lead levels (BLLs), blood cadmium (CdB), urine cadmium (CdU), urine beta-2-microglobulin (B-2-M), and serum barium. Not all tests were done for each inmate. The test results are reviewed by a physician. Paper copies of test results are maintained in the inmate's personal medical record but not with UNICOR management. No physical examinations are performed and inmates did not receive medical clearance to wear a respirator. Each inmate's medical records are transferred with them; no medical records are retained at Atwater after an inmate is transferred or released. The timeline provided states that blood testing for inmates working in the GBO began in July 2002; however, a handwritten list of test results done in July 2002 had prior test results noted in parentheses. The Health Services Administrator from that time frame reported that tests noted in parentheses were from March 2002 for inmates in the GBO. There was also a typed list of seven inmates' CdB and CdU results dated March 31, 2003. No units of measurement were given on this list, but reference ranges for CdB were given in micrograms per liter (μg/L). The remainder of the biological monitoring results reviewed was provided on the actual laboratory reports. The results of the available inmate biological monitoring are summarized in the following sections.

[1] See *Occupational exposure limits and health effects* in Appendix.

Preplacement test results from March 2002 were available for 10 inmates who performed glass breaking. All had BLLs, CdB, and serum barium testing. The BLL was below the limit of detection (LOD) of 2 micrograms per deciliter of whole blood (µg/dL) for six inmates, 2 µg/dL for two inmates, and 3 µg/dL for two inmates. CdB was below the LOD of 0.5 µg/L for the one inmate documented to be a nonsmoker. The mean CdB for the remaining inmates was 1.4 µg/L (range: 0.7-2.3 µg/L). Three inmates noted to be smokers had CdBs of 1.7, 2.0, and 2.3 µg/L. Smoking is known to increase CdB levels, sometimes drastically. The mean CdB for the six remaining inmates, for whom smoking status was unknown, was 1.0 µg/L (range: 0.6-2.1 µg/L). No CdU testing was documented. The mean serum barium level was 76.4 µg/L (range: 59-116 µg/L). The reference range provided by the laboratory for serum barium was 0-400 µg/L.

Results were available for 18 inmates who had biological monitoring performed in early July 2002, prior to respirator use but about a week after the temporary shutdown of the GBO. The 10 inmates tested in March 2002 were retested along with eight other inmates who were tested for the first time. The BLLs of the 10 inmates previously tested increased, with all BLLS being above the LOD in July 2002. The mean BLL for these 10 inmates was 4.6 µg/dL (range: 2-9 µg/dL). In contrast, CdBs decreased. The nonsmoking inmate with a nondetectable CdB in March 2002 remained below the LOD. Three others dropped below the LOD of 0.5 µg/L, as well. The remainder had a mean CdB of 1.3 µg/L (range: 0.6-1.8 µg/L). No CdU testing was documented, and mean serum barium was 105.5 µg/L (range: 78-150 µg/L). These test results are the best indication of inmate exposure during the time frame when glass breaking was occurring without controls or respiratory protection. The slightly increased BLLs indicate

exposure to lead, however, the decreased CdB results likely represent an inability to leave the work area to smoke.

The eight inmates tested for the first time in July 2002 had a mean BLL of 3.8 µg/dL (range: 2-8 µg/dL). CdB results were below the LOD for four inmates; one nonsmoker, one smoker, and two whose smoking status was unknown. The mean for the other four was 1.4 µg/L (range: 0.7-2.2 µg/L). Two were smokers, one was a nonsmoker, and the status of the other is unknown. No CdU testing was documented, and mean serum barium was 103.1 µg/L (range: 66-240 µg/L). The value of 240 was an outlier, with the next highest value being 96 µg/L.

Ten inmates were tested between one and four times each between March 2003 and November 2004. Thirteen BLLs were available. Four BLLs were below the LOD of 2 µg/dL. The mean of the other nine BLLs was 3.6 µg/dL (range 2-6 µg/dL). Seventeen CdB were available. Three were below the LOD of of 0.5 µg/L. The mean of the remaining 14 CdB was 1.8 µg/L (range 0.6-4.0 µg/L). Seven inmates known to be smokers had a mean CdB of 1.8 µg/L (range: 0.9-4.0 µg/L). Four inmates were documented nonsmokers: two had CdB below the LOD and two had CdB of 0.6 µg/L. Smoking status of the remaining six inmates was not known. Fourteen CdU test results were available. Five were noted to be "negative" and three were below the LOD of 1.0 µg/L. Three CdU concentrations were quantified at 0.6, 1.2, and 1.3 micrograms per gram of creatinine (µg/g/Cr). Another three were noted to be 1.2, 1.8, and 2.8 but no units of measurement were provided. There were 11 serum barium levels, with a mean concentration of 122.2 µg/L (range: 47-385 µg/L). There were three urinary B-2-Ms, all of which were normal, and no zinc protoporphyrins (ZPP).

UNICOR Staff

Records were reviewed from seven staff members who filed workers' compensation claims for exposures from recycling. These seven were seen by an occupational medicine physician and a toxicologist. Two reported no symptoms; five reported cough productive of brown sputum and brown nasal discharge. They had biological monitoring for lead and cadmium; chest x-rays; spirometry; complete blood counts; blood chemistries; blood beryllium, barium, cobalt, arsenic, mercury, and zinc; erythrocyte sedimentation rate; sputum culture and sensitivity; prothrombin time and partial prothrombin time; and electrocardiograms and a variety of other tests performed. Test results were available for eight staff members (the safety manager was also tested during this time frame), each of whom was tested one to four times between February 2003 and December 2004. Ten BLLs were available. Two were above the LOD, both in the same individual, and measured 3.5 and 5 µg/dL. The LOD varied, and was either 2, 3 or 5 µg/dL. Twelve CdB were available, and six were below the LOD of 0.5 µg/L. The remainder ranged from 0.5-0.9 µg/L. The highest was in a smoker. Nine CdU results were available, and six were below the LOD of 0.5 µg/L. Two were 0.1-0.3 µg/g/Cr, and one was 0.7 µg/L. There were five ZPP results and seven B-2-M results; all were within the normal range. There were seven serum beryllium test results and all were below the LOD. Eight serum barium levels were available. The mean concentration was 43.4 µg/L (range: 3.1-86 µg/L). In addition, blood arsenic, mercury, cobalt, and zinc levels were done. These tests are not based upon occupational exposures, but were noted to be normal. The remainder of the tests was unremarkable and did not suggest an occupational hazard. The toxicologist determined that none of the individuals evaluated had any occupational medical problems.

Results of medical surveillance that 10 UNICOR staff received from private physicians between 2007 and 2008 were available. There were eight BLLs, all below the LOD, and nine CdBs, eight of which were below the LOD and one that was 0.8 µg/L. There were nine CdU results; six were below the LOD of 0.5 µg/L and the other three ranged from 0.3-0.4 µg/L. Eight B-2-M results were within the normal range. The mean of nine serum barium levels was 30.9 µg/L (range: 17-47 µg/L).

Finally, five laundry staff had biological monitoring done once each at the USP clinic during 2003. Two BLLS were below the LOD, the others ranged from 2-3 µg/dL. Four CdBs from nonsmokers were below the LOD. One smoker had a CdB of 1.3 µg/L. All five CdUs were reported as 0.0 µg/L. B-2-M measurements were normal, and mean serum barium was 56.2 µg/L (range:42-68 µg/L).

In summary, results of biological monitoring of both staff and inmates were unremarkable with regards to potential occupational exposure to lead, cadmium, and barium.

Interviews with Inmates

Neither inmate reported medical issues related to work in recycling.

Industrial Hygiene

Records Review

The OIG provided 13 reports of occupational exposure assessments of glass breaking operations performed at USP Atwater between June 2002 and March 2005. Eleven reports were prepared by consultants to UNICOR, and two by the BOP industrial hygienist.

2002

A consultant conducted the first exposure assessment on June 20, 2002. During this visit, the consultant collected one 65-minute personal breathing zone (PBZ) sample that indicated an airborne cadmium concentration of 50 micrograms per cubic meter of air ($\mu g/m^3$) in glass breaking. (The OSHA PEL for cadmium is 5 $\mu g/m^3$ as an 8-hour time-weighted average [TWA]). The airborne lead concentration was reported to be 99 $\mu g/m^3$ (the PEL for lead is an 8-hour TWA concentration of 50 $\mu g/m^3$). The consultant recommended that respiratory protection be provided and that "personal hygiene procedures" be reviewed. The report contained no other information regarding the work environment, work practices, engineering controls, or personal protective equipment (PPE).

The consultant returned on July 24, 2002, and collected seven full-shift PBZ samples for cadmium and lead. The consultant reported that four samples exceeded the cadmium PEL and two other samples exceeded the cadmium action level (AL) of 2.5 $\mu g/m^3$. Cadmium concentrations were reported to be as high as 270 $\mu g/m^3$; however, the report did not state the results for the individual samples. The lead PEL was exceeded in one sample; the lead AL (30 $\mu g/m^3$) was exceeded in two other samples. The report does not indicate if the results were reported for the sampling period (approximately 6½ hours) or calculated as an 8-hour TWA. Cadmium and lead were detected in each of eight surface wipe samples collected on this date. The highest concentrations were found on surfaces in the glass breaking area; lower

concentrations were reported on inmate workers' skin and on surfaces in the food service area. The report repeated the recommendations presented in the previous report.

On September 4-5, 2002, the BOP industrial hygienist conducted a technical assistance visit. He conducted PBZ exposure monitoring in and around the GBO. Five of 11 PBZ samples indicated 8-hour TWA concentrations exceeding the cadmium PEL; one worker was exposed to lead above the PEL. The panel breaker's exposure to cadmium exceeded the PEL on both dates. The panel breaker's exposure to cadmium was an 8-hour TWA concentration of 90 $\mu g/m^3$ (18 times the PEL) while breaking glass outside of the booth under the mezzanine. Of the six samples that did not indicate overexposure to airborne cadmium, five were collected outside the glass breaking area. Shoveling and sweeping of floor debris, and an "aggressive" glass breaking technique were reported as factors contributing to excessive airborne dust concentrations. Recommendations for changing the glass breaking technique, and changing glass breakers' locations relative to the ventilation system were made.

The consultant returned on November 4, 2002, and collected six surface wipe samples, and six full-shift PBZ samples in the GBO. The sampling period was approximately 6 hours. Five of the six samples exceeded the cadmium PEL; one exceeded the lead PEL. PPE worn by workers included half-face piece air purifying respirators fitted with high efficiency particulate air (HEPA) filter cartridges. Both glass breakers were exposed to airborne cadmium concentrations that greatly exceeded the assigned protection factor of 10 for the half-face piece respirators. One glass breaker's lead exposure exceeded the PEL. Lead and cadmium were present in all wipe samples. No recommendations were provided in the report.

2003

On January 21 and February 27, 2003, the consultant assessed worker exposures to barium, beryllium, cadmium, and lead. The report for January 21, 2003, indicates that four of eight PBZ samples exceeded the PEL for cadmium; none were reported to exceed the PEL for lead. Barium concentrations were reported to be very low (beryllium was not detected). The report states that the airborne cadmium concentration near the "exhaust outlet of the booth" exceeded the PEL; however, the report does not describe the location of the outlet, i.e., indoors, outdoors, or proximity to workers. (It is our understanding that the ventilation system used at this time exhausted indoors.) Values reported for barium and beryllium in skin wipe samples were incorrectly interchanged in the report, i.e, the consultant reported beryllium in all wipes samples, while the laboratory analysis report for this visit clearly indicates that beryllium was below the LOD in all wipe samples.

Three PBZ and one area air sample were collected on February 27, 2003. Barium and lead exposures were below PELs; cadmium exposures exceeded the PEL and AL. One PBZ exposure reportedly exceeded the PEL and ACGIH Threshold Limit Value® (TLV) for beryllium; however no supporting documentation (e.g., laboratory analysis reports) was provided to substantiate this finding. In 2003, the PEL and TLV for an eight-hour TWA exposure to beryllium were 0.002 mg/m^3. Given the low beryllium concentrations found in relatively few air samples collected by NIOSH Division of Applied Research Technology (DART) investigators at other UNICOR recycling facilities, the incompleteness of data provided for this visit, and the error in the January report, it is uncertain whether an overexposure to beryllium occurred on this date.

Neither of the reports for 2003 contained recommendations, or provided additional information regarding the work environment, work practices, engineering controls, or PPE.

2004

UNICOR used a different consultant starting in 2004. Another change appears to be the location of the GBO; it is our understanding that in June 2003 the GBO moved from beneath a mezzanine to an existing spray booth on a loading dock, which we toured during our October 2008 site visit.

The consultant conducted four exposure assessments from January through March 2004. During these visits, the consultant collected 18 PBZ and six area air samples that were analyzed for barium, beryllium, cadmium, and lead. With one exception, air sampling indicated airborne concentrations below the LOD and/or occupational exposure limits. The exception was a PBZ sample collected at panel glass breaking on February 9, 2004, which indicated an airborne cadmium concentration of 28 $\mu g/m^3$ during a 287 minute sampling period (17 $\mu g/m^3$ as an 8-hour TWA, assuming no additional cadmium exposure during the unsampled time). No explanation for this singular overexposure was given in the report or in either of the two subsequent reports for 2004. We noted that two reports were written for the February 9, 2004, visit, the first of which suggested that the panel breaker had not been overexposed to cadmium because the worker had been wearing a full-face piece respirator. The transmittal memo for the first report erroneously stated that because a full-face piece respirator was worn, ". . . the PEL for cadmium has been increased to 250." It appears that the second report for this visit was provided a month later in order to correct the errors contained in the initial report; however, the second

report merely omitted the errors, and did not provide a correction, per se. We mention the erroneous statements in the report as another example of incorrect or incomplete information that has been provided to UNICOR by environmental consultants.

Reports for the latter three consultant visits in 2004 state that workers wore disposable suits and full-face piece respirators (presumably air-purifying, not powered air-purifying) while breaking cathode ray tubes (CRTs).

On September 28-30, 2004, the BOP industrial hygienist assessed exposure to metals while workers handled computer monitors in the UNICOR factory and warehouse; the purpose of this visit was not to assess exposure during glass breaking. All air sampling results (barium, beryllium, cadmium, lead) were below the LODs and PELs. Air sampling where six monitors were broken in a Gaylord box produced results below the OSHA PELs for the four elements. Wipe samples were collected from workers' hands, table tops in the production area, and in the food service/dining area located in the corner of the UNICOR factory. Metals were reported in wipe samples obtained from table tops in production areas. Wipe samples from workers' hands were generally below the LOD; however, barium and lead were detected in some samples. Cadmium was detected in one hand wipe sample. Barium and cadmium were detected in a sample from a dining room table top that was reportedly used and cleaned each day. Barium, cadmium, and lead were detected in a wipe sample from the top of cabinet in the dining area. The report recommended using butcher paper or other disposable covering on dining tables, wet wiping or HEPA vacuuming surfaces, and wearing disposable gloves to prevent contamination of workers' skin.

2005

Reports were provided to us for two consultant visits conducted in March 2005. Six PBZ and one area air sample were collected. Air samples during these visits indicated concentrations that were low or below the LOD. The most notable result was a PBZ sample on a glass breaker assistant that indicated a cadmium exposure of 3 $\mu g/m^3$ during a 206 minute sampling period (an 8-hour TWA of 1.3 $\mu g/m^3$ assuming no cadmium exposure during the unsampled period). Low concentrations of cadmium and lead were detected in wipe samples. The report for the first March visit correctly noted that PELs are applied without regard for PPE. Worker exposures were described as insignificant.

No other reports of exposure assessments were provided to us.

Conclusions

Inmates were exposed to cadmium and lead above occupational exposure limits during glass breaking from 2002-2003. It appears that inmates worked without adequate respiratory protection from April 2002 until July 2002. Exposures seem to have been better controlled with the relocation of the GBO to the spray booth, however, one sample taken after the relocation demonstrated significant airborne cadmium exposure. No inmates or employees had blood or urine levels of lead or cadmium which exceeded occupational standards. Medical surveillance was not in compliance with the OSHA lead and cadmium standards, and medical clearance was not performed for respirator use, a violation of the OSHA respiratory protection standard. If the

GBO reopens, UNICOR should thoroughly characterize exposures to lead and cadmium, and perform medical surveillance in compliance with the applicable OSHA standards until it is documented that exposures are controlled below the OELs. There is no need to perform any surveillance if the GBO remains closed. It is unclear if there was exposure to beryllium. The industrial hygiene reports often lacked information needed to interpret findings.

Recommendations

The following recommendations are provided to improve the safety and health of the staff and inmates involved with electronics recycling at the USP Atwater.

1. Although engineering controls and work practices in the GBO generally appear to provide effective control of worker exposure to cadmium and lead based upon review of industrial hygiene sampling, exposures should be better characterized if the GBO reopens. UNICOR needs to maintain an ongoing program of environmental monitoring to confirm that engineering and work practice controls are sufficiently protective. Environmental monitoring also provides data needed to determine which provisions of the OSHA cadmium and lead standards should be applied to the GBO.

3. Ensure full compliance with all applicable OSHA standards, including the General Industry Lead Standard [29 CFR 1910.1025], the Cadmium Standard [29 CFR 1910.1027], the Hazard Communication Standard [29 CFR 1910.1200], and the Respiratory Protection Standard [29 CFR 1910.134]. This includes record keeping requirements, hazard communication requirements, compliance plans, and medical surveillance. In addition to the OSHA

requirements, we recommend that the preplacement examination for cadmium exposure be identical to the periodic examinations so that baseline health status may be obtained prior to exposure. We also strongly recommend UNICOR to voluntarily follow the more protective guidelines for lead exposure and BLLs set forth by the expert panel, [Kosnett et al. 2007], that is outlined in the appendix to this letter.

4. Carefully evaluate the qualifications and expertise of consultants who are hired to assess occupational or environmental health and safety issues. One useful benchmark for vetting individuals who provide industrial hygiene services is the designation of Certified Industrial Hygienist (CIH). Certification by the American Board of Industrial Hygiene (ABIH) ensures that prospective consultants have met ABIH standards for education, ongoing training, and experience, and have passed a rigorous ABIH certification examination. The UNICOR and/or BOP industrial hygienists can assist in the selection of your consultants.

5. Perform a detailed job hazard analysis prior to beginning any new operation or before making changes to existing operations. This will allow UNICOR and BOP to identify potential hazards prior to exposing staff or inmates, and to identify appropriate controls and PPE. Involve the UNICOR and/or BOP industrial hygienists in these job hazard analyses. If medical surveillance is needed then UNICOR and BOP should perform pre-placement evaluations of exposed staff and inmates. This medical surveillance should be overseen by an occupational medicine physician.

6. Appoint a union safety and health representative. This individual should be a regular participant on the joint labor-management safety committee that meets quarterly. Since inmates

do not have a mechanism for representation on this committee, ensure that they are informed of its proceedings and that they have a way to voice their concerns about and ideas for improving workplace safety and health.

This interim letter will be part of the final report that will include evaluations at three other BOP facilities. Please post a copy of this letter for 30 days at or near work areas of affected staff and inmates. Thank you for your cooperation with this evaluation. If you have any questions, please do not hesitate to contact us at (513) 841-4382.

Sincerely yours,

Elena H. Page, M.D., M.P.H.

Medical Officer

David Sylvain, M.S., C.I.H.

Regional Industrial Hygienist

Hazard Evaluations and Technical

Assistance Branch

Division of Surveillance, Hazard

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cc:

Paul Laird, Assistant Director, UNICOR

Timothy Herchenback, AFGE Local 1242

John Grandstaff, Associate Warden of Industries and Education

Appendix

Occupational Exposure Limits and Health Effects

In evaluating the hazards posed by workplace exposures, NIOSH investigators use both mandatory (legally enforceable) and recommended occupational exposure limits (OELs) for chemical, physical, and biological agents as a guide for making recommendations. OELs have been developed by Federal agencies and safety and health organizations to prevent the occurrence of adverse health effects from workplace exposures. Generally, OELs suggest levels of exposure to which most workers may be exposed up to 10 hours per day, 40 hours per week for a working lifetime without experiencing adverse health effects. However, not all workers will be protected from adverse health effects even if their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition, and/or a hypersensitivity (allergy). In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the worker to produce health effects even if the occupational exposures are controlled at the level set by the exposure limit. Also, some substances can be absorbed by direct contact with the skin and mucous membranes in addition to being inhaled, which contributes to the individual's overall exposure.

Most OELs are expressed as a time-weighted average (TWA) exposure. A TWA refers to the average exposure during a normal 8- to 10-hour workday. Some chemical substances and

physical agents have recommended short-term exposure limit (STEL) or ceiling values where health effects are caused by exposures over a short-period. Unless otherwise noted, the STEL is a 15-minute TWA exposure that should not be exceeded at any time during a workday, and the ceiling limit is an exposure that should not be exceeded at any time.

In the U.S., OELs have been established by Federal agencies, professional organizations, state and local governments, and other entities. Some OELs are legally enforceable limits, while others are recommendations. The U.S. Department of Labor Occupational Safety and Health Administration's (OSHA) permissible exposure limits (PELs) (29 CFR 1910 [general industry]; 29 CFR 1926 [construction industry]; and 29 CFR 1917 [maritime industry]) are legal limits enforceable in workplaces covered under the Occupational Safety and Health Act. NIOSH recommended exposure levels (RELs) are recommendations based on a critical review of the scientific and technical information available on a given hazard and the adequacy of methods to identify and control the hazard. NIOSH RELs can be found in the *NIOSH Pocket Guide to Chemical Hazards* [NIOSH 2005]. NIOSH also recommends different types of risk management practices (e.g., engineering controls, safe work practices, worker education/training, personal protective equipment, and exposure and medical monitoring) to minimize the risk of exposure and adverse health effects from these hazards. Other OELs that are commonly used and cited in the U.S. include the threshold limit values (TLVs) recommended by the American Conference of Governmental Industrial Hygienists® (ACGIH), a professional organization, and the Workplace environmental exposure limits (WEELs) recommended by the American Industrial Hygiene Association, another professional organization. ACGIH TLVs are considered voluntary exposure guidelines for use by industrial hygienists and others trained in this discipline "to assist in the

control of health hazards" [ACGIH 2009]. WEELs have been established for some chemicals "when no other legal or authoritative limits exist" [AIHA 2009].

Outside the U.S., OELs have been established by various agencies and organizations and include both legal and recommended limits. Since 2006, the Berufsgenossenschaftlichen Institut für Arbeitsschutz (German Institute for Occupational Safety and Health) has maintained a database of international OELs from European Union member states, Canada (Québec), Japan, Switzerland, and the U.S. [www.hvbg.de/e/bia/gestis/limit_values/index.html]. The database contains international limits for over 1250 hazardous substances and is updated annually.

Employers should understand that not all hazardous chemicals have specific OSHA PELs, and for some agents the legally enforceable and recommended limits may not reflect current health-based information. However, an employer is still required by OSHA to protect its employees from hazards even in the absence of a specific OSHA PEL. OSHA requires an employer to furnish employees a place of employment free from recognized hazards that cause or are likely to cause death or serious physical harm [Occupational Safety and Health Act of 1970 (Public Law 91–596, sec. 5(a)(1))]. Thus, NIOSH investigators encourage employers to make use of other OELs when making risk assessment and risk management decisions to best protect the health of their employees. NIOSH investigators also encourage the use of the traditional hierarchy of controls approach to eliminate or minimize identified workplace hazards. This includes, in order of preference, the use of: (1) substitution or elimination of the hazardous agent, (2) engineering controls (e.g., local exhaust ventilation, process enclosure, dilution ventilation), (3) administrative controls (e.g., limiting time of exposure, employee training, work practice changes, medical surveillance), and (4) personal protective equipment (e.g., respiratory

protection, gloves, eye protection, hearing protection). Control banding, a qualitative risk assessment and risk management tool, is a complementary approach to protecting worker health that focuses resources on exposure controls by describing how a risk needs to be managed [http://www.cdc.gov/niosh/topics/ctrlbanding/]. This approach can be applied in situations where OELs have not been established or can be used to supplement the OELs, when available.

Lead

Occupational exposure to inorganic lead occurs via inhalation of lead-containing dust and fume and ingestion of lead particles from contact with lead-contaminated surfaces. In cases where careful attention to hygiene (for example, handwashing) is not practiced, smoking cigarettes or eating may represent another route of exposure among workers who handle lead and then transfer it to their mouth through hand contamination. Industrial settings associated with exposure to lead and lead compounds include smelting and refining, scrap metal recovery, automobile radiator repair, construction and demolition (including abrasive blasting), and firing range operations [ACGIH 2007]. Occupational exposures also occur among workers who apply and/or remove lead-based paint or among welders who burn or torch-cut metal structures.

Acute lead poisoning, caused by intense occupational exposure to lead over a brief period of time can cause a syndrome of abdominal pain, fatigue, constipation, and in some cases alteration of central nervous system function [Moline and Landrigan 2005]. Symptoms of chronic lead poisoning include headache, joint and muscle aches, weakness, fatigue, irritability, depression, constipation, anorexia, and abdominal discomfort [Moline and Landrigan 2005]. These

symptoms usually do not develop until the blood lead level (BLL) reaches at least 30-40 micrograms per deciliter of whole blood (µg/dL) [Moline and Landrigan 2005]. Psychiatric symptoms such as depression, anxiety and irritability appear to be related to high levels of current lead exposure, while decrements in cognitive function are related to both recent and cumulative dose [Schwartz and Stewart 2007]. One study documented a significant positive relationship between white matter lesion of the brain noted on magnetic resonance imaging (MRI) and tibia lead levels in former organolead workers [Stewart et al. 2006]. However, the strongest predictors of white matter lesions are sex, age, blood pressure, education, smoking history, alcohol consumption, and ApoE genotype [Stewart et al. 2006]. Overexposure to lead may result in damage to the kidneys, anemia, high blood pressure, impotence, and infertility and reduced sex drive in both sexes. Studies have shown subclinical effects on heme synthesis, renal function, and cognition at BLLs <10 µg/dL [ATSDR 2007a]. Inorganic lead is reasonably anticipated to cause cancer in humans [ATSDR 2007a].

In most cases, an individual's BLL is a good indication of recent exposure to lead, with a half-life (the time interval it takes for the quantity in the body to be reduced by half its initial value) of 1-2 months [Lauwerys and Hoet 2001; Moline and Landrigan 2005; NCEH 2005]. The majority of lead in the body is stored in the bones, with a half-life of years to decades. Bone lead can be measured using K-shell x-ray fluorescence instruments, but these are primarily research based and are not widely available. Elevated zinc protoporphyrin (ZPP) levels have also been used as an indicator of chronic lead intoxication, however, other factors, such as iron deficiency, can cause an elevated ZPP level, so the BLL is a more specific test for evaluating occupational lead exposure.

The NIOSH REL for inorganic lead is 50 micrograms per cubic meter of air ($\mu g/m^3$) as an 8-hour TWA. This REL is consistent with the OSHA PEL, which is intended to maintain worker BLLs below 40 µg/dL; medical removal is required when an employee has a BLL of 60 µg/dL, or the average of the last 3 tests at 50 µg/dL or higher [29 CFR 1910.1025; 29 CFR 1962.62]. This is intended to prevent overt symptoms of lead poisoning, but is not sufficient to protect workers from more subtle adverse health effects like hypertension, renal dysfunction, and reproductive and cognitive effects [Schwartz and Stewart 2007; Schwartz and Hu 2007; Brown-Williams et al. 2009]. Adverse effects on the adult reproductive, cardiovascular, and hematologic systems, and on the development of children of exposed workers, can occur at BLLs as low as 10 µg/dL [Sussell 1998]. At BLLs below 40 µg/dL, many of the health effects would not necessarily be evident by routine physical examinations but represent early stages in the development of lead toxicity. In recognition of this, voluntary standards and public health goals have established lower exposure limits to protect workers and their children. The ACGIH TLV for lead in air is 50 $\mu g/m^3$ as an 8-hour TWA, with worker BLLs to be controlled to $\leq$ 30 µg/dL [ACGIH 2009]. A national health goal is to eliminate all occupational exposures that result in BLLs >25 µg/dL [DHHS 2000]. A panel of experts recently published guidelines for the management of adult lead exposure intended to prevent both acute and chronic effects of lead poisoning [Kosnett et al. 2007]. They recommended that an employee be removed from exposure if a single BLL exceeds 30 µg/dL, or if two measurements taken over 4 weeks exceed 20 µg/dL. Removal should be considered if control measures over an extended period do not decrease BLLs to < 10 µg/dL. The panel also recommended quarterly BLL testing if the BLL is between 10-19 µg/dL, and semiannual testing if the BLL is < 10 µg/dL. Pregnant women should avoid BLLs > 5 µg/dl. The Third National Report on Human Exposure to Environmental Chemicals (TNRHEEC) found the geometric mean blood lead among non-institutionalized, civilian males in 2001-2002 was 1.78

µg/dL [NCEH 2005]. However, widespread contamination of the environment from leaded gasoline in the past led to significant lead exposure among the general population. This contamination peaked between 1950 and the early 1970s. The average blood lead in Americans in 1965 was over 20 µg/dL [Patterson 1965]. Therefore, persons born prior to the 1970s may have substantial body burdens of lead.

OSHA requires medical surveillance on any employee who is or may be exposed to an airborne concentration of lead at or above the action level, which is 30 $\mu g/m^3$ as an 8-hour TWA ,for more than 30 days per year [29 CFR 1910.1025]. Blood lead and ZPP levels must be done at least every 6 months, and more frequently for employees whose blood leads exceed certain levels. In addition, a medical examination must be done prior to assignment to the area, and should include detailed history, blood pressure measurement, blood lead, ZPP, hemoglobin and hematocrit, red cell indices, and peripheral smear, blood urea nitrogen (BUN), creatinine, and a urinalysis. Additional medical exams and biological monitoring depend upon the circumstances, for example, if the blood lead exceeds a certain level.

Cadmium

Cadmium is a metal that has many industrial uses, such as in batteries, pigments, plastic stabilizers, metal coatings, and television phosphors [ACGIH 2007]. Workers may inhale cadmium dust when sanding, grinding, or scraping cadmium-metal alloys or cadmium-containing paints [ACGIH 2007]. Exposure to cadmium fume may occur when materials containing cadmium are heated to high temperatures, such as during welding and torching

operations; cadmium-containing solder and welding rods are also sources of cadmium fume. In addition to inhalation, cadmium may be absorbed via ingestion; non-occupational sources of cadmium exposure include cigarette smoke and dietary intake [ACGIH 2007]. Early symptoms of cadmium exposure may include mild irritation of the upper respiratory tract, a sensation of constriction of the throat, a metallic taste and/or cough. Short-term exposure effects of cadmium inhalation include cough, chest pain, sweating, chills, shortness of breath, and weakness [Thun et al. 1991]. Short-term exposure effects of ingestion may include nausea, vomiting, diarrhea, and abdominal cramps [Thun et al. 1991]. Long-term exposure effects of cadmium may include loss of the sense of smell, ulceration of the nose, emphysema, kidney damage, mild anemia, and an increased risk of cancer of the lung, and possibly of the prostate [ATSDR 1999].

The OSHA PEL for cadmium is 5 $\mu g/m^3$ as an 8-hour TWA [29 CFR 1910.1027]. The ACGIH has a TLV for total cadmium of 10 $\mu g/m^3$ (8-hour TWA), with worker cadmium blood level to be controlled at or below 5 micrograms per liter (µg/L) and urine level to be below 5 micrograms per gram creatinine (µg/g/Cr), and designation of cadmium as a suspected human carcinogen [ACGIH 2009]. NIOSH recommends that cadmium be treated as a potential occupational carcinogen and that exposures be reduced to the lowest feasible concentration [NIOSH 1984].

Blood cadmium levels measured while exposure is ongoing reflect fairly recent exposure (in the past few months). The half-life is biphasic, with rapid elimination (half-life approximately 100 days) in the first phase, but much slower elimination in the second phase (half-life of several years) [Lauwerys and Hoet 2001; Franzblau 2005]. Urinary cadmium levels are reflective of body burden and have a very long half-life of 10-20 years [Lauwerys and Hoet 2001].

OSHA requires medical surveillance on any employee who is or may be exposed to an airborne concentration of cadmium at or above the action level, which is 2.5 $\mu g/m^3$ as an 8-hour TWA, for more than 30 days per year [29 CFR 1910.1027]. A preplacement examination must be provided, and shall include a detailed history, and biological monitoring for urine cadmium (CdU) and beta-2-microglobulin (B-2-M), both standardized to grams of creatinine (g/Cr), and blood cadmium (CdB), standardized to liters of whole blood. OSHA defines acceptable CdB levels as < 5 µg/L, CdU as < 3 µg/g/Cr, and B-2-M as < 300 µg/g/Cr. TNRHEEC found geometric mean CdB of 0.4 µg/L among men in 1999-2000. Smokers can have CdB levels much higher than nonsmokers, with levels up to 6.1 µg/L [Martin et al. 2009]. The geometric mean CdU for men in 2001-2002 was 0.2 µg/g/Cr in TNRHEEC. Periodic surveillance is also required one year after the initial exam and at least biennially after that. Periodic surveillance shall include the biological monitoring, history and physical examination, a chest x-ray (frequency to be determined by the physician after the initial x-ray), pulmonary function tests, blood tests for BUN, complete blood count, and Cr, and a urinalysis. Men over 40 years of age require a prostate examination as well. The frequency of periodic surveillance is determined by the results of biological monitoring and medical examinations. Biological monitoring is required annually, either as part of the periodic surveillance or on its own. We recommend that the preplacement examination be identical to the periodic examinations so that baseline health status may be obtained prior to exposure. Termination of employment examinations, identical to the periodic examinations, are also required. The employer is required to provide the employee with a copy of the physician's written opinion from these exams and a copy of biological monitoring results within 2 weeks of receipt.

Biological monitoring is also required for all employees who may have been exposed at or above the action level unless the employer can demonstrate that the exposure totaled less than 60 months. In this case it must also be conducted one year after the initial testing. The need for further monitoring for previously exposed employees is then determined by the results of the biological monitoring.

Barium

Barium is a silver-white metal found in the earth's crust [ATSDR 2007b; NCEH 2005]. It binds with a variety of chemicals to form barium salts. About half of these salts (including barium oxide) are soluble in water, and the other half are not (i.e. barium sulfate used in medical procedures). Barium can be found in food and water, and can be released into the air during mining and certain industrial processes. It is used to make drilling muds, paints, bricks, tiles, ceramics, insect and rat poisons, and a variety of other products. Barium oxide is incorporated into the glass of CRT monitors. Ingestion of large amounts of soluble barium compounds leads to numbness around the mouth, diarrhea, vomiting, weakness or paralysis, and cardiac rhythm disruption [ATSDR 2007b; NCEH 2005]. These symptoms are due to hypokalemia, or low blood potassium levels. Studies of humans or animals exposed to barium compounds in the air are conflicting. Some workers have developed baritosis, a benign lung condition that shows x-ray changes but does not cause abnormal lung function. No routine medical tests are available to determine exposure to barium, and barium levels in blood or urine cannot determine the level of exposure or whether health effects will occur [ATSDR 2007b]. TNRHEEC found geometric mean urine barium levels of 1.32 µg/g/Cr among men in 2001-2002.

The OSHA PEL and the NIOSH REL for soluble barium compounds (except barium sulfate) is 0.5 mg/m^3 as an 8-hour TWA.

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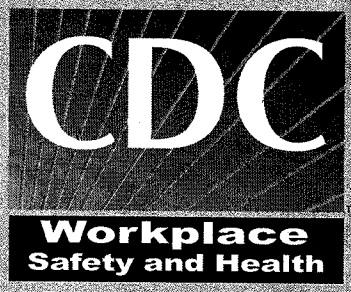

Exposure to Hazardous Metals During Electronics Recycling at Four UNICOR Facilities

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Health Hazard Evaluation Report
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NIOSH *National Institute for Occupational Safety and Health*

The employer shall post a copy of this report for a period of 30 calendar days at or near the workplace(s) of affected employees. The employer shall take steps to insure that the posted determinations are not altered, defaced, or covered by other material during such period. [37 FR 23640, November 7, 1972, as amended at 45 FR 2653, January 14, 1980].

CONTENTS

REPORT

ACKNOWLEDGMENTS

HIGHLIGHTS OF THE NIOSH HEALTH HAZARD EVALUATION

The National Institute for Occupational Safety and Health (NIOSH) received a request for technical assistance from the United States Department of Justice, Office of the Inspector General, in their health and safety investigation of the UNICOR electronics recycling program at four Bureau of Prison institutions. The request concerned reports of exposure to metals, especially lead and cadmium, among staff and inmates involved with the glass breaking operation of electronics recycling at the four UNICOR facilities. We were asked to assess the current medical surveillance program and make recommendations for future surveillance.

What NIOSH Did

- We conducted site visits in Elkton, Ohio, on February 21-22, 2008, and March 25, 2008; in Atwater, California, on October 15, 2008; in Texarkana, Texas, on June 24-25, 2008, and July 16, 2008; and in Marianna, Florida, on February 17-18, 2009.
- We reviewed medical surveillance records, individual medical records, and industrial hygiene sampling records from each institution.
- We visited each institution and toured the current and/or former recycling and glass breaking facilities.
- We met with staff and inmates to hear their concerns and present our findings.
- We measured exposures to lead and cadmium at the Elkton and Texarkana facilities.

What NIOSH Found

- Available records, including results of biological monitoring, and interviews with staff and inmates documented no health problems that could be linked to recycling work. Very few records were available for inmates who worked during the early years of electronics recycling at Elkton and Texarkana.
- Exposure monitoring and medical surveillance were not performed during the first several years of operation at Elkton and Texarkana, so we could not determine the extent of exposure to lead and cadmium during that time. Descriptions of operations during those times suggest that exposures were not well controlled, causing the potential for exposure above occupational exposure limits for lead and cadmium.
- Past exposure monitoring at Atwater documented exposure to lead and cadmium over occupational exposure limits when the glass breaking booth was in its first location, but not when it was moved to the loading dock.
- Past exposure monitoring at Marianna documented exposure to lead and cadmium below occupational exposure limits.
- The sampling we performed demonstrated exposure to lead and cadmium far below occupational exposure limits at Elkton and Texarkana.

HIGHLIGHTS OF THE NIOSH HEALTH HAZARD EVALUATION (CONTINUED)

What Managers Can Do

- At a minimum, ensure full compliance with all applicable Occupational Safety and Health Administration (OSHA) standards. The General Industry Lead Standard [29 CFR 1910.1025], the Cadmium Standard [29 CFR 1910.1027], the Hazard Communication Standard [29 CFR 1910.1200], and the Respiratory Protection Standard [29 CFR 1910.134] should all be followed. Full compliance includes record keeping requirements, communication requirements, compliance plans, and medical surveillance.
- We strongly recommend that UNICOR voluntarily follow the more protective guidelines for lead exposure outlined in the letter we wrote for our site visit to Atwater, California.
- In addition to complying with the OSHA requirements, we recommend that the preplacement examination for cadmium exposure be identical to the periodic examinations so that baseline health status may be obtained prior to exposure. Contract a board-certified, residency-trained occupational medicine physician who is familar with applicable OSHA ations to oversee the medical surveillance program.
- Carefully evaluate the qualifications and expertise of any consultant who is hired to assess occupational health and safety issues. One useful benchmark for vetting individuals who provide industrial hygiene services is the designation of certified industrial hygienist. Hire a certified industrial hygienist if outside expertise is needed to assess environmental health and safety issues.
- Perform a detailed job hazard analysis prior to beginning any new operation or before making changes to existing operations.
- Designate a union safety and health representative to provide consistent employee representation on the joint labor-management safety committee that meets quarterly. Because inmates are not represented on this committee, ensure that they are informed of its proceedings and have a voice in improving workplace safety and health.

What Employees Can Do

- Notify your supervisor and union safety representative if you have concerns or health problems you think are related to your job.
- Participate in employer sponsored medical surveillance programs.

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Introduction

On November 27, 2007, the National Institute for Occupational Safety and Health (NIOSH) received a request for technical assistance from the United States Department of Justice (USDOJ), Office of the Inspector General (OIG), in their health and safety investigation of the Federal Prison Industries, Inc. (UNICOR) electronics recycling program at Bureau of Prisons (BOP) institutions in Elkton, Ohio; Texarkana, Texas; and Atwater, California. We were asked to assess the current medical surveillance program for inmates and staff exposed to lead and cadmium during electronics recycling, and to make recommendations for future surveillance. In addition, we were asked to assess past exposures to lead and cadmium, and to investigate the potential for "take-home" exposure. Later we were asked to perform a similar evaluation for the BOP institution in Marianna, Florida.

We reviewed medical surveillance records, individual medical records, and industrial hygiene sampling records from each institution. We visited each institution and toured the current and/or former recycling and glass breaking facilities and met with staff and inmates to hear their concerns and present our findings. We also performed industrial hygiene sampling at Elkton and Texarkana. At the time of our site visits, glass breaking was being performed at Elkton and Texarkana, but not at Marianna or Atwater. Letters containing detailed information about our assessment, findings, and recommendations for each facility were sent to the OIG and the warden and union at each facility after each of these evaluations. In August 2009, the OIG forwarded additional data for inmates at Elkton. This report contains a summary of our findings at each institution, a review of the additional biological monitoring for Elkton, and overall conclusions and recommendations. For a copy of the individual letters for each BOP institution, please call 513-841-4382.

Facility Evaluations

Federal Correctional Institution Elkton

Electronics recycling at the Federal Correctional Institution (FCI) Elkton appears to have taken place from 1997 until May 2003 without adequate engineering controls, respiratory protection, medical surveillance, or industrial hygiene monitoring. Because

of the lack of biological monitoring and industrial hygiene data, we cannot determine the extent of exposure to lead and cadmium that occurred during that time frame, but descriptions of work tasks from staff and inmates indicate that exposures were not well controlled, causing the potential for exposure above occupational exposure limits (OELs) for lead and cadmium. Based upon available sampling results, we determined that the current glass breaking operation (GBO) controls exposure to lead and cadmium to far below occupational exposure limits. The GBO can be further enhanced to limit exposure to those performing glass breaking as well as limiting the migration of lead and cadmium from the GBO into other areas. Results of biological monitoring of staff and inmates since 2003 were unremarkable. While some take-home contamination was documented in inmate cubicles, surface wipe sampling and biological monitoring suggest that take-home contamination did not pose a health threat. In late August 2009, the USDOJ provided biological monitoring data for 10 inmates, 8 of whom were on the roster of inmates performing glass breaking. The results of this monitoring were unremarkable. One inmate glass breaker was tested in early April 2002, prior to the installation of the glass breaking booth in 2003. This inmate is the only individual for whom we have results prior to that time. His blood lead level (BLL) was 5 micrograms per deciliter (µg/dL), and his blood cadmium level (CdB) was 0.7 micrograms per liter.

We cannot determine the extent of exposure to lead that occurred in the chip recovery process because of the lack of data. Descriptions of work tasks from staff and a BLL of 5 µg/dL in an inmate 4 months after the process ended indicate that exposure to lead during this process did occur. We found no evidence that actions were taken to prevent exposure to lead at the outset in the chip recovery process and that no medical surveillance was performed until after the process ended.

Medical surveillance has not complied with Occupational Safety and Health Administration (OSHA) standards. No medical exams (including physical examinations) were done on inmates, staff received inconsistent examinations and biological monitoring by their personal physicians, biological monitoring for lead was not done at standard intervals, and results were not communicated to the inmates. Inappropriate biological monitoring tests such as urine lead and arsenic testing have been done. Records of medical surveillance were not maintained by the employer for the appropriate length of time.

After careful review of existing records and current operations, we conclude that the only persons with current potential for exposure to either lead or cadmium over the OSHA action level are the inmates who perform glass breaking or monthly filter change-out. We believe that medical surveillance can be discontinued for all other inmates and staff. Some former inmates and/or staff may require surveillance under the OSHA Cadmium Standard.

Federal Correctional Institution Texarkana

Electronics recycling at FCI Texarkana appears to have been performed from late 2001 until May 2004 without appropriate engineering controls, respiratory protection, medical surveillance, or industrial hygiene monitoring. Because of the sparse biological monitoring and industrial hygiene data, we cannot determine the extent of exposure to lead and cadmium that occurred during that time. Descriptions of work tasks from staff and inmates indicate that exposures were not well controlled, causing a potential for exposure above OELs for lead and cadmium. Based on information provided to us and our industrial hygiene sampling, we believe that the current GBO is a significant improvement with respect to controlling worker exposures to cadmium and lead. Some lead- and cadmium-containing dust is still being carried out of the glass breaking booth. Although this does not represent a serious health hazard, it shows a need to maintain good housekeeping throughout the glass breaking area.

Exposures since May 2004 are sufficiently low that the OSHA-mandated medical surveillance has not been required since that time. In addition, the results of medical surveillance conducted since 2003 on inmates and staff were generally unremarkable. It is not possible to quantify past exposures to determine whether they triggered the OSHA lead and/or cadmium standard prior to that time. Inmates are advised of the results of their monitoring and see the physician's assistant; however, records of medical surveillance are not maintained by the employer for the appropriate length of time. Some staff have refused to participate in medical surveillance paid by UNICOR but conducted by their personal physicians.

After careful review of existing records and current operations, we conclude that medical surveillance can be discontinued for inmates and staff who work in electronics recycling and GBO. UNICOR may choose to continue to perform the limited biological monitoring currently in place as an additional safeguard against excessive exposure and to provide reassurance to inmates and staff.

United States Penitentiary Atwater

Inmates were exposed to cadmium and lead above OELs during glass breaking from 2002–2003. It appears that inmates worked without adequate respiratory protection from April 2002 until July 2002. Exposures seem to have been better controlled with relocation of the GBO to the spray booth; however, one sample taken after the relocation demonstrated significant airborne cadmium exposure. Results of medical surveillance of inmates and staff were unremarkable. The medical surveillance program was not in compliance with the OSHA lead and cadmium standards, and medical clearance was not performed for respirator use, a violation of the OSHA respiratory protection standard. If the GBO reopens, UNICOR should thoroughly characterize exposures to lead and cadmium and perform medical surveillance in compliance with the applicable OSHA standards until documentation shows that exposures are controlled below the OELs. Medical surveillance is not needed if the GBO remains closed.

Federal Correctional Institution Marianna

Limited exposure monitoring data suggests that exposures to metals in the FCI GBO may have been sufficiently low such that OSHA-mandated medical surveillance was not required. In addition, the results of medical surveillance conducted on inmates and staff were unremarkable. However, if the GBO reopens, UNICOR should continue to perform the limited biological monitoring currently in place as an additional safeguard against excessive exposure and to provide reassurance to inmates and staff. Medical surveillance is not needed if the GBO remains closed.

Overall Conclusions

UNICOR did not conduct adequate planning and job hazard analysis before initiating electronics recycling operations at the facilities we evaluated. As a result, potential health hazards were not identified in a timely manner, no training was provided to UNICOR staff or inmate workers, and adequate hazard controls were not established for up to several years at some BOP institutions. Factory managers did not receive training, guidance, or oversight needed to address health hazards associated with electronics recycling. Despite this, although testing was incomplete,

BLL, urine cadmium (CdU), and CdB results were below OELs for the vast majority of inmates and staff. No biological monitoring or medical records were available for inmates who were released or transferred.

Overall Recommendations for UNICOR Electronics Recycling Operations

Occupational health and safety should be an integral part of all UNICOR operations. UNICOR needs to commit adequate resources and staff to address workplace hazards and maintain an ongoing program of environmental monitoring to confirm that engineering and work practice controls are sufficiently protective. Environmental monitoring also provides data to determine which provisions of the OSHA Cadmium and Lead Standards should be applied for the GBO. A union safety and health representative should be selected at each BOP institution. This individual should be a regular participant on the joint labor-management safety committee that meets quarterly. Because inmates have no mechanism for representation on this committee, they should be informed of its proceedings and have a way to voice their concerns about and ideas for improving workplace safety and health.

Full compliance with all applicable OSHA standards is mandatory, including the General Industry Lead Standard [29 CFR 1910.1025], the Cadmium Standard [29 CFR 1910.1027], the Hazard Communication Standard [29 CFR 1910.1200], and the Respiratory Protection Standard [29 CFR 1910.134]. Full compliance includes record keeping requirements, hazard communication requirements, compliance plans, and medical surveillance. In addition, the preplacement examination for cadmium exposure should be identical to the periodic examinations so that baseline health status may be assessed and documented prior to exposure. UNICOR should voluntarily follow the more protective guidelines for lead exposure and BLLs set forth by an expert panel [Kosnett et al. 2007]. These guidelines were endorsed by the California Department of Public Health and the Council of State and Territorial Epidemiologists in 2009 and therefore were not included in the initial letters sent to Elkton and Texarkana, but they should be applied to all UNICOR facilities where exposure to lead occurs.

UNICOR should carefully evaluate the qualifications and expertise of consultants hired to assess occupational or environmental health and safety issues. One useful benchmark for vetting individuals who provide industrial hygiene services is the designation of certified industrial hygienist. Certification by the American Board of Industrial Hygiene ensures that prospective consultants have met standards for education, ongoing training, and experience and have passed a rigorous certification examination. The UNICOR and/or BOP industrial hygienists can assist in the selection of consultants.

While air sampling in the GBOs suggests that the level of protection afforded by powered air purifying respirators (PAPRs) may not be needed, continued use of PAPRs does have benefits in this setting. Loose-fitting PAPRs are comfortable and provide cooling in the potentially hot work environment. In addition, they offer the benefit that fit testing is not required. Additional periodic air sampling should be conducted to help ensure that exposures remain consistently below all applicable OELs before a reduction in the level of respiratory protection in the GBOs is considered.

A detailed job hazard analysis should be performed prior to beginning any new operation or before making changes to existing operations. This analysis will allow potential hazards to be identified prior to exposing staff or inmates and identify appropriate controls and personal protective equipment. Involve the UNICOR industrial hygienist in these job hazard analyses. If medical surveillance is needed, BOP should perform preplacement evaluations of exposed staff and inmates. Use a board-certified, residency-trained occupational medicine physician who is familiar with applicable OSHA regulations to oversee the medical surveillance program. UNICOR or BOP may be able to find a local hysician, or contract with Federal Occupational Health. The occupational medicine physician should also oversee medical clearance for respirators.

References

CFR. Code of Federal Regulations. Washington, DC: U.S. Government Printing Office, Office of the Federal Register.

Kosnett MJ, Wedeen RP, Rothenberg SJ, Hipkins KL, Materna BL, Schwartz BS, Hu H, Woolf A [2007]. Recommendations for medical management of adult blood lead exposure. Environ Health Perspect *115*(3):463–471.

Keywords: NACIS 922140 (Correctional Institutions), correctional institution, prison, lead, cadmium, electronic recycling

Acknowledgments and Availability of Report

The Hazard Evaluations and Technical Assistance Branch (HETAB) of the National Institute for Occupational Safety and Health (NIOSH) conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found. HETAB also provides, upon request, technical and consultative assistance to federal, state, and local agencies; labor; industry; and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

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This report was prepared by Elena H. Page and David Sylvain of HETAB, Division of Surveillance, Hazard Evaluations and Field Studies. Field assistance was provided by Manuel Rodriguez. Health communication assistance was provided by Stephanie Evans. Editorial assistance was provided by Ellen Galloway. Desktop publishing was performed by Robin Smith.

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ATTACHMENT 3

FOH Review of the UNICOR Document: *"MARIANNA RECYCLING FACTORY HEAT STRESS PROGRAM Effective Date: January 12, 2009"*

Submitted to: [redacted]
Investigative Counsel
Oversight and Review Division
Office of the Inspector General
U.S. Department of Justice

Submitted by: George Bearer, CIH
FOH Safety and Health Investigation Team
Program Support Center
U.S. Public Health Service
Federal Occupational Health Service

April 14, 2010

FOH Review of the UNICOR Document:
"MARIANNA RECYCLING FACTORY
HEAT STRESS PROGRAM
Effective Date: January 12, 2009"

1.0 INTRODUCTION

During the course of the OIG investigation into UNICOR's e-waste recycling operations, the OIG technical team found that inmate workers conducting certain recycling operations at FCI Marianna including glass breaking and some warehouse and disassembly operations were exposed to heat above American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) and NIOSH Recommended Exposure Limits (RELs) and were at risk of heat stress. Heat exposure was also a factor at other UNICOR e-waste recycling factories. BOP and UNICOR developed a draft operating guideline and a draft heat stress procedure that FOH reviewed in early 2008. FOH found these documents were inadequate. UNICOR then prepared a DRAFT Heat Stress Program, dated September 26, 2008 and finalized this document having an effective date of January 12, 2009. As part of preparation of the OIG Final Report, FOH reviewed the draft and final UNICOR heat stress program documents and provides its comments below.

2.0 DOCUMENT AND IMPLEMENTATION STATUS

The Marianna Recycling Factory (MNRC) Heat Stress Program has an effective date of January 12, 2009 and is in "final" status. During the course of developing its reports for the various UNICOR factories, FOH made inquiries of various Factory Managers concerning the implementation of this program. FOH found that this program has been implemented at Marianna but not at any other UNICOR recycling factory.

FOH confirmed through discussions with the Marianna Factory Manager and review of recent heat exposure measurement data that FCI Marianna is taking steps to implement the Heat Stress Program. Documentation showed that Marianna staff collected heat stress measurements for nine days in August 2009. FOH also noted, however, that the heat measurement table lacked any documentation of actions taken based on the results. FOH recommends that heat stress measurements be accompanied by documentation of exposure control actions taken, such as work/rest regimens or other controls.

3.0 PROGRAM SCOPE AND APPLICABILITY

The scope and applicability of the MNRC Heat Stress Program is limited to UNICOR Marianna Recycling Factory operations, specifically conducted at FCI Marianna. FOH notes that heat exposure is an issue at various UNICOR factories other than MNRC, and that the scope and applicability should be UNICOR-wide. FOH also notes that the OIG technical team identified the potential for heat stress for certain warehouse and factory operations, other than glass breaking. Therefore, this program is required even with the suspension of glass breaking.

4.0 TECHNICAL CONTENT

The technical content of the Heat Stress Program includes measures for heat stress prevention, heat exposure control, heat measurement and evaluation, worker training, medical evaluation and monitoring, and recordkeeping. The content includes important elements for an effective heat stress program, such as worker acclimation, hydration, administrative controls that apply a work/rest regimen, engineering controls and personal protective equipment that are selected considering both the heat hazard and toxic metals hazard, heat stress monitoring using wet bulb globe temperature (WBGT) methods, training requirements, and medical screening and evaluation at pre-employment and under emergency situations. Appendices associated with the program provide useful and more detailed information and guidelines to conduct certain elements of the program such as heat measurement and evaluation, medical monitoring, and training.

The MNRC Heat Stress Program refers to the American Conference of Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) for evaluating and controlling exposure. However, FOH recommends that the document explicitly state in the Background and Purpose that it is UNICOR's policy to adopt the ACGIH TLVs as its heat stress standard.

The Heat Stress Program was drafted when UNICOR was conducting glass breaking operations, and therefore it includes content for glass breaking. UNICOR suspended all glass breaking in June 2009. FOH recommends that UNICOR revise the program to reflect the current operations performed, which do not include glass breaking.

FOH is of the opinion that UNICOR factories could have some difficulty in implementing this program without technical support from industrial hygienists experienced in heat stress evaluation and controls and without an associated and straight forward implementing procedure. The program requires that factories conduct heat stress evaluations (both monitoring and work rate analyses for each activity) and then implement various requirements

based on the results. Factory personnel will need training in the performance of heat measurements and assistance in work rate determinations and other aspects of implementation. The program does point out the need for training in various aspects of implementation and for the need of industrial hygiene assistance. FOH offers a recommended approach to implementation in Section 5.0, below.

In summary, the MNRC Heat Stress Program contains the information and requirements necessary for effective heat exposure analysis and control. UNICOR should apply this program across all its factories. Factory staff will require assistance in its implementation as discussed below in Section 5.0. In addition, UNICOR should add a clear statement to the program that it adopts the ACGIH TLVs as its standard for heat stress evaluation and control.

5.0 RECOMMENDATIONS FOR IMPLEMENTATION AND PATH FORWARD

Assuming that glass breaking remains permanently suspended, UNICOR should issue a revision to this program to eliminate the glass breaking content and focus on current warehouse and factory operations. UNICOR should adopt the ACGIH TLVs as its standard for heat stress control and should also define the scope and applicability as UNICOR-wide, rather than Marianna (MNRC) alone. These actions will serve to simplify the program, particularly since the complicating factors of disposable protective coveralls and respiratory protection should be largely eliminated in most cases (except for less routine operations such as cleanup of accidentally broken CRTs or certain operations and maintenance functions that impact recurring or legacy contamination). FOH recommends a three tiered approach to safety and health programs, with level one being overall safety and health policy, level two being topic-specific safety and health programs and procedures, and level three being straightforward factory level implementing procedures for the level two documents. UNICOR should consider this MNRC Heat Stress Program to be a level two program that then requires a level three implementing procedure to assist the factories in effective application of the program's requirements. Therefore, UNICOR should also develop a straightforward implementing procedure that the factories can successfully apply. FOH provides the following recommendations for this implementation process.

FOH recommends that UNICOR simplify the implementation of the heat stress program at the factory level by taking the following steps.

1. Revise the Heat Stress Program as summarized above.

2. As stated in the current program, the Factory Manager will arrange for workload (work rate) assessments for each job category. UNICOR should

provide experienced industrial hygiene support to determine work rates for work tasks for the various warehouse and factory operations. If tasks are consistent among factories, then UNICOR could determine work rates for one or two typical factories and apply those determinations UNICOR-wide. Where tasks differ in nature among factories, UNICOR should determine such rates at the individual factories. With this information in hand, the Factory Managers will be in a position to focus their efforts on the tasks of moderate or moderate to heavy work rate.

3. Also as stated in the program, UNICOR should provide WBGT monitoring devices to Factory Managers and train staff assigned to perform these measurements in the use of this equipment.

4. UNICOR should develop a straightforward step-wise implementing procedure for the Factory Managers. This procedure should define the work rates determined in step 2 above, as well as instruction on when and how to conduct WBGT measurements. The implementing procedure should also include actions to be taken based on the results of the measurements. For instance, the procedure should provide instruction on how the Factory Manager implements the work/rest regimen based on WBGT measurements and work rates of various tasks.

5. The implementing procedure should also address other elements of implementing the heat stress program, such as the means for providing hydration, identifying and reporting on signs of heat stress, and providing for emergency assistance.

When the implementation process is complete, the Factory Managers should be in a position to implement the practical daily aspects of the heat stress program, without requiring expert industrial hygiene support. The expert support, however, is essential during the initial implementation of the program and implementing procedure.

If through hazard analysis processes UNICOR determines that heat stress is not a factor at a particular factory, then it can exempt that factory from the program even though the program would apply UNICOR-wide. For instance, the USP Leavenworth Factory Manager stated that all work, even unloading of trucks, is conducted in air conditioned areas. However, UNICOR should confirm the presence or absence of a heat hazard through the hazard analysis process.

6.0 SUMMARY

In summary, the MNRC Heat Stress Program contains the essential elements for the effective control of the heat hazard. UNICOR should revise the current MNRC Heat Stress Program to reflect current recycling operations and conditions and apply the program as a level two document on a UNICOR-wide basis. UNICOR should also develop a straightforward implementing procedure that can be applied at the factory level by factory staff. UNICOR should also provide experienced industrial hygiene assistance to determine work rates, train factory personnel, and perform other implementation assistance for the program. Factory management should then be capable of applying the program and procedure when conditions of potential excessive heat exposure are present.

ATTACHMENT 4

U.S. Department of Justice

Federal Bureau of Prisons

Office of the Director

Washington, DC 20534

October 14, 2010

MEMORANDUM FOR CAROL F. OCHOA
ASSISTANT INSPECTOR GENERAL
OVERSIGHT AND REVIEW DIVISION

FROM: Harley G. Lappin, Director

SUBJECT: Response to the Office of Inspector General's (OIG) Revised Draft Report: A Review of Federal Prison Industries' Electronic-Waste Recycling Program

The Bureau of Prisons (BOP) appreciates the opportunity to provide a response to the recommendations from OIG's revised draft report entitled A Review of Federal Prison Industries' Electronic-Waste Recycling Program. I have directed UNICOR and the BOP to work together in a collaborative fashion to further determine the best means for implementing these recommendations.

As you know, Federal Prison Industries (FPI) is one of the Bureau of Prisons' most important correctional programs. While FPI provides products and services, the program's real output is inmates who are more likely to return to society as law-abiding taxpayers because of the job skills training and work experience they received while in FPI. In fact, independent research demonstrates that participation in prison industries and vocational training programs has a significant positive effect on post-release employment and recidivism.

Within all FPI operations nationwide, the continued safety of both staff and inmates alike is a top priority. Specifically,

UNICOR began to institute comprehensive health and safety improvements to its e-waste recycling operations starting in approximately June 2003. By 2007, Robert Tonetti, who was then a senior environmental scientist with EPA, with over 35 years experience in the waste management and recycling fields, stated unequivocally in an email to OIG, "UNICOR facilities are among the best electronics recyclers in the country, and likely are among the best in the world in some regards, such as their handling of CRT glass." As such, FPI is committed to ensuring compliance with all applicable health, safety, and environmental requirements. Specific responses to your twelve recommendations can be found below.

Implement the OIG Technical Team's Recommendations

Recommendation 1: UNICOR and the BOP should complete implementation of the OIG technical team's recommendations.

FOH, NIOSH, OSHA, and EPA made numerous recommendations during our investigation to address deficiencies that they identified from their field work at UNICOR's e-waste factories. The OIG technical team's recommendations addressed 47 issues in 12 general topic areas, including toxic metal contamination, personal protective equipment, medical surveillance, regulatory compliance, hazard assessments, oversight, and glass breaking procedures.

Following a request by the OIG to describe the progress that had been made to implement the technical team's recommendations, the BOP and UNICOR provided a written update in January 2010, which is found in Appendix 1. After reviewing this submission, we determined that UNICOR and the BOP have made significant progress to implement the recommendations. However, 16 of the 47 issues require future updates to the OIG (Recommendations 1, 2, 7, 8, 9, 14, 16, 17, 19, 20, 23, 26, 32, 35, 36, and 38). These 16 issued involve matters such as decontaminating prior glass breaking areas, improving record keeping for medical surveillance data, monitoring surface contamination levels, and improving compliance with the OSHA noise standard.

Response: We agree with OIG's assessment that, as documented in our January 19, 2010, memorandum, UNICOR and the BOP have made substantial progress implementing the recommendations that are contained in the various OIG technical team reports. UNICOR and the BOP plan to work together in order to collaboratively determine the best means for addressing the remaining

outstanding recommendations. We will report back to OIG with progress updates as appropriate.

Enhance Accountability and Improve Inspections and Oversight

Recommendation 2: UNICOR and the BOP should hold their supervisors accountable for compliance with health, safety, and environmental requirements. In particular, the performance appraisals of UNICOR and BOP supervisors should address compliance with these requirements.

UNICOR and the BOP are required to comply with the OSHA and EPA regulations cited throughout our report. We believe that supervisors in UNICOR and the BOP should be held accountable for ensuring compliance with these requirements.

OSHA regulations provide that "[e]ach agency head shall ensure that any performance evaluation of any management official in charge of an establishment, any supervisory employee, or other appropriate management official, measures that employee's performance in meeting requirements of the agency occupational safety and health program, ..." 29 C.F.R. 1960.11. Executive Order 13148 on Greening the Government Through Leadership in Environmental Management also requires that the implementation of pollution prevention and environmental management efforts be accounted for in the performance reviews of federal supervisory personnel.

According to OSHA, UNICOR and the BOP's past and current performance appraisals are inadequate. For example, our review of BOP performance appraisals for Wardens revealed that their performance measures made no reference to ensuring occupational safety and health. We believe that UNICOR and the BOP should ensure that their performance appraisals account for performance that directly impacts institution health and safety.

In addition, we believe that supervisors' performance appraisals should include input from the Health Services Division and account for inspections made by local and regional safety staff, the Program Review Division, UNICOR and BOP Industrial Hygienists, and external auditors.

Response: UNICOR and the BOP recognize that accountability for environmental and occupational health and safety issues is important. As such, we plan to evaluate the performance work plans for managers at all levels, in order to ensure that environmental and occupational health and safety remain a top

priority for all, and also to ensure that input on these issues is received from the Health Services Division and others (as appropriate).

Recommendation 3: UNICOR and the BOP should develop inspection checklists and guidelines for each UNICOR business group and complete inspections of all business groups within 18 months from the date of this report.

An important tool to assist with the detection of non-compliance with health and safety regulations and policies is an inspection checklist. UNICOR does not have an inspection checklist that is specifically designed for its recycling operations. Although we do not believe that checklists are a substitute for well-trained staff, the use of checklists by local and regional safety staff during their inspections of UNICOR's e-waste operations should improve the detection of health, safety, and environmental problems. We also recommend that checklists should be developed for new operations at the time that their initial hazard assessments are performed.

Our discussions with UNICOR and BOP staff revealed that the regulatory non-compliance that we identified in the Recycling Business Group's operations likely exists in other UNICOR business groups. We believe that the development of inspection checklists for UNICOR's six other business groups is important based on the general lack of effective oversight that we identified during this investigation.

In addition, our investigation found that the Program Review Division's Guidelines for UNICOR's operations omit evaluation of health and safety issues, and that the Guidelines for Health Services and Safety do not reference UNICOR. The Assistant Director for the Program Review Division told us that it is not guaranteed that Program Review Division safety inspections will include UNICOR operations. To remedy this deficiency, we believe that the Program Review Division should develop Guidelines that specifically address health and safety issues in UNICOR's factories, and that the Health Services Division and UNICOR's Environmental and Occupational Health Services Manager should assist with this effort. Moreover, to ensure that Program Review Division auditors are properly trained on use of the new Guidelines, Health Services Division or UNICOR hygienists should provide instruction to the auditors and a hygienist should participate in the inspection when practicable.

We therefore recommend that within 18 months from the date of this report, the Health Services Division, in conjunction with UNICOR and BOP hygienists and regional and local safety staff, should complete industrial hygiene inspections for all UNICOR business groups. Results showing significant non-compliance with regulatory requirements should be reported to DOJ, consistent with Recommendation 4 below.

Response: The Recycling Business Group factories are pursuing third-party certification under the Responsible Recycler (R2) program for electronics recycling facilities. It is expected that all RBG factories will have this certification (which includes the ISO 14001 environmental management system, as well as the OHSAS 18001 worker safety management system) by the end of calendar year 2011. In order to obtain and maintain the R2 environmental and worker safety certification, RBG factories will be audited annually by a third-party who has been approved by a certifying organization authorized by the American National Standards Institute.

Likewise, UNICOR and the BOP also plan to evaluate UNICOR's other operations and develop checklists and additional training materials if needed. We anticipate this would include an industrial hygiene risk assessment for each business group. We will continue to provide updates to OIG as this process progresses.

UNICOR and the BOP have also been working together to enhance the relevant Program Review guidelines. Changes which have been considered include environmental/safety policy issues, PPE, and permitting. More specific enhancements to Program Review safety guidelines will also be made in coordination with the BOP.

Recommendation 4: DOJ should monitor health, safety, and environmental compliance by UNICOR and the BOP and establish internal compliance oversight procedures to address repeat noncompliance.

Our interviews with the environmental and occupational health and safety program managers in DOJ's Justice Management Division revealed that DOJ does not monitor or collect health, safety, and environmental compliance information from Department components, including UNICOR and the BOP, such as the issuance of fines or notices of violation from regulatory inspections. Both JMD program managers told the OIG that they thought that DOJ should receive and review compliance-related health and safety information from components within the Department. The

occupational health and safety program manager said that three types of information should be reported to him: (1) OSHA violations identified by OSHA inspectors; (2) OSHA violations that inspectors, including Industrial Hygienists and local safety staff, identified as serious and that are repeated; and (3) any imminent danger or hazard findings, including those made by local safety staff.

We believe that DOJ should monitor UNICOR and the BOP's health, safety, and environmental compliance performance, and should be prepared to ensure that corrective action is taken in the event that it appears that the non-compliance is not being adequately addressed.

Response: The response to Recommendation 4 was provided by Lee J. Lofthus, Assistant Attorney General for Administration, to Carol F. Ochoa, Assistant Inspector General, Oversight and Review Division, in an October 8, 2010, memorandum. A copy of that memorandum is attached.

Acquire Necessary Technical Resources

Recommendation 5: UNICOR and the BOP should perform an evaluation to determine how many additional Industrial Hygienists are needed. UNICOR and the BOP should use hygienists to oversee the selection and use of industrial hygiene contractors.

The OIG technical team concluded that UNICOR and the BOP have an insufficient number of Industrial Hygienists. According to the team, the increasing complexity of the occupational health and safety fields requires trained safety staff with ample skills and competencies.

According to UNICOR's sole Industrial Hygienist, UNICOR's operations frequently require evaluation by personnel with training that exceeds that typically possessed by BOP safety staff. The Assistant Director of the Health Services Division, Dr. Newton Kendig, told the OIG that he was aware of the need to improve the technical competency of safety staff and that he is attempting to professionalize the discipline within the BOP. He stated that there is probably more technical expertise required for the safety discipline than almost any other in the BOP; although, BOP safety staff member have not had the depth of training that is needed for their positions.

To increase the technical resources available to UNICOR and the BOP, we believe that UNICOR and the Health Services Division should perform an evaluation to determine how many hygienists are needed. The Chief Operating Officer of UNICOR, Paul Laird, told the OIG that it would not be unreasonable for UNICOR and the BOP to obtain four additional hygienists pending the outcome of the evaluation above.

We believe that oversight of the hygienists should be performed by the Health Services Division, under the leadership of an experienced Chief Industrial Hygienist and safety professional who can manage the delivery of industrial hygiene and safety services throughout UNICOR and the BOP. The complexity of the industrial hygiene and safety services required by UNICOR and the BOP warrants overall supervision of those services by an experienced hygienist with familiarity in managing a large industrial hygiene and safety program. Recommendation 6 also discusses the need for hygienists or other safety professionals from the Health Services Division to supervise regional and institution safety staff.

Our investigation also found that UNICOR and the BOP often obtained industrial hygiene consulting services that were deficient and that UNICOR and BOP staff lacked sufficient training to recognize the deficiencies. We believe that this problem can be addressed by requiring UNICOR and BOP Industrial Hygienists to participate in drafting the scope of work for the contractors, overseeing their selection and use, and evaluating their work product.

Response: UNICOR and the BOP agree with the OIG's assessment that occupational health and safety issues are growing increasingly complex and more often than not require hands-on involvement from an Industrial Hygienist.

As such, UNICOR had previously hired an Industrial Hygienist, and is in the process of adding a second Industrial Hygienist. Likewise, the BOP recently added an Industrial Hygienist to their staff as well.

In the coming months, UNICOR and the BOP plan to work together to fully evaluate the agency's occupational health needs and determine the number of additional trained staff required to meet those needs. In addition to simply evaluating the number of staff required, we will also evaluate the best manner in which to deploy the additional staff, in order to ensure their skills and abilities will be best utilized by the agency.

Strengthen the Role of the Health Services Division

Recommendation 6: The Health Services Division should oversee the delivery of health, safety, and environmental services at BOP institutions and UNICOR factories. We believe that the BOP and UNICOR should consider requiring that local and regional safety staff, as well as BOP and UNICOR Industrial Hygienists, report to the Health Services Division rather than to institution or regional correctional managers. In addition, compliance enforcement of health safety and environmental regulations should be an integral part of the Division's responsibilities.

Our investigation revealed that the quality of services that institution safety offices provided to the BOP and UNICOR varied significantly, and that local safety staff at times provided inaccurate information and advice. We found that BOP regional and headquarters safety personnel are not responsible for the management of local safety programs, including the performance of institution safety staff, and that important safety information often was "stove piped" at the institution level and not shared. We believe that this method of furnishing industrial hygiene and safety services exacerbated problems with the e-waste recycling program, primarily by delaying both the recognition of the hazards associated with e-waste and the formulation of a sufficient response to these hazards that was implemented consistently between factories.

To avoid similar problems in the future, as well as to improve UNICOR and the BOP's compliance performance, we believe that the BOP should evaluate whether the Health Services Division should be assigned management responsibility for the delivery of industrial hygiene and safety services throughout the BOP and UNICOR. The Health Services Division presently establishes health, safety, and environmental policies, and is knowledgeable about regulatory requirements that must be carried-out in BOP's institutions. We believe that for the BOP and UNICOR to achieve compliance with regulatory requirements and ensure that the advice of safety staff is consistent and accurate, regional and local safety personnel should be overseen by experienced Industrial Hygienists or other safety professionals from the Health Services Division who are familiar with regulatory requirements and are committed to seeing that they are respected.

This change would also ensure that local safety staff would not be overseen by managers whose performance evaluations depend

in part on the outcome of safety staff inspections. OSHA regulations require that the performance appraisals of UNICOR and BOP supervisors include an assessment of their performance in meeting the requirements of the BOP's occupational safety and health program (see Recommendation 2), which mandates compliance with applicable health, safety, and environmental regulations. 29 C.F.R. 1960.11. Requiring safety staff to report to institutional correction managers whose performance evaluations depend in part on the results of safety inspections could compromise the independence of safety staff.

We also believe that the Health Services Division should adopt a rigorous program of compliance enforcement. The Division should oversee regular, unannounced inspections of UNICOR operations and UNICOR and BOP managers should be held accountable for the results. When regulatory violations are found, the Health Services Division should issue warnings to institution and regional BOP managers. Large numbers of single instance violations or repeated serious violations should be addressed in manager performance appraisals, and the violations should also be reported to DOJ.

In addition, UNICOR's issuance of health, safety, and environmental policies should be contingent on the Health Services Division's review and approval. UNICOR currently is able to issue its own health and safety policies without review and approval from any oversight entity. We believe that BOP should consider making the Health Services Division the sole authority on health, safety, and environmental matters within UNICOR and the BOP. We believe that without centralized BOP control over policy development, inconsistent advice will be provided to UNICOR and BOP managers.

Response: The UNICOR and the BOP are currently evaluating a variety of options for the delivery of health, safety, and environmental services. Items such as, but not limited to, technical staff reorganization and compliance enforcement are being considered during this evaluation to better ensure that the mission of the BOP and UNICOR are met.

Recommendation 7: The BOP should evaluate the need to establish an occupational health program administered by the Health Services Division.

Our investigation determined that the BOP lacks an adequate occupational health program that seeks to reduce illnesses and injuries in the workplace. According to the Assistant Director

for the BOP's Health Services Division, Dr. Kendig, BOP health staff is currently not assigned occupational health duties. We believe that the deficiencies we identified with the BOP's medical surveillance of UNICOR staff and inmates were caused in large part by the lack of occupational health resources within the BOP. The BOP should evaluate the need to create an occupational health program that would be overseen by the Health Services Division.

Response: The BOP is currently evaluating the establishment of an occupational health program administered by the Health Services Division.

Enhance Training

Recommendation 8: UNICOR and the BOP need to improve their ability to detect violations of health, safety, and environmental regulations, and should develop a joint plan to enhance site-specific training for regional and institution staff with oversight responsibilities of UNICOR operations.

Our investigation found an unacceptably high number of regulatory violations, the vast majority of which were not identified by UNICOR and BOP staff. To improve staff members' ability to identify health, safety, and environmental problems, UNICOR and the BOP should jointly formulate and implement intensive training on regulatory requirements for safety staff, UNICOR Factory Managers, Production Controllers, Associate Wardens, and Superintendents of Industries. This training should supplement annual training and be focused on the particular operations that the managers are required to supervise.

Response: UNICOR and the BOP recognize the need to further improve health, safety, and environmental regulatory compliance issues and training. UNICOR and the BOP are currently working towards improving these areas.

Improve Communications

Recommendation 9: Safety Managers who oversee similar UNICOR operations should communicate regularly about health, safety, and environmental issues that they identify in their UNICOR's factories. The results of industrial hygiene and environmental testing and inspections should be shared promptly between institutions and with UNICOR Program Managers.

We found during our visits to BOP institutions that Safety Managers who oversaw e-waste recycling operations did not regularly communicate with each other about problems that they were finding with the e-waste operations, and that the results of industrial hygiene testing and inspections were not consistently shared between institutions and with UNICOR Program Managers. This "stove piping" of information and the lack of communication between institutions and with UNICOR and BOP Headquarters placed workers in jeopardy. For example, information on injuries from glass breaking operations was not shared, resulting in delays in furnishing adequate protective equipment to inmate glass breakers at some factories.

To avoid problems related to poor communications, we believe that safety staff with similar UNICOR operations should consult through conference calls at least bi-annually, that information about problems should promptly be shared with other factories, and that testing and inspection results should be promptly distributed to institutions with similar UNICOR operations and to UNICOR Program Managers following receipt.

Response: We concur with OIG's recommendation that efforts should be taken to seek to further promote communication and that it would be beneficial for Safety Managers who oversee similar UNICOR operations to communicate regularly about health, safety, and environmental issues that they identify in their UNICOR factories. We also believe it would be beneficial to share the results of industrial hygiene and environmental testing and inspections done by UNICOR or the BOP promptly between institutions and with UNICOR Program Managers. UNICOR and BOP will seek to evaluate ways to enhance communication between the factories and with Central Office.

Evaluate Use of OSHA Cooperative Programs

Recommendation 10: UNICOR should complete an assessment of the feasibility of enrolling its factories in OSHA cooperative programs and report the results to the OIG.

During our investigation, OSHA encouraged UNICOR to enroll in one of its cooperative programs to improve compliance performance. Many agencies in the federal government participate in programs such as the OSHA Voluntary Protection Program, including the Postal Service and the Navy. A Voluntary Protection Program establishes performance related criteria for the management of safety and health systems and uses the criteria to assess the progress of the program participant.

We believe that UNICOR currently is not in compliance with many federal health and safety regulations, and that enrollment of its factories in an OSHA cooperative program could significantly improve compliance performance. UNICOR should assess the feasibility of enrolling its factories in an OSHA cooperative program and report the results of its evaluation to the OIG. We recommend that the UNICOR Board of Directors be briefed on the results of this evaluation.

Response: Although there may have been some compliance issues in the past, UNICOR is committed to maintaining its current compliance and to further ensuring compliance with all federal health and safety regulations in the future. Recently, UNICOR developed an "Environmental Occupational Health Commitment Statement" signed by senior UNICOR executive staff, to demonstrate UNICOR's desire and commitment to continue to achieve compliance. We agree to further assess and/or pursue occupational, safety and health management system recognition, cooperative programs and other compliance efforts, and to provide regular updates relating to UNICOR's compliance with federal health and safety regulation to its Board of Directors.

Evaluate Controls on Exports of E-Waste

Recommendation 11: The Recycling Business Group should evaluate ways to better ensure that exports of its e-waste are in compliance with host-nation, and international laws and do not result in harm to workers or to the environment.

According to current General Manager of the Recycling Business Group, Robert Tonetti, UNICOR currently sells e-waste products to other recyclers and brokers who export them to smelters in other countries in order to complete the recycling process. Tonetti told the OIG that this practice is common in e-waste recycling. For example, he stated that recycled CRT glass from U.S. goes to only four plants in the world that manufacture new CRTs - two in India and one in Korea, and one is in Malaysia. However, investigations of e-waste recycling practices in many nations abroad have revealed serious health, safety, and environmental problems. To address this issue, since approximately 2003, UNICOR has required its vendors to self-certify that they do not send e-waste to landfills for disposal and that their exports of e-waste comply with all national and international laws. Tonetti told the OIG while the vendor self-certifications "are a start," he stated that "it is nowhere near where we need to be." He said that he is seeking to obtain third-party certifications for the Recycling Business

Group's operations that address the issue of "downstream" due diligence.

We concur with Tonetti's actions and believe that the Recycling Business Group should institute procedures to better ensure that its e-waste that is sold to vendors does not end up later causing harm to workers or to the environment. We recommend that within six months from the release of this report, the Recycling Business Group should identify current "best practices" for performing due diligence on downstream vendors and develop a written plan to put those practices into use.

Response: UNICOR's Recycling Business Group has been working to improve procedures for the screening of downstream market vendors in regards to the adequacy of practices used by these vendors in protecting worker safety and the environment.

Downstream due diligence for worker safety and environmental protection is a major component of the R2 certification that all RBG factories are pursuing. Two of the current seven UNICOR factories are expected to achieve R2 certification by Spring of 2011. RBG's template for screening downstream vendors for environmental and safety aspects would be completed as part of this process. Following certification of the initial two factories, the other RBG factories will begin implementing this same screening protocol for downstream vendors, with the goal of achieving full implementation by the end of calendar year 2011.

Prevent Injuries

Recommendation 12: UNICOR and the Health Services Division should track injury trends in UNICOR operations. UNICOR Program Managers should be informed of all injuries in factories that they oversee.

Our investigation determined that the BOP was failing to comply with OSHA regulations governing the recording of inmate worker injuries. UNICOR and the BOP have advised the OIG that they intend to comply with this requirement.

We believe that UNICOR and the Health Services Division should use the inmate injury data that is collected to determine whether injury trends are evident in UNICOR operations, such as would have been apparent from examination of injuries sustained by inmate glass breakers. In addition, all injuries in UNICOR operations should be reported to Headquarters' Program Managers.

This will enable UNICOR Headquarters staff to assist in monitoring the safety of the operations for which they are responsible. The Assistant Director for the Health Services Division, Dr. Kendig, told the OIG that he is attempting to upgrade the Division's ability to collect and manage occupational health and injury data, and he is evaluating web-based options to perform this work.

Response: UNICOR and the BOP agree that inmate injury data should be collected in a central location, in order to better identify trends throughout the agency. This work has already commenced. The BOP is evaluating the best manner in which to collect and manage this data, as well as introduce and implement the new system and train staff with respect to any new systems to be utilized.

If you have any questions regarding this response, please contact VaNessa P. Adams, Assistant Director, Program Review Division, at (202) 353-3206.

Attachment

U.S. Department of Justice

Office of the Associate Attorney General

Washington, D.C. 20530

OCT - 8 2010

MEMORANDUM FOR CAROL F. OCHOA
Assistant Inspector General
Oversight and Review Division

FROM: Lee J. Lofthus
Assistant Attorney General
for Administration

SUBJECT: Response to the Office of the Inspector General's (OIG) Draft Report: A Review of Federal Prison Industries' Electronic-Waste Recycling Program

The Justice Management Division (JMD) appreciates the opportunity to respond to a recommendation from the OIG's draft report entitled A Review of Federal Prison Industries' Electronic-Waste Recycling Program, dated July 2010. Please find JMD's response below:

OIG Recommendation # 4: *"DOJ should monitor health, safety and environmental compliance by UNICOR and the BOP and establish internal compliance oversight procedures to address repeat non-compliance."*

JMD Response: JMD agrees that a strong Departmental health and safety oversight program is essential. According to DOJ Order 1779.2A, "Occupational Safety and Health Program," Heads of Components have primary responsibility for maintaining a safe workplace within their organization. The Order also establishes monitoring and review processes and oversight procedures to address health, safety and environmental compliance by all Components, including UNICOR and the Bureau of Prisons. The Order is in the process of being rewritten, and JMD will clarify the practices and guidelines for Component and Departmental Safety and Health Program Managers to use in conducting appropriate inspections and review of records and reports. The proposed plan of action is:

A. JMD will update DOJ Order 1779.2A, "Occupational Safety and Health Program," to clarify the requirements for maintaining records related to accidents, occupational injuries, and Federal and State occupational safety and health inspection activities. The updated Order will also clarify the role of the Department Safety and Health Program Manager (DSHPM), JMD Facilities and Administrative Services Staff (FASS), in reviewing the records prepared by the Components.

B. The DSHPM will request and review the reports specified in the Safety and Health Order on a regular basis and will address any deficiencies found back to the appropriate Component official(s).

Please contact Steve Eck, Department Safety and Health Program Manager, FASS, at (202) 307-6247 if you require additional information.

U.S. Department of Justice
Justice Management Division

Office of the Assistant Attorney General

Washington, D.C. 20530

OCT 19

MEMORANDUM FOR CAROL F. OCHOA
Assistant Inspector General
Oversight and Review Division

FROM: Lee J. Lofthus
Assistant Attorney General
for Administration

SUBJECT: Supplement to Response to the Office of the Inspector General's (OIG) Draft Report: A Review of Federal Prison Industries' Electronic-Waste Recycling Program

The Justice Management Division (JMD) sent a response to a recommendation from the OIG's draft report entitled A Review of Federal Prison Industries' Electronic-Waste Recycling Program, on October 8, 2010. We offer additional information below to clarify and supplement that response:

OIG Recommendation # 4: *"DOJ should monitor health, safety and environmental compliance by UNICOR and the BOP and establish internal compliance oversight procedures to address repeat non-compliance."*

JMD Additional Response: JMD intends to maintain a strong and effective program to ensure appropriate oversight of component efforts in environmental protection. We are currently developing a Department Order to implement an Environmental Management System in accordance with Executive Order 13423 and we will ensure that appropriate steps to ensure strong and effective oversight and compliance enforcement for environmental protection issues are included.

Please contact Steve Eck, Department Safety and Health Program Manager, FASS, at (202) 307-6247 if you require additional information.

ATTACHMENT 5

U.S. Department of Justice

Office of the Associate Attorney General

Washington, D.C. 20530

OCT - 8

MEMORANDUM FOR CAROL F. OCHOA
Assistant Inspector General
Oversight and Review Division

FROM: Lee J. Lofthus
Assistant Attorney General
for Administration

SUBJECT: Response to the Office of the Inspector General's (OIG) Draft Report: A Review of Federal Prison Industries' Electronic-Waste Recycling Program

The Justice Management Division (JMD) appreciates the opportunity to respond to a recommendation from the OIG's draft report entitled A Review of Federal Prison Industries' Electronic-Waste Recycling Program, dated July 2010. Please find JMD's response below:

OIG Recommendation # 4: *"DOJ should monitor health, safety and environmental compliance by UNICOR and the BOP and establish internal compliance oversight procedures to address repeat non-compliance."*

JMD Response: JMD agrees that a strong Departmental health and safety oversight program is essential. According to DOJ Order 1779.2A, "Occupational Safety and Health Program," Heads of Components have primary responsibility for maintaining a safe workplace within their organization. The Order also establishes monitoring and review processes and oversight procedures to address health, safety and environmental compliance by all Components, including UNICOR and the Bureau of Prisons. The Order is in the process of being rewritten, and JMD will clarify the practices and guidelines for Component and Departmental Safety and Health Program Managers to use in conducting appropriate inspections and review of records and reports. The proposed plan of action is:

A. JMD will update DOJ Order 1779.2A, "Occupational Safety and Health Program," to clarify the requirements for maintaining records related to accidents, occupational injuries, and Federal and State occupational safety and health inspection activities. The updated Order will also clarify the role of the Department Safety and Health Program Manager (DSHPM), JMD Facilities and Administrative Services Staff (FASS), in reviewing the records prepared by the Components.

B. The DSHPM will request and review the reports specified in the Safety and Health Order on a regular basis and will address any deficiencies found back to the appropriate Component official(s).

Please contact Steve Eck, Department Safety and Health Program Manager, FASS, at (202) 307-6247 if you require additional information.

ATTACHMENT 6

OIG ANALYSIS OF BOP, UNICOR, AND DOJ RESPONSES TO OIG RECOMMENDATIONS

The OIG provided a draft of this report to the BOP, UNICOR, and DOJ for their review and comment. The BOP's and UNICOR's response to the draft report is included in Attachment 4. The DOJ provided comments on Recommendation 4, which is included in Attachment 5. Our analysis of these responses and a summary of the actions necessary to close each recommendation are presented below.

Recommendation Number:

1. **Resolved.** The BOP and UNICOR concurred with our recommendation that they complete implementation of the OIG technical team's recommendations. The BOP and UNICOR stated that they plan to work together to determine the best means to address the outstanding recommendations and will provide progress updates to the OIG.

This recommendation can be closed when the BOP and UNICOR provide evidence that they have fully completed implementation of the technical team's recommendations.

2. **Resolved.** The BOP and UNICOR concurred with our recommendation that they hold their supervisors accountable for compliance with health, safety, and environmental requirements. The BOP and UNICOR stated that they recognize that accountability for health, safety, and environmental issues is important and will evaluate the performance work plans of their managers.

This recommendation can be closed when the BOP and UNICOR provide documentation that they have considered and revised as appropriate the performance work plans of supervisors to account for compliance with health, safety, and environmental requirements, and that they have begun addressing such compliance in performance appraisals of such supervisors. The BOP also should establish procedures that require these performance appraisals to include input from the Health Services Division about the supervisor's performance in achieving compliance with relevant health, safety, and environmental requirements, and include consideration of any inspections of the facility or facilities under the supervision of the relevant supervisor by local and regional safety staff, the Program Review Division, UNICOR and BOP industrial hygienists, and external auditors.

3. **Resolved.** In response to our recommendation that the BOP and UNICOR develop inspection checklists and guidelines for each UNICOR business group, the BOP stated that the Recycling Business Group is pursuing third-party certification under the Responsible Recycler (R2) program, and that its e-waste factories will be audited annually. The BOP and UNICOR further stated that they plan to evaluate UNICOR's other operations, and that they are working together to improve the relevant Program Review Guidelines.

We believe the Recycling Business Group's decision to seek third-party certification of its operations is a positive step. We believe that independent assessments can provide valuable compliance and performance information that will better ensure that workers and the environment are protected. However, we believe it is important, in addition to the R2 program certification and audit, that UNICOR and the BOP develop their own compliance resources, including inspection checklists, and to train other BOP and UNICOR staff on their use. The BOP's response also did not address completion of the inspections called for in the recommendation.

This recommendation can be closed when the BOP and UNICOR provide copies to the OIG of inspection checklists for UNICOR business groups, provide revised Program Review Division guidelines that ensure evaluation of UNICOR operations for health and safety issues, and provide documentation that the inspections referred to in this recommendation have been completed.

4. **Resolved.** In response to our recommendation that DOJ provide oversight of UNICOR's and the BOP's health and safety compliance performance, DOJ's Justice Management Division (JMD) stated that it "agrees that a strong Departmental health and safety oversight program is essential" and that it is revising DOJ Order 1779.2A which, according to JMD, "establishes monitoring and review processes and oversight procedures to address health, safety, and environmental compliance by all Components, including UNICOR and the Bureau of Prisons." In a supplemental response dated October 19, 2010 (included in Attachment 4), JMD further stated that "JMD intends to maintain a strong and effective program to ensure appropriate oversight of component efforts in environmental protection." According to JMD, it is developing a Department-wide Environmental Management System (EMS) in accordance with Executive Order 13423, and will ensure that strong and effective oversight and compliance enforcement are included in the EMS.

This recommendation can be closed when DOJ establishes oversight policies that allow it to monitor UNICOR and the BOP's health, safety, and

environmental compliance performance, and that these policies require corrective action in the event that it appears that UNICOR and the BOP are not adequately addressing non-compliance.

5. **Resolved.** The BOP and UNICOR concurred with our recommendation that they should perform an evaluation to determine how many additional industrial hygienists they should recruit. The BOP and UNICOR response stated that they recognize that occupational health and safety issues have become highly complex and that "more often than not require hands-on involvement from an Industrial Hygienist." They also stated that they intend to fully evaluate occupational health needs within the BOP and determine the number of additional trained staff that are required to meet those needs and how best to deploy them.

However, we also recommended that the BOP's Health Services Division retain a Chief Industrial Hygienist to manage the delivery of industrial hygiene and safety services throughout UNICOR and the BOP and that UNICOR and the BOP should ensure that industrial hygienists oversee the work of safety contractors. We believe that it is essential for the BOP to retain highly trained and experienced professionals to oversee the delivery of safety and occupational health services. The BOP and UNICOR did not respond to these aspects of our recommendation.

This recommendation can be closed when the BOP and UNICOR complete an evaluation of how many industrial hygienists they need to hire; recruit the hygienists that this evaluation determines are needed; establish policies that ensure that oversight of BOP and UNICOR hygienists is performed by the Health Services Division under the leadership of an experienced Chief Industrial Hygienist and safety professional who can manage the delivery of industrial hygiene and safety services throughout UNICOR and the BOP; and establish policies that require BOP and UNICOR industrial hygienists to participate in defining the work of health and safety contractors, overseeing their selection and use, and evaluating their work product.

6. **Resolved.** In response to our recommendation that the Health Services Division oversee the delivery of health, safety, and environmental services at BOP institutions and UNICOR factories, the BOP and UNICOR stated that they currently are evaluating a variety of options to improve the delivery of health, safety, and environmental services, including technical staff reorganization and compliance enforcement.

This recommendation can be closed when: (1) the Health Services Division assumes oversight responsibility for the delivery of health, safety, and environmental services at BOP institutions and UNICOR factories; (2) the BOP and UNICOR complete an evaluation to determine whether local and regional safety staff, as well as BOP and UNICOR industrial hygienists, should report to the Health Services Division rather than to institution or regional correctional managers; (3) the Health Services Division adopts policies to implement a compliance enforcement program; and (4) the BOP and UNICOR establish policies requiring the Health Services Division's review and approval of UNICOR health, safety, and environmental policies.

7. **Resolved.** The BOP and UNICOR concurred with our recommendation to evaluate the need to establish an occupational health program administered by the Health Services Division, and the BOP stated that the evaluation is underway.

This recommendation can be closed when the BOP completes its evaluation and provides us with the results.

8. **Resolved.** The BOP and UNICOR concurred with our recommendation to improve training so that BOP and UNICOR staff can better detect violations of health, safety, and environmental regulations. The BOP and UNICOR stated that they currently are working to improve their training programs.

This recommendation can be closed when the BOP and UNICOR provide evidence that they have upgraded their training programs, including creating and implementing site-specific training on regulatory requirements for safety staff, UNICOR Factory Managers, Production Controllers, Associate Wardens, and Superintendents of Industries.

9. **Resolved.** The BOP and UNICOR concurred with our recommendation to improve communications between Safety Managers who oversee similar UNICOR operations, and to promptly share the results of industrial hygiene and environmental testing and inspections between institutions and with UNICOR Program Managers. The BOP and UNICOR agreed that efforts should be taken to further promote communications and that "it would be beneficial for Safety Managers who oversee similar UNICOR operations to communicate regularly about health, safety, and environmental issues that they identify in their UNICOR factories."

This recommendation can be closed when the BOP and UNICOR institute policies that require the communications described in this recommendation.

10. **Resolved.** The BOP and UNICOR concurred with our recommendation to assess the feasibility of enrolling its factories in OSHA cooperative programs.

This recommendation can be closed when the BOP provides us with this assessment.

11. **Resolved.** In response to our recommendation that the Recycling Business Group evaluate ways to better ensure that exports of its e-waste are in compliance with U.S., host-nation, and international laws and do not result in harm to workers or to the environment, the BOP and UNICOR stated that the Recycling Business Group has been working to improve its procedures for screening the safety and environmental practices of "downstream" vendors. The BOP stated that the Recycling Business Group expects its participation in the Responsible Recycler (R2) program to improve these screening procedures.

This recommendation can be closed when the Recycling Business Group provides evidence of improved procedures for screening the safety and environmental practices of downstream vendors. For example, the BOP should consider identifying current "best practices" for performing due diligence on downstream vendors and developing a written plan to put those practices into use.

12. **Resolved.** The BOP and UNICOR concurred with our recommendation to record inmate injuries and to track injury trends in UNICOR operations. The BOP and UNICOR stated that inmate injury data should be collected in a central location in order to better identify injury trends.

This recommendation can be closed when the BOP and UNICOR establish policies that require the recording of inmate injuries, the assessment of injury trends, and the sharing of injury information with UNICOR Program Managers.