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Exhibit 19 – KG Exhibit # 16

Exhibit KG#16 Laws and Standards

Occupational Safety and Health Act of 1970 as amended

Executive Order 12196 – Occupational safety and health programs for Federal employees: Paragraphs 1-2 and 1-201 (a), (b), (C), (d), (e), (f), (g), (h), (I), and (j)

OSHA regulations
29 CFR 1960.8
29 CFR 1960.9
29 CFR 1960.11
29 CFR 1960.12
29 CFR 1960.16
29 CFR 1960.17
29 CFR 1960.18
29 CFR 1960.19
29 CFR 1960.25
29 CFR 1960.26
29 CFR 1960.27
29 CFR 1960.28
29 CFR 1960.29
29 CFR 1960.30

29 CFR 1910.94 paragraphs (b), (c),
29 CFR 1910.95 paragraphs (a), (b), (c), (d), (e), (f), (i), (j), (k), (l), (m), (n)
29 CFR 1910.120 paragraphs (a), (b), (c), (e), (h), (l), (m), (p), (q)
29 CFR 1910.132 paragraphs (a), (d), (f),
29 CFR 1910.133 paragraphs (a),
29 CFR 1910.134 paragraphs (a), (b), (c), (d), (f), (g), (h), (k), (m), App A
29 CFR 1910.135
29 CFR 1910.136
29 CFR 1910.138
29 CFR 1910.141 paragraphs (a), (g)
29 CFR 1910.146 paragraphs (a), (b), (c), (d), (e), (f), (g), (h), (l)
29 CFR 1910. subpart Z paragraphs (a), (b), (c), (d)
29 CFR 1910.1000 all tables : paragraph a, b, c, d, e.
29 CFR 1910.1001 paragraphs (a), (b), (c), (d), (e), (f), (g), (h), (i), (j), (k), (m), (n), App A,
29 CFR 1910.1018 paragraphs (a), (b), (c), (e), (f), (g), (h), (j), (k), (m), (o), (p), (q), (r)
29 CFR 1910.1020 paragraphs (a), (b), (c), (d), (e), (g),
29 CFR 1910.1025 paragraphs (a), (b), (c), (d), (e), (f), (g), (h), (i), (l), (m), (n), (o), App A, B, C, D
29 CFR 1910.1026 paragraphs (a), (b), (c), (d), (e), (f), (g), (i), (j), (l), (m),
29 CFR 1910.1027 paragraphs (a), (b), (c), (d), (e), (f), (g), (i), (j), (k), (m), (n), (o),
29 CFR 1910.1028 paragraphs (a), (b), (c), (d), (e), (f), (g), (h), (j), (k), (l)
29 CFR 1910.1048 paragraphs (a), (b), (c), (d), (e), (f), (g), (h), (i), (m), (n), (o), App B
29 CFR 1910.1052 paragraphs (a), (b), (c), (d), (e), (f), (g), (h), (i), (k), (l), (m),
29 CFR 1910.1200 paragraphs (a), (b), (c), (d), (e), (g), (h), App B
29 CFR 1910.1045 paragraphs (a), (b), (c), (d), (e), (f), (h), (i), (j),

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29 CFR 1926. Subpart C
29 CFR 1926. Subpart D
29 CFR 1926.62 paragraphs (a), (b), (c), (d), (e), (f), (g), (h), (i), (l), (m), (n), (o), App A, B, C, D
29 CFR 1926.65
29 CFR 1926. Subpart E
29 CFR 1926.1101 paragraphs (a), (b), (c), (d), (e), (f), (g), (h), (i), (j), (k), (m), (n), App A

NIOSH NTIS Publication No. PB-94-195047; Documentation for Immediately Dangerous to Life or Health Concentrations (IDLH)
National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL)

Department of Defense Instruction 6055.1, Dated August 19, 1998
Paragraphs 2.2.; 4.1; 4.3; E3.1.;E3.1.1; E3.5; E3.5.1; E3.5.3; E3.5.3.1; E35.3.2;

Department of Defense Instruction 6055.5, dated January 10, 1989
Paragraphs 1.2.; 5.1.; 6.1.1; 6.1.1.1.; 6.1.1.2.; 6.1.1.3.;

AR 385-10, Chapter 16, 17, and 18; Paragraphs 8-1.a, 8-1.b; and 8-2.
DA PAM 385-10, Paragraphs 8-1.a, 8-1.b; and 8-2.

AR 40-5, Paragraphs 1-5; 1-6; 1-7; 2-18 to include n.(1) & n.(3); 2-26;
DA PAM 40-11; Paragraphs 1-4; 1-6; 2-2; 2-18; 4-14; 4-15; 5-1; 5-2 d; 5-3; 5-7; 5-8; 5-10; 5-12; 5-13; 5-14; 5-15; 5-17; 5-19; 5-20; 5-22; 5-26; 7-12; 7-14; 10-1; 11-1; 11-2;
DA PAM 40-21, Ergo; 1-1; 1-4; 1-6; 1-7; 1-8; 1-9; Chapter 3, 4,
DA PAM 40-501, Noise Chapter 1, 3, 4, 5, 6
DA PAM 40-503, IHP; Chapter 1, 2, 3, 4, 5, 6, 7, App C, D
DA PAM 40-506 Vision; Chapter 1, 2, 3, 4, 5, 6
TB MED 510, WAG; Chapter 1, 2, 3, 5,
TB MED 513, Asbestos, paragraphs 4, 8, 9, 10, 11, 12, 13, 14
TG 278, Mold; Page 3
TG-040, Noise: Part I
TG 141, Sampling; All
TG 181, Noise; All

AR 608-10, Paragraph 4-4; 4-6; 4-8; 4-24 through 4-37; 4-33; 5-27; 5-35; 5-39; 5-41; 5-42; 5-43; 5-48; 5-50; 5-53; 6-52; App C
AR 190-47 paragraph 1-4; 7-2 a.4.; 9-4 d;
Title 41, CFR, Section 101–20.107.

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Exhibit 19 – KG Exhibit # 17

DEPARTMENT OF THE ARMY
U.S. ARMY MEDICAL DEPARTMENT ACTIVITY
550 POPE AVENUE
FORT LEAVENWORTH KS 66027-2332

REPLY TO
ATTENTION OF

MCXN-PM (40-5f) 12 March 2007

MEMORANDUM For Record

SUBJECT: MFR for Employee Notification

1. On 26 February 2007 LTC [redacted], 2LT [redacted], and Mr. Karl Gibson met to discuss the up coming changes to the PM staff. At the meeting LTC [redacted] expressed that she did not want to continue to include the survey sample results in the survey memorandums.

2. Why are sampling results included in the Industrial Hygiene survey memorandums?

a. Congress passed and the President signed the Safety Act in 1971. It established Occupational Safety and Health Administration (OSHA). In the law, it requires employers to provide there employees a safe and healthful work environment. This requires documentation to be established and employees informed of the hazards or the lack of hazards in the work environment.

b. President Executive Order 12196, "Occupational Safety and Health Programs for Federal Employees," February 26, 1980 made compliance of executive branch (to include DOD and DA) must comply with OSHA standards.

c. OSHA established worker protection regulations in Title 29 CFR 1910. for general industry and Title 29 CFR 1926 for construction industry. These require:

1) All environmental (workplace) monitoring or measuring of a toxic substance or harmful physical agent, including personal, area, grab, wipe, or other form of sampling, as well as related collection and analytical methodologies, calculations, and other background data relevant to interpretation of the results obtained must be documented in writing and provided to the employee. These records for each employee shall be preserved and maintained for at least the duration of employment plus thirty (30) years.

2) The employer must, within 15 working days after the receipt of the results of any monitoring performed notify each affected employee of these results either individually in writing or by posting the results in an appropriate location that is accessible to affected employees.

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d. For DOD safety requirements includes and encompasses all DoD personnel and operations worldwide during peacetime and military deployments. They are found in:

1) DoD Instruction 6055.6, "DoD Fire and Emergency Services," December 15, 1994
DoD Instruction 6055.7, "Mishap Investigation, Reporting and Recordkeeping," April 10, 1989
DoD Directive 5110.4, "Washington Headquarters Services (WHS)," May 6, 1991
DoD Instruction 1438.5, "Civilian Employees' Occupational Health and Medical Services Program," December 4, 1997
DoD Instruction 6055.5, "Industrial Hygiene and Occupational Health," January 10, 1989
DoD Instruction 6055.1, "DoD Safety and Occupational Health (SCH) Program", 08/19/1998

2) Within the Department of Defense, the right of access to relevant civilian employee exposure and medical records shall be in accordance with OSHA or other Federal Agencies, regardless of any argument concerning the applicability of that part to Federal Agencies. The DoD Components shall conduct safety and health evaluations of all workplaces and operations where DoD personnel are regularly employed at fixed installations during peacetime operations, and, to the extent feasible, to wartime and peacekeeping operations.

3) The DoD Components shall comply with the standards promulgated by OSHA under 29 U.S.C. 651 et seq. (reference (d)) in all nonmilitary-unique DoD operations and workplaces, regardless of whether work is performed by military or civilian personnel. Although these OSHA-prescribed or approved standards are the primary measure of workplace safety and health, the DoD Components shall, in addition, ensure compliance with other applicable regulatory standards related to SOH that are issued under statutory authority by the Department of Defense or other Federal Agencies.

4) At least annually, qualified SOH personnel shall visit every installation workplace. The exact nature of the visit is at the discretion of the local senior SOH professional or as directed by that official's higher headquarters. Visits are to be conducted more frequently based on factors such as the exposure to and potential severity of hazards, actual accident experience, special emphasis programs, changes in the organization's staffing or workplaces, or other event that increases risk of accidents and occupational illnesses. Military personnel and DoD civilian workers or their representatives should be encouraged to participate in these visits to assist in identifying unsafe or unhealthful working conditions. Also, the DoD Components are required to schedule visits, based upon hazard analysis, to ensure the health and safety of their personnel working in DoD contractor facilities. Procedures shall be established to document and follow-up on the correction of deficiencies identified during a visit.

e. For the US Army, the requirements are found in AR 385-10 Safety and AR 40-5:

1) AR 385-10 requires a standard Army safety and occupational health inspections. All workplaces will be inspected at least annually using SASOHI procedures. Facilities and operations involving special hazards will be inspected more frequently as determined by qualified safety and occupational health personnel. As well as a written hazard assessment will be done for current operations and be on file at the work site, conducted by qualified civilian or military safety and occupational health professional.

2) AR 385-10 requires a written reports of violations resulting from SASOHI will be provided to the head of the activity or the commander of the unit inspected. These reports will cite hazards and safety management deficiencies and will recommend corrective actions. Notices will be posted by the official in charge of the workplace where the condition was discovered. Where it is not practical to post the notice at or near the hazard, it will be posted in a prominent place where it will be readily observable by all affected personnel. Delivery and posting will take place within 15 days of detection for safety violations and 30 days for health violations. The notices will remain posted for 3 working days or until correction, whichever is later. All posted notices will describe the nature and severity of the violation, the substance of the abatement plan, and interim protective measures.

3) AR 40-5 requires PM to inform Army personnel and co-located contractor personnel of health threats, risks, and appropriate unit and individual preventive countermeasures using health risk communication techniques.

4) AR 40-5 requires Commanders of MEDCENs and MEDDACs, in coordination with the chief of preventive medicine services, will notify unit and installation commanders of special or potentially serious health problems. **The initial telephonic or electronic notification will be followed by a written report within 72 hours.** The purpose is to inform commanders of serious sanitary deficiencies, OEH hazards, potential epidemic conditions, or other serious situations that may affect the health of the command.

5) DA Pam 40-11 requires in order to meet AR 385-10 and AR 40-5 requirements that worksite visits/evaluations are conducted annually by occupational health, industrial hygiene, and safety personnel. Additional worksite evaluations are conducted as operations change. **Each visit is documented, and the worksite supervisor is provided a written report. At a minimum, these evaluations should include hazardous material identification, type of engineering controls needed if applicable, type of personal protective equipment required, and posting of appropriate signs needed (that is, noise-hazardous area, eye protection required).**

MCXN-PM (40-5f) 12 March 2007
SUBJECT: MFR for Employee Notification

6) DA Pam 40-503 requires in order to meet AR 385-10 and AR 40-5 requirements that The Industrial Hygiene Program Manager (IHPM) must ensure that each operation performed on the installation is analyzed to evaluate and document all worker exposures, both potential and/or real. Documentation of exposures includes qualitative and quantitative assessment. And in DA Pam 40-503, Paragraph 4–12. ***Worker notification: Regardless of outcome, the IHPM notifies, in writing, the workplace supervisor of the assessment results. The supervisor in turn notifies the employees.***

3. In order to meet these requirements, the Notice of Sampling (a CHPPM and Great Plains provided electronic form) is provided to the C, PM so the 72 hour notification is compiled with. This is to be sent to Commander/Director/Supervisor of work area, CAC Safety, and DIS. The initial form just had the sample information table. Previous Chiefs in PM have added the findings and recommendation sections. The written memorandum is written as soon as possible to meet the 15 work day requirement.

4. As the IHPM, the removal of the survey sampling results would not be lawful and would be non-compliant with OSHA, DOD and DA regulations.

3. POC is Mr. Karl Gibson, Industrial Hygienist, [redacted] or [redacted]@cen.amedd.army.mil.

[redacted]
LTC, AN
Chief, Preventive Medicine

KARL L. GIBSON
GS 11, USA MEDDAC

APPENDIX A

List of Some of the Requirements

Sections 1101 note, 1105, 1115 note, and 1116-1119, 1982 and Supp 1998, of title 31, United States Code

Public Law 104-113, "National Institute of Standards and Technology Act," March 7, 1996.

Executive Order 12196, "Occupational Safety and Health Programs for Federal Employees," February 26, 1980

Occupational Safety and Health Administration (OSHA), Department of Labor, "Basic Program Elements for Federal Employees Occupational Safety and Health Programs and Related Matters," October 21, 1980 (29 CFR 1960)

IAW OSHA's Title 29 CFR 1960 Subpart I - Recordkeeping and Reporting Requirements

IAW OSHA's Title 29, Code of Federal Regulations, Part 1910.1020, "Access and Retention to Medical Records"

1910.1020(c)(1)
"Access" means the right and opportunity to examine and copy.

1910.1020(c)(2)
"Analysis using exposure or medical records" means any compilation of data or any statistical study based at least in part on information collected from individual employee exposure or medical records or information collected from health insurance claims records, provided that either the analysis has been reported to the employer or no further work is currently being done by the person responsible for preparing the analysis.

1910.1020(c)(3)
"Designated representative" means any individual or organization to whom an employee gives written authorization to exercise a right of access. For the purposes of access to employee exposure records and analyses using exposure or medical records, a recognized or certified collective bargaining agent shall be treated automatically as a designated representative without regard to written employee authorization.

1910.1020(c)(4)
"Employee" means a current employee, a former employee, or an employee being assigned or transferred to work where there will be exposure to toxic substances or harmful physical agents. In the case of a deceased or legally incapacitated employee, the employee's legal representative may directly exercise all the employee's rights under this section.

1910.1020(c)(5)
"Employee exposure record" means a record containing any of the following kinds of information:

1910.1020(c)(5)(i)
Environmental (workplace) monitoring or measuring of a toxic substance or harmful physical agent, including personal, area, grab, wipe, or other form of sampling, as well as related collection and analytical methodologies, calculations, and other background data relevant to interpretation of the results obtained;

1910.1020(c)(5)(ii)
Biological monitoring results which directly assess the absorption of a toxic substance or harmful physical agent by body systems (e.g., the level of a chemical in the blood, urine, breath, hair, fingernails, etc.) but not including results which assess the biological effect of a substance or agent or which assess an employee's use of alcohol or drugs;

1910.1020(c)(5)(iii)
Material safety data sheets indicating that the material may pose a hazard to human health; or

1910.1020(c)(5)(iv)
In the absence of the above, a chemical inventory or any other record which reveals where and when used and the identity (e.g., chemical, common, or trade name) of a toxic substance or harmful physical agent.

1910.1020(c)(8)
"Exposure" or "exposed" means that an employee is subjected to a toxic substance or harmful physical agent in the course of employment through any route of entry (inhalation, ingestion, skin contact or absorption, etc.), and includes past exposure and potential (e.g., accidental or possible) exposure, but does not include situations where the employer can demonstrate that the toxic substance or harmful physical agent is not used, handled, stored, generated, or present in the workplace in any manner different from typical non-occupational situations.

1910.1020(c)(9)
" Health Professional" means a physician, occupational health nurse, industrial hygienist, toxicologist, or epidemiologist, providing medical or other occupational health services to exposed employees.

1910.1020(c)(10)
"Record" means any item, collection, or grouping of information regardless of the form or process by which it is maintained (e.g., paper document, microfiche, microfilm, X-ray film, or automated data processing).

1910.1020(c)(13)
"Toxic substance or harmful physical agent" means any chemical substance, biological agent (bacteria, virus, fungus, etc.), or physical stress (noise, heat, cold, vibration, repetitive motion, ionizing and non-ionizing radiation, hypo - or hyperbaric pressure, etc.) which:

1910.1020(c)(13)(i)
Is listed in the latest printed edition of the National Institute for Occupational Safety and Health (NIOSH) Registry of Toxic Effects of Chemical Substances (RTECS) which is incorporated by reference as specified in Sec. 1910.6; or

1910.1020(c)(13)(ii)
Has yielded positive evidence of an acute or chronic health hazard in testing conducted by, or known to, the employer; or

1910.1020(c)(13)(iii)
Is the subject of a material safety data sheet kept by or known to the employer indicating that the material may pose a hazard to human health.

.1020(d)
"Preservation of records."

1910.1020(d)(1)
Unless a specific occupational safety and health standard provides a different period of time, each employer shall assure the preservation and retention of records as follows:

1910.1020(d)(1)(i)
"Employee medical records." The medical record for each employee shall be preserved and maintained for at least the duration of employment plus thirty (30) years, except that the following types of records need not be retained for any specified period:

1910.1020(e)(1)
"General."

1910.1020(e)(1)(i)
Whenever an employee or designated representative requests access to a record, the employer shall assure that access is provided in a reasonable time, place, and manner. If the employer cannot reasonably provide access to the record within fifteen (15) working days, the employer shall within the fifteen (15) working days apprise the employee or designated representative requesting the record of the reason for the delay and the earliest date when the record can be made available.

1910.1020(g)
"Employee information."

1910.1020(g)(1)
Upon an employee's first entering into employment, and at least annually thereafter, each employer shall inform current employees covered by this section of the following:

1910.1020(g)(1)(i)
The existence, location, and availability of any records covered by this section;

1910.1020(g)(1)(ii)
The person responsible for maintaining and providing access to records; and

1910.1020(g)(1)(iii)
Each employee's rights of access to these records.

1910.1020(g)(2)
Each employer shall keep a copy of this section and its appendices, and make copies readily available, upon request, to employees. The employer shall also distribute to current employees any informational materials concerning this section which are made available to the employer by the Assistant Secretary of Labor for Occupational Safety and Health.

1910.1025(d)(8)
Employee notification.

1910.1025(d)(8)(i)
The employer must, within 15 working days after the receipt of the results of any monitoring performed under this section, notify each affected employee of these results either individually in writing or by posting the results in an appropriate location that is accessible to affected employees.

1910.1025(d)(8)(ii)
Whenever the results indicate that the representative employee exposure, without regard to respirators, exceeds the permissible exposure limit, the employer shall include in the written notice a statement that the permissible exposure limit was exceeded and a description of the corrective action taken or to be taken to reduce exposure to or below the permissible exposure limit.

1910.1025(d)(9)
Accuracy of measurement. The employer shall use a method of monitoring and analysis which has an accuracy (to a confidence level of 95%) of not less than plus or minus 20 percent for airborne concentrations of lead equal to or greater than 30 ug/m(3).

1910.1000(e)
To achieve compliance with paragraphs (a) through (d) of this section, administrative or engineering controls must first be determined and implemented whenever feasible. When such controls are not feasible to achieve full compliance, protective equipment or any other protective measures shall be used to keep the exposure of employees to air contaminants within the limits prescribed in this section. Any equipment and/or technical measures used for this purpose must be approved for each particular use by a competent industrial hygienist or other technically qualified person. Whenever respirators are used, their use shall comply with 1910.134.

1910.1200 App B
4. "Adequacy and reporting of data." The results of any studies which are designed and conducted according to established scientific principles, and which report statistically significant conclusions regarding the health effects of a chemical, shall be a sufficient basis for a hazard determination and reported on any material safety data sheet. In vitro studies alone generally do not form the basis for a definitive finding of hazard under the HCS since they have a positive or negative result rather than a statistically significant finding.

1910.1200(a)(2)
This occupational safety and health standard is intended to address comprehensively the issue of evaluating the potential hazards of chemicals, and communicating information concerning hazards and appropriate protective measures to employees, and to preempt any legal requirements of a state, or political subdivision of a state, pertaining to this subject. Evaluating the potential hazards of chemicals, and communicating information concerning hazards and appropriate protective measures to employees, may include, for example, but is not limited to, provisions for: developing and maintaining a written hazard communication program for the workplace, including lists of hazardous chemicals present; labeling of containers of chemicals in the workplace, as well as of containers of chemicals being shipped to other workplaces; preparation and distribution of material safety data sheets to employees and downstream employers; and development and implementation of employee training programs regarding hazards of chemicals and protective measures.

1910.1200(h)
"Employee information and training."

1910.1200(h)(1)
Employers shall 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. Information and training may be designed to cover categories of hazards (e.g., flammability, carcinogenicity) or specific chemicals. Chemical-specific information must always be available through labels and material safety data sheets.

1910.1200(h)(2)

"Information." Employees shall be informed of:

1910.1200(h)(2)(i)

The requirements of this section;

1910.1200(h)(2)(ii)

Any operations in their work area where hazardous chemicals are present; and,

1910.1200(h)(2)(iii)

The location and availability of the written hazard communication program, including the required list(s) of hazardous chemicals, and material safety data sheets required by this section.

1910.1200(h)(3)

"Training." Employee training shall include at least:

1910.1200(h)(3)(i)

Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);

1910.1200(h)(3)(ii)

The physical and health hazards of the chemicals in the work area;

1910.1200(h)(3)(iii)

The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used; and,

1910.1200(h)(3)(iv)

The details of the hazard communication program developed by the employer, including an explanation of the labeling system and the material safety data sheet, and how employees can obtain and use the appropriate hazard information.

1910.1048(d)(6)

Employee notification of monitoring results. The employer must, within 15 working days after the receipt of the results of any monitoring performed under this section, notify each affected employee of these results either individually in writing or by posting the results in an appropriate location that is accessible to employees. If employee exposure is above the PEL, affected employees shall be provided with a description of the corrective actions being taken by the employer to decrease exposure.

1960)

DOD Regulations:

DoD 6055.9-STD, "Ammunition and Explosive Safety Standards," August 1997

DoD Instruction 6055.6, "DoD Fire and Emergency Services," December 15, 1994

DoD Instruction 6055.7, "Mishap Investigation, Reporting and Recordkeeping," April 10, 1989

DoD Directive 5110.4, "Washington Headquarters Services (WHS)," May 6, 1991

DoD Instruction 1438.5, "Civilian Employees' Occupational Health and Medical Services Program," December 4, 1997

DoD Instruction 6055.5, "Industrial Hygiene and Occupational Health," January 10, 1989

DoD Instruction 6050.5, "DoD Hazard Communication Program," October 29, 1990

DoD Instruction 6490.3, "Implementation and Application of Joint Medical Surveillance for Deployments," August 7, 1997

DoD 5000.2-R, "Defense Acquisition Management Policies and Procedures," March 15, 1996

DoD 1400.25-M, "Civilian Personnel Manual"

DoD Instruction 6055.1, "DoD Safety and Occupational Health (SCH) Program", 08/19/1998
2.2. Encompasses all DoD personnel and operations worldwide during peacetime and military deployments. These provisions consider limitations on the applicability of 29 U.S.C. 651 et seq., E.O. 12196 and 29 CFR 1960 (references (d), (f), and (g)) to the Department of Defense. These limitations include the exemptions or exceptions from Department of Labor (DoL) oversight for military personnel, military-unique operations and workplaces, specific conditions governed by other statutory authorities, and, in certain overseas areas, conditions governed by international agreements.
2.3. Includes risk management, aviation safety, ground safety, traffic safety, occupational safety, and occupational health.
E2.1.27. Risk Management. The Department of Defense's principal structured risk reduction process to assist leaders in identifying and controlling safety and health hazards and making informed decisions. Risk management is a cyclical process that involves:
E2.1.27.1. Identifying hazards.
E2.1.27.2. Assessing hazards to personnel, equipment, and mission.

E2.1.27.3. Developing controls.
E2.1.27.4. Making risk decisions to eliminate all unnecessary risks. Determining which risks are acceptable and unacceptable from the standpoint of balancing benefit against the potential for accidental losses or harm (severity, likelihood of occurrence). The standard for risk management is leadership at the appropriate level of authority making an informed decision to either control hazards or accept risks. In those circumstances where local resources are not available to control residual risks, leaders will make a conscious decision to either accept the risk or elevate the risk decision to the next higher level of leadership.
E2.1.27.5. Implementing controls.
E2.1.27.6. Supervising and evaluating the appropriateness of established controls and making adjustments where necessary.
E2.1.28. Risk Management Integration. The process by which individuals and organizations embed risk management into all that they do.
E2.1.33. Workplace Visit. A formal inspection, staff assistance visit, walk through survey, awareness briefings for the management and staff, risk management consultations, or any other activity that will enhance the safety of the people and the operation.
E3.1.3. SOH Staffing. Qualified Safety and Occupational Health personnel shall be designated at levels of command consistent with the DoD Component's organizational structure, including installation and unit levels, to serve as principal command SOH advisors, accident prevention policy and program developers, performance monitors, and points-of-contact for SOH matters.
E3.1.6. Dissemination of Information.
E3.1.6.1. Component programs shall ensure that all personnel have access to, and are informed of, the location, availability, and procedures to obtain SOH information. SOH information includes the location and means to contact the local DoD SOH office or offices, technical data, applicable regulations, basic reference standards, specialized consultations, etc. See 29 CFR 1910.1020 (reference (n)) for additional information on the collection and distribution of safety and health data; i.e., material safety data sheets.
E3.1.7. Reports, Recordkeeping, and Accident Investigations.
E3.1.7.1. Access to Records. Within the Department of Defense, the right of access to relevant civilian employee exposure and medical records shall be in accordance with reference (n), regardless of any argument concerning the applicability of that part to Federal Agencies within the language of reference (g).
E3.4. SOH Standards.
E3.4.1. General.
E3.4.1.1. The DoD Components shall comply with the standards promulgated by OSHA under 29 U.S.C. 651 et seq. (reference (d)) in all nonmilitary-unique DoD operations and workplaces, regardless of whether work is performed by military or civilian personnel. The DoD Components may develop and apply standards that are alternate or supplemental to such OSHA standards, provided that the approval procedures described in paragraph E3.4.5. below are followed.
E3.4.1.2. Although these OSHA-prescribed or approved standards are the primary measure of workplace safety and health, the DoD Components shall, in addition, ensure compliance with other applicable regulatory standards related to SOH that are issued under statutory authority by the Department of Defense or other Federal Agencies (such as the Departments of Transportation

and Energy, the Environmental Protection Agency, the Nuclear Regulatory Commission, or the Food and Drug Administration).

E3.4.1.3. Any conflicts between regulatory standards shall be referred to the DUSD(ES) who will resolve the matter with the Secretary of Labor and other responsible Federal officials.

E3.5. Evaluations of Workplaces and Operations.

The DoD Components shall conduct safety and health evaluations of all workplaces and operations where DoD personnel are regularly employed at fixed installations during peacetime operations, and, to the extent feasible, to wartime and peacekeeping operations. Inspections of workplaces and operations in contractor installations where fewer than 25 DoD personnel are employed shall be at the DoD Component's discretion, based on existing conditions and potential risks. While no formal annual inspection is required, the DoD Components are required to ensure the health and safety of their personnel in the contractor facility. In addition, evaluations shall include determining if contractor operations jeopardize the safety and health of DoD personnel and endanger DoD property.

E3.5.1. Risk assessments and dosimetry of environmental and occupational chemical, radiological, biological, and physical hazards to DoD personnel and *DODI 6055.1, Aug. 19, 1998* supporting DoD contractor personnel during OCONUS force deployments and construction of prospective health surveillance epidemiology data bases shall be accomplished under DoD Instructions 6050.5 and 6490.3 (references (p) and (q)). Toxic hazards to which DoD personnel and contractors are exposed during wartime and peacekeeping deployments should cover all aspects of the potential hazard, from the source and levels of exposure to health effects of individuals and groups.

E3.5.2. However, in peacetime continental United States operations, Components' SOH programs will not perform any measurements; i.e., perform worker exposure monitoring of contractor worker exposure to DoD equipment unless specifically provided for in contracts between the Government and the contractor, and with prior approval by the Component's health or safety service provider's major command. Refer to enclosure E5. for additional information on SOH considerations for DoD contractors.

E3.5.3. DoD Workplace Visits.

E3.5.3.1. General. At least annually, qualified SOH personnel shall visit every installation workplace. The exact nature of the visit is at the discretion of the local senior SOH professional or as directed by that official's higher headquarters. Visits are to be conducted more frequently based on factors such as the exposure to and potential severity of hazards, actual accident experience, special emphasis programs, changes in the organization's staffing or workplaces, or other event that increases risk of accidents and occupational illnesses. Military personnel and DoD civilian workers or their representatives should be encouraged to participate in these visits to assist in identifying unsafe or unhealthful working conditions. Also, the DoD Components are required to schedule visits, based upon hazard analysis, to ensure the health and safety of their personnel working in DoD contractor facilities. Procedures shall be established to document and follow-up on the correction of deficiencies identified during a visit.

E3.5.3.2. Formal Inspections. The DoD Components shall ensure that formal OSH inspections of workplaces meet the requirements of the OSHA report (reference (g)).

AR 385–10 dated 29 February 2000

4–1. Standard Army safety and occupational health inspections
The procedures outlined below, designated as Standard Army Safety and Occupational Health Inspections (SASOHIs), are mandatory and will be followed on selected installation-level inspections as indicated in *a* below.
a. All workplaces will be inspected at least annually using SASOHI procedures.
(1) Facilities and operations involving special hazards will be inspected more frequently as determined by qualified safety and occupational health personnel.
b. Unless specifically exempted in this paragraph, SASOHIs for all work sites will be conducted by qualified safety and occupational health professionals as defined in section II of the glossary. SASOHIs for tenant activities will be conducted in accordance with the host installation and tenant activity agreement. The SASOHIs for work sites meeting the criteria specified below may be performed by trained, qualified and appointed collateral duty safety personnel. If there is a dispute over interpretation of safety and health standards, hazard, or risk severity and probability, a qualified safety and occupational health professional, as defined in section II of the glossary, will make the final determination on the disputed issue. Personnel conducting SASOHIs will have access to diagnostic equipment and to personnel necessary to identify, document, and analyze the significance of the hazards discovered during the inspection. Current reference materials pertinent to the work site, such as standards, regulations, SOPs, hazard analyses/job hazard analysis, risk assessments, materiel safety data sheets, technical and field manuals, will be readily available.

(c) Written hazard assessment (title 29 of the Code of Federal Regulations, 1910.132) for current operations on file at the work site, conducted by qualified civilian or military safety and occupational health professional as defined in section II of the glossary.
c. SASOHI may be conducted with or without prior notice. No-notice inspections will be used when local safety and health personnel determine they will provide a significantly more meaningful assessment of actual operating conditions and practices. However, appropriate representatives of civilian employees and recognized employee organizations will be notified when management receives prior notice of an inspection.

An appropriate employee representative will be given the opportunity to participate in the closing conference.
h. Written reports of violations resulting from SASOHI will be provided to the head of the activity or the commander of the unit inspected. These reports will cite hazards and safety management deficiencies and will recommend corrective actions. DA Form 4753 (Notice No. of Unsafe or Unhealthful Working Conditions) may be used for this purpose. (See fig 4-1 for a sample form.) RAC 1 and 2 violations that cannot be corrected within 30 calendar days of discovery will be recorded and maintained at the installation on DA Form 4756 (Installation Hazard Abatement Plan). (See fig 4-2 for a sample form and instructions.) **Written reports of inspections will be retained on file for 5 years after the deficiencies have been corrected.**

Automatic data processing systems may be used to facilitate the recording and documentation of SASOHI and abatement plans provided the requirements of this regulation are met.
i. Notices of violations for RAC 1 or 2 hazards detected during SASOHI will be recorded on DA Form 4753 or equivalent. Copies of each notice of unsafe or unhealthful conditions will be given to the appropriate official in charge of the workplace and any participating employee representative. Notices will be posted by the official in charge of the workplace where the condition was discovered. Where it is not practical to post the notice at or near the hazard, it will be posted in a prominent place where it will be readily observable by all affected personnel. Delivery and posting will take place within 15 days of detection for safety violations and 30 days for health violations. The notices will remain posted for 3 working days or until correction, whichever is later. All posted notices will describe the nature and severity of the violation, the substance of the abatement plan, and interim protective measures.
j. All violations of standards detected during SASOHI will be entered on DA Form 4754 (Violation Inventory Log) or equivalent. (See fig 4-3 for a sample form.) This log will be used to monitor compliance. It will show all violations in order of discovery and prescribe an abatement date and the date for follow-up on correction of the deficiencies.
k. Procedures will be established to follow up on the correction of deficiencies identified during a SASOHI. If corrective action has not been accomplished or it is discovered that interim safety measures are not being enforced, the inspector will inform the installation safety and occupational health official who will determine remedial action, to include notifying the installation or activity commander if appropriate. For all uncorrected violations, entries on DA Form 4756 will reflect the revised corrective action schedule and appropriate remarks.
l. All safety and occupational health inspection procedures will conform to security regulations

AR 40-5 dated 22 July 2005
1–5. Preventive medicine policies
The Army will—
b. Protect all Army personnel from exposures to ionizing and nonionizing radiation, biological warfare agents, vector-borne disease agents, chemical warfare agents, environmental pollutants, toxic industrial materials (TIMs), psychological stressors, and physical agents.
c. Adhere to Federal, state, and host nation laws, regulations, and guidance governing OEH during peacetime in nondeployed situations and during training exercises, except for uniquely military equipment, systems, and operations as authorized in Executive Order 12196. These statutes and regulations also apply during military operational deployments and war unless specifically exempted by appropriate authority based on the tactical situation. Contractors whose personnel are using Government-furnished facilities will similarly adhere to Federal, state, and host nation laws, regulations, and guidance governing OEH.
d. Strive to adhere to peacetime U.S. or host nation health standards, whichever are more stringent, during military operational deployments. However, when the mission or the overall health of deployed personnel warrant risk decisions that may require overriding the peacetime health standards, such decisions must be made by the first general officer in the chain of command as far as possible and practicable or as specified in the operational plans and orders. These decisions must be based on a complete consideration of operational as well as health risks

and available contingency guidance and criteria so that the total risk to our Soldiers and civilians is minimized. **This decision making will be deliberate, documented, and archived.**
e. Use the operational risk management process to minimize the total health threat and risk to personnel in garrison, training, contingency operations, and war. Army health policies are intended to allow commanders to execute the full spectrum of military operations while minimizing the total health risk to Soldiers and civilian employees, according to applicable Department of Defense (DOD)/Army policies, implementing instructions, and regulations.
f. Have Army leaders make informed risk decisions about OEH risks and consider, in all risk decisions, health risks to personnel arising from short-term and long-term exposures across the full spectrum of operations.
i. Inform Army personnel and co-located contractor personnel of health threats, risks, and appropriate unit and individual preventive countermeasures using health risk communication techniques.

1–7. Preventive medicine programs and services
d. Occupational health.
(1) In Army preventive medicine, occupational health consists of those capabilities and activities necessary to anticipate, identify, assess, communicate, mitigate, and control occupational disease and injury threats. This includes management of the risks to personnel from exposures encountered at their worksite in garrison and field settings. Occupational health hazards include risks from chemical, biological, radiological, physical, and psychological threats. These risks will be evaluated using standardized risk assessment methodologies.
(2) The Army Occupational Health Program's medical components will be developed and provided consistent with the Defense Safety and Occupational Health Program and implemented according to the detailed instructions and guidance published in DA Pam 40–11, chapter 5. Occupational health programs, services, and capabilities will be established and provided for the following specific areas:
(b) Health hazard education.
(c) Surety programs.
(d) Reproductive hazards.
(e) Bloodborne pathogens.
(f) Hearing conservation and readiness.
(g) Vision conservation and readiness.
(h) Workplace epidemiological investigations.
(i) Ergonomics.
(j) Radiation exposure and medical surveillance.
(k) Industrial hygiene.
(l) Personal protective equipment.
(m) Respiratory protection.
(n) Asbestos exposure control and surveillance.
(o) Injury prevention and control.
(p) Occupational illness and injury prevention and mitigation.
(q) Work-related immunizations.

(r) Recordkeeping and reporting.
(s) Worksite evaluations.

2–17. Commanders, regional medical commands
Commanders of regional medical commands (RMCs) will—
a. Provide command and operational guidance, oversight, mentorship, coordination, and consultative support for effective preventive medicine programs and services within the region based on this regulation and the guidance provided in DA Pam 40–11

2–18. Commanders, U.S. Army medical centers and U.S. Army medical department activities
Commanders of MEDCENs and MEDDACs, as the local medical authorities, will—
d. (2) Commanders must also comply with all Federal, state and local medical reporting requirements including applicable Occupational Safety and Health Administration (OSHA) requirements for work-related injuries and illnesses.

The director of health services, in coordination with the chief of preventive medicine services, will—
(1) Notify unit and installation commanders of special or potentially serious health problems. The initial telephonic or electronic notification will be followed by a **written report within 72 hours.** The purpose is to inform commanders of serious sanitary deficiencies, OEH hazards, potential epidemic conditions, or other serious situations that may affect the health of the command.
(3) Work with the installation safety manager to provide the installation commander with a comprehensive Safety and Occupational Health Program that includes, but is not limited to, ergonomics, injury prevention and control, respiratory protection, industrial hygiene, hearing conservation, vision conservation and readiness, hazard communication, laboratory safety, and occupational health surveillance.
(4) Provide technical and quality assurance oversight of the OEH program, and provide qualifications and competency oversight for preventive medicine and occupational health service providers.

2–26. Installation commanders and state and territory adjutants general
a. Installation commanders and state and territory adjutants general are responsible and accountable for providing a safe and healthy environment for all assigned and supported military personnel. They will also ensure that required preventive medicine programs and services are provided to all personnel under their command and all other military personnel they support, such as tenant organizations. Such preventive medicine support will be provided in coordination with the supporting medical commander and that commander's preventive medicine assets. Preventive medicine support of tenant organizations and other supported military personnel will be established through local installation or other type of support agreement. (See DA Pam 40–11, chaps 1–11 and apps B–G, for implementing guidance.)
b. Installation commanders are responsible for resourcing and implementing the preventive medicine components of installation infrastructure and services in coordination with the director

of health services and the chief of preventive medicine services. Installation commanders provide the safe and healthy living and work environments and services such as drinking water, food, safe worksites, and recreational activities. Preventive medicine personnel provide the medical oversight and monitoring of installation infrastructure and services that may pose health threats. They provide the technical advice and assistance to installation commanders to minimize risks from such threats.

c. Installation occupational health programs and services that will include, but are not limited to the following:

(1) Safety and Occupational Health Program according to AR 385–10, chapter 4, and 29 CFR Part 1960.

(2) Ergonomics Program with an ergonomics subcommittee and an installation ergonomics officer according to DA
Pam 40–21, chapters 1–7 and appendix B.

(3) Respiratory Protection Program according to AR 11–34, chapters 1–3.

(4) Hearing Conservation Program according to DA Pam 40–501, chapters 1–10.

(5) Vision Conservation and Readiness Program according to DA Pam 40–506, chapters 1–6 and appendixes B–H.

(6) Health Promotion Program according to AR 600–63, paragraph 1–19 and chapters 2–3.

(7) The Army Industrial Hygiene Program according to DA Pam 40–503, chapters 1–7 and appendixes B–D.

(8) The Army Radiation Safety Program according to AR 11–9, paragraph 1–4j, chapters 2–6 and appendixes A–C.

DA Pam 40-11 Paragraph 5–20. Worksite evaluations

a. Worksite visits/evaluations are conducted annually by occupational health, industrial hygiene, and safety personnel. Additional worksite evaluations are conducted as operations change. **Each visit is documented, and the worksite supervisor is provided a written report. At a minimum, these evaluations should include hazardous material identification, type of engineering controls needed if applicable, type of personal protective equipment required, and posting of appropriate signs needed (that is, noise-hazardous area, eye protection required).** Appropriate entries should be made in the Health Hazard Information Module (HHIM) until DOEHRS–Industrial Hygiene (IH) is fielded. Appropriate entries are then made in DOEHRS–IH.

b. AR 385–10, DA Pam 40–503, and DODI 6055.1 contain additional guidance.

DA Pam 40-503 dated 30 October 2000

4–4. Survey frequency and scope

a. Recognizing existing and potential hazards is a step towards improving health and safety in the workplace.

b. The 29 CFR 1960, AR 385-10, and AR 40-5 require the annual inspection of workplaces by OSH personnel who are qualified to recognize and evaluate hazards. The IHPM ensures that this annual workplace survey documents the IH
aspects, such as—

(1) Chemical, physical, biological, and ergonomic hazards inherent to each activity. (See glossary.)
(2) Existing measures employed to control exposure to the hazard.

Hazard Evaluation paragraph 4–8. Purpose and scope
a. Health hazard evaluations are the foundation on which the OH program is built. Health hazard assessments identify and quantify all potential and actual health hazards. A comprehensive health hazard assessment requires the IHPM to collect both qualitative and quantitative data. The IHPM uses this data to assess the effectiveness of protective equipment, administrative controls and engineering controls. Health hazard assessments also provide occupational medicine personnel with data to develop an effective medical surveillance program.
b. Following the IHIP's (or order of accomplishment) established priorities (PACs), the IHPM ensures that—
(1) Each operation performed on the installation is analyzed to evaluate and document all worker exposures, both potential and/or real. Documentation of exposures includes qualitative and quantitative assessment.
(2) A sampling strategy is developed that includes both recognized qualitative and quantitative protocols to provide statistically significant exposure data. Breathing zone, ventilation and noise measurements, and other appropriate hazard exposure measurements are performed and documented using the sampling strategy. (USACHPPM Technical Guide (TG) 141 provides instructions for sampling chemical contaminants, and DA PAM 40-501 and USACHPPM TG 181 provide instructions for sampling noise hazards.)
(3) Sampling results are subject to approved statistical analysis to determine data significance. Statistical analysis is used to determine data accuracy and precision and exposure trends. The IHPM must use statistical analysis to both develop sampling strategies and to analyze sample results.
(4) Statistical analysis is not a substitute for professional judgment but is an additional tool used by the IHPM to provide a better health hazard assessment. When exposure conclusions/decisions are obvious, such as during emergencies or when the data obviously indicates an overexposure and/or very low exposures, the application of statistical analysis is not warranted.

DA Pam 40-503, paragraph 4–12. ***Worker notification***
Regardless of outcome, the IHPM notifies, in writing, the workplace supervisor of the assessment results. The supervisor in turn notifies the employees.

DA Pam 40-503, paragraph 4–13. **Applications for quantitative exposure data**
A database of quantitative exposure data of worker exposure provides input to (see chap 7)—
a. The OH program. Quantitative measurements of exposure allow the medical practitioner to determine the appropriate type and frequency of medical surveillance testing needed to monitor and document the physical well being of the worker over the course of employment.
b. The installation respiratory protection program (AR 11-34). Quantitative exposure data allow for the proper selection of respiratory protective equipment (RPE). To ensure the recommended RPE remains appropriate for the intended use, continued periodic measurement of the contaminant's exposure levels is necessary.

c. The installation hearing conservation program. Quantitative measurements of noise levels allow for the proper selection of hearing protective devices. Continued measurements of noise hazardous operations are necessary to ensure that hearing protective devices are appropriate for the intended use (DA PAM 40-501 and USACHPPM TG 181).
d. The installation civilian personnel office. Quantitative assessments of specific workplace or occupational exposures can assist the personnel specialist in defining job requirements and managing the civilian resource conservation program (chap 7).
e. The installation safety office.
(1) Quantitative assessments of exposure and workplace conditions aid the installation safety office in promoting safe work practices and conditions.
(2) Quantitative measurements of exposure aid in managing the hazard abatement program by prioritizing—
(a) Funds for implementing hazard controls (see para 4-11).
(b) Work areas and operations for the implementation of hazard controls.
f. The workplace supervisor. Quantitative assessments of exposure and workplace conditions aid supervisors in correcting unsafe working conditions, enforcing safe work practices, and scheduling employees for HAZCOM and other training.

DA Pam 40-503, paragraph 7–10. **Standard Army safety and occupational health inspections**
a. AR 40-5, chapter 5 identifies IH responsibilities. The IH mission defined in AR 40-5 will meet the standard Army safety and occupational health inspections (SASOHI) requirements of AR 385-10.
b. The OSHA regulation concerning Federal employees (29 CFR 1960, AR 385-10, and AR 40-5) requires persons qualified through training and experience to identify and evaluate worksite health hazards and to operate monitoring
equipment. (See para 4-4.) The industrial hygienist has responsibility for assessing health hazards in DA worksites that have potential chemical, physical or biological health hazards. The role of the IHPM in SASOHIs includes:
(1) Performing field surveys to complete the annual SASOHI requirements for all workplaces, which have potentially hazardous chemical, physical, or biological exposures.
(2) Assigning health RACs to operations or chemical, physical, or biological health hazards for inclusion in installation prioritized abatement action plans.
(3) Providing the installation safety officer with DOEHRS-IH information and results of field surveys.

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Exhibit 19 – KG Exhibit # 18

DEPARTMENT OF THE ARMY
U.S. ARMY MEDICAL DEPARTMENT ACTIVITY
550 POPE AVENUE
FORT LEAVENWORTH KS 66027-2332

REPLY TO
ATTENTION OF

MCXN-PM

14 March 2007

MEMORANDUM FOR RECORD

SUBJECT: ADDENDUM TO INDIVIDUAL PERFORMANCE STANDARDS

1. The following is an addendum to the Individual Performance Standards for Karl L. Gibson established during the initial counseling on 08 January 2007.

a. Maintain a log of all the surveys and Industrial Hygiene (IH) work done by week, and grouped by month for review by the rater and input to the evaluation of the Industrial Hygienist.

b. All known leave requests will be submitted to the first-line supervisor at the beginning of the leave year. Leave and earned Compensatory Time must be scheduled for use throughout the year to avoid excessive amounts remaining at the end of the leave year.

c. Troop Motor Pool (TMP) – the TMP assigned to Preventive Medicine (2002 Chevrolet Blazer, serial number G61-10170) will be dispatched on the 15th and last business day of every month. The Industrial Hygienist will need to coordinate any preventive maintenance and service (i.e. oil changes, service of brakes, system diagnostics, etc.) that needs to be performed on the TMP with DIS Transportation and Maintenance as the issues arise. The first-line supervisor will be kept apprised of any situations that arise involving the aforementioned TMP.

d. Memoranda produced to report results from the IH surveys will not exceed an electronic file size of three megabytes (MB), in accordance with Munson Army Health Center's Information Management Division's best management practices. The first-line supervisor will give approval for files in excess of 3 MB.

2. This counseling session took place on 14 March 2007

3. Individual counseled Karl Gibson (Print Name) KLG (Initials)

Karl L Gibson
(Signature)

[redacted]
2LT, MS
Environmental Science Officer

KG #18

19

Exhibit 19 – KG Exhibit # 19

MCXN-PM 9 April 2007

Memorandum for Record

SUBJECT: Performance Expectations for Karl Gibson (GS-0690-11- Industrial Hygienist, Ft. Leavenworth, KS)

1. The purpose of this memorandum is to outline performance expectations with regard to required and requested environmental sampling/air sampling of buildings at Ft. Leavenworth, KS 66207. From recent report of surveys it appears sampling techniques may be faulty and/or laboratory analyses may have been misinterpreted. The unexpected and unexplained results warrant a review and possible remedial training. The reports referred to in this memorandum are:

a. Bell-Hall, Asbestos
b. Trolley Building
c. Commander's Office, Munson Army Health Center
d. SAAF Hanger, Lead

2. Based on the attached reports, the following actions are required:

a. **Environmental Monitoring/Air Sampling.**

(1) Fully successful performance will require that air samples be collected on three consecutive days so that outliers can be identified. In the interim, you will be required to collect side-by-side samples. All samples will be collected using the approved NIOSH method and be submitted to an AIHA accredited laboratory for analyses. One set will be forward to Scheinder Laboratories and the other set will be sent to the GPRMC IH Program Manager and transported to Brooks AFIOH Laboratory in San Antonio, TX (GPRMC IH Services will pay for the Brooks AFIOH Laboratory sampling fees).

CITE: DA PAM 40-503

(3) Sampling results are subject to approved statistical analysis to determine data significance. Statistical analysis is used to determine data accuracy and precision and exposure trends. The IHPM must use statistical analysis to both develop sampling strategies and to analyze sample results.

(4) Statistical analysis is not a substitute for professional judgment but is an additional tool used by the IHPM to provide a better health hazard assessment. When exposure conclusions/decisions are obvious, such as during emergencies or when the data obviously indicates an overexposure and/or very low exposures, the application of statistical analysis is not warranted.

KG #19a

(2) A minimum of six (6) samples will be collected to ensure statistical analyses can be completed. All sampling results will be entered into DOEHRS-IH and all statistics will be analyzed and reviewed by the GPRMC Regional IH Program Manager before results are released to appropriate activity managers.

CITE: DA PAM 40-503

5-7. Data verification

The IH data are used for patient care decisions and legal proceedings, and the IHPM must-

a. Verify that the data entered in the DOEHRS-IH are an accurate and complete record of the identification and evaluation of health hazards. Additional safeguards, such as chain-of-custody, may be necessary for IH data likely to be involved in legal proceedings, such as exposure sampling done after personal injury or death.

b. Review data obtained from other sources such as technicians, safety professionals, collateral duty personnel, and contractors before inclusion in the DOEHRS-IH database.

b. **IH Quality Assurance Program**

(1) The GPRMC Regional IH will serve in the Quality Assurance role for DOEHRS-IH at Leavenworth, KS. Sample data will be entered into DOEHRS-IH and subsequent review by the GPRMC Regional IH Program Manager prior to information release.

(2) Field notes will be taken and maintained along with sampling data. In addition, photos may be uploaded to the electronic file.

(3) A chain of custody will be maintained for all air monitoring samples.

CITE: DOEHRS-IH USER MANUAL:

3.4 QUALITY ASSURANCE ROLE
The Quality Assurance (QA) role is responsible for checking the validity and accuracy of the data, findings and recommendations in the system.
The QA role has the authority to "publish" the data, findings and recommendations.
Permission(s):
** Ability to review and publish IH data for a given PO.*
** Ability to mark a published record as invalid (remove from corporate analysis) for a given IH PO (Program Office).*

(4) The IHPM will develop and implement a Quality Assurance SOP within forty-five days.

c. **Equipment Maintenance and Calibration.** A complete audit of the IH equipment will be conducted within forty-five (45) working days. All equipment will be maintained in accordance with manufacturer's recommendations and DA PAM 40-503. The equipment inventory will be maintained in DOEHRS-IH. This item will be completed by ~~13~~ 22 June 2007.

d. **GPRMC Staff Assistance Visit (SAV).** The GPRMC IH Program Manager and/or his designee will schedule a site visit within the next 90 days to verify sampling techniques and procedures. This will provide hands-on training and validate of sampling methods/techniques utilized.

e. **Follow-up and Documentation.** These tasks will be reviewed *quarterly* and feedback provided and documented.

[redacted]
LTC, AN
C, Preventive Medicine

Signed by Employee and Dated Karl L. Gibson 19 Apr 07

19 April 2007

Memorandum For Record

SUBJECT: Minutes for the 19 April 2007 Meeting

1. On 19 April 2007, I was asked to step into LTC [redacted] office by LT [redacted]. There I was ambushed and read an MFR Subject: Performance Expectation for Karl Gibson (GS-0690-11-Industrial Hygienist, Ft Leavenworth, KS) dated 9 April 2007.

a. LTC [redacted] stated that she did not want to do this, but was required to by the Commander. LTC [redacted] read the MFR to me.

b. For each of the 4 listed surveys that the Commander has issues with, I once again explained what had occurred. The bottom line appeared to be that the Commander did not like the results found during the surveys, so it is her intent to make doing my job more difficult. This is even though the Negotiated Agreement Article XVIII Performance Evaluation and Acceptable Level clearly states:

1) In Section 2. "Major and critical elements shall be communicated, in writing, to each employee at the beginning of the rating period."

2) In Section 3. "Standards used for the evaluation of performance shall be fair, valid, objective, attainable, and shall be communicated in writing to each employee at the beginning of the rating period."

2. Even though these Evaluation Standards were not provided at the beginning of the rating period (1 July 2006). I have tried to comply with LTC [redacted]s order of demands, but I have some questions.

3. POC is Mr. Karl Gibson, Industrial Hygienist at [redacted]@cen.amedd.army.mil.

Karl L. Gibson

KARL L. GIBSON
GS-11, Industrial Hygienist
USA MEDDAC

KG 4/19b

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Exhibit 19 – KG Exhibit # 20

DEPARTMENT OF THE ARMY
U.S. ARMY MEDICAL DEPARTMENT ACTIVITY
550 POPE AVENUE
FORT LEAVENWORTH KS 66027-2332

REPLY TO
ATTENTION OF

MCXN-PM (40-5f) 25 May 2007

MEMORANDUM FOR RECORD

SUBJECT: Performance Expectations for Karl Gibson Questions

1. Issues concerning the 4 surveys:

a. Bell Hall Asbestos. See 18 September 2006 MFR. Mr. [redacted] GPRMC IH Program Manager came at the Commander's request to determine if Karl Gibson's sampling techniques might be faulty. He came and found nothing defective in my work, procedures, and laboratory analysis interpretation. Karl Gibson, Fort Leavenworth IH is a trained with certified training as an Asbestos Supervisor and Asbestos Inspector since 1991 and has had the annual training refresher every year. (See Enclosure A)

b. Trolley Station. I was called by employees who were reporting health problems. Industrial Hygiene survey was to identify hazards and exposures from vehicle exhaust on 7-12 November 2006. I used at least 4 different calibrated pieces of monitoring equipment to measure exposures. I tested for 5 days. No samples were sent to a lab. The MEDDAC Commander had the NCOs of Preventive Medicine check all the IH equipment to see if the equipment was calibrated and serviceable without notifying Karl Gibson. They could only find calibrated and serviceable equipment. The only problem that has been identified by my command is that they do not like the results. (See Enclosure B)

c. MEDDAC Commander's Office from Ceiling Tiles and Carpet Replacement Project January – February 2007 Survey. I was requested by [redacted], MEDDAC Safety Officer to test the air in the commander's office. We met with COL [redacted] and he ordered that Karl Gibson conduct testing on 31 January and 1 February 2007 to measure the fiberglass and mold levels. He was informed and was aware that the same TEM analysis for fiberglass would also identify asbestos fibers if present. None of Karl Gibson's work, procedures, and laboratory analysis interpretation were found defective. I have only been asked "why would I measure if I knew it would be non-complaint and not a normal work day"? The only problem that has been identified by my command is that they do not like the results. (See Enclosure C)

d. Sherman Army Airfield, Lead Exposures. The D, DPTM had concerns about the possible lead hazards in SAAF. Karl Gibson, Fort Leavenworth IH is a trained and licensed by the State of Kansas with certified training as a Lead Supervisor, Lead Inspector, and Lead Risk Assessment. COL [redacted] ordered Karl Gibson to just measure air levels of lead on 30 January 2007 and not perform a complete lead risk assessment. Each subsequent sampling event has followed management meetings to control exposure results, dictate date of samplings and what appears to be attempts to manipulate the results. Karl Gibson's work was observed by 2LT Derivan and enlisted Preventive Medicine staff. None of Karl Gibson's work, procedures, and

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MCXN-PM (40-5f) 25 May 2007
SUBJECT: Performance Expectations for Karl Gibson Questions

laboratory analysis interpretation were found defective. The only problem that has been identified by my command is that they do not like the results. (See Enclosure D)

2. Questions for required actions.

a. According to Mr. [redacted] GPRMC IH Program Manager, Karl Gibson is not to send samples to them. How can Karl Gibson comply with these side-by-side samples requirements?

b. According to paragraph 2.a.(2), Karl Gibson is to enter all sampling results into DOEHRS-IH and all statistics will be analyzed and reviewed by the GPRMC Regional IH Program Manager before results are released to appropriate activity managers. How is this to happen?

c. According to paragraph 2.b. "the GPRMC Regional IH will serve in the Quality Assurance role for DOEHRS-IH at Leavenworth, KS. Sample data will be entered into DOEHRS-IH and subsequent review by the GPRMC Regional IH Program Manager prior to information release." How is this to happen since DOEHRS-IH does not have this Quality Assurance role?

d. According to paragraph 2.b.(4) The IHPM will develop and implement a Quality Assurance SOP within 45 days. Since the IHPM has used for years the Sampling and QA SOP that the GPRMC Regional IH Program Manager and CHPPM-west IH staff provided at the last assistance visit where they found no deficiencies in the IH program except not supported by the MEDDAC Command and not staffed for the mission – what problem is with the current SOP except that the C, PM has not reviewed them in 2006 or 2007? (See Enclosure E)

e. According to paragraph 2.c."A complete audit of the IH equipment will be conducted within 45 working days. All equipment will be maintained IAW manufacturer's recommendations and DA PAM 40-503. The equipment inventory will be maintained in DOEHRS-IH. Who and how is this audit to be performed? The data entry was completed on 25 May 2007.

POC is Mr. Karl Gibson, Industrial Hygienist at [redacted]@cen.amedd.army.mil.

Karl L. Gibson
KARL L. GIBSON
GS-11, Industrial Hygienist
USA MEDDAC

[redacted] refused, so I emailed them this as well.

Enclosure A

MCXN-PM (40-5f) 18 September 2006

MEMORANDUM FOR RECORD

SUBJECT: Preventive Medicine Comments to the US Army Corps of Engineers Asbestos Issues at Bell Hall – Observations dated 18 July 2006

1. The basic difference in the Fort Leavenworth IH sampling and monitoring plan vs. the Corps of Engineer sampling and monitoring plan. Karl Gibson, Fort Leavenworth IH is a trained Asbestos Supervisor and Asbestos Inspector since 1991 and has had the annual training refresher every year.

a. Karl Gibson, Fort Leavenworth IH sampling and monitoring plan complies with the Secretary of the Army's 1998 guidance, US Army Center of Health Promotion and Preventive Medicine recommendations, and OSHA's 29 CFR 1910.1001 "Asbestos" standard. This requires an 8 hour area samples for ¼ of the work areas with a calibrated pump set at a flow rate of 2 lpm (allowance is .5 lpm to 5 lpm, but OSHA recommends between 1-2 lpm). For samples in which results return at .05 f/cc or greater, TEM analysis are then run to determine if fibers measured are asbestos or not. OSHA and EPA both recognize 2 basic air sampling methodologies as area and personal monitoring. Area samples are taken with a pump (calibrated), tubing and filter cassette placed at breathing zone height at some stationary location. Personal samples are collected from within the breathing zone height of the individual, but outside the respirator. The results are compared to the OSHA's Permissible Exposure Limits (PEL) of 0.1 f/cc.

b. The Corps of Engineer sampling and monitoring plan is called "clearance". It does not follow the Secretary of the Army's 1998 guidance, US Army Center of Health Promotion and Preventive Medicine recommendation, and OSHA's 29 CFR 1910.1001 "Asbestos". The regulators define clearance as "Air Samples collected at the conclusion of an asbestos response action to determine if airborne asbestos fiber concentrations are below those levels acceptable for persons to reoccupy an area." The Corps' plan follows only the general requirements of NIOSH Method 7400 is to sample for 105 – 110 minutes of ¼ of the work areas with a calibrated pump flow rate of 10 lpm. The results are not compared to the OSHA's Permissible Exposure Limits (PEL) of 0.1 f/cc, but a lower level of 0.01 f/cc.

c. The last quarter's Karl Gibson, Fort Leavenworth IH sampling results and the Corps of Engineer's APEX (Contractor) sampling results were nearly identical to each other with the ceiling ventilation systems off during both sample periods.

2. According to the Corps of Engineer paragraph 1. discussed the difference between PCM and TEM methods. (Note for those who do not know what these methods are.)

a. PCM is an OSHA approved method that measures fibers in the air. It does not ID if the fibers are asbestos or not. This is the OSHA PEL.

b. TEM is an EPA approved method that measures asbestos structures and what kind of asbestos.

c. As documented in the OSHA standard 29 CFR 1910.1001 Appendix B:

"Paragraph 1.3. Advantages and Disadvantages
There are four main advantages of PCM over other methods:
(1) The technique is specific for fibers. Phase contrast is a fiber counting technique which excludes non-fibrous particles from the analysis.
(2) The technique is inexpensive and does not require specialized knowledge to carry out the analysis for total fiber counts.
(3) The analysis is quick and can be performed on-site for rapid determination of air concentrations of asbestos fibers.
(4) The technique has continuity with historical epidemiological studies so that estimates of expected disease can be inferred from long-term determinations of asbestos exposures.
The main disadvantage of PCM is that it does not positively identify asbestos fibers. Other fibers which are not asbestos may be included in the count unless differential counting is performed. This requires a great deal of experience to adequately differentiate asbestos from non-asbestos fibers. Positive identification of asbestos must be performed by polarized light or electron microscopy techniques. A further disadvantage of PCM is that the smallest visible fibers are about 0.2 um in diameter while the finest asbestos fibers may be as small as 0.02 um in diameter. For some exposures, substantially more fibers may be present than are actually counted."

"Paragraph 6.7. Fiber Identification
As previously mentioned in Section 1.3., PCM does not provide positive confirmation of asbestos fibers. Alternate differential counting techniques should be used if discrimination is desirable. Differential counting may include primary discrimination based on morphology, polarized light analysis of fibers, or modification of PCM data by Scanning Electron or Transmission Electron Microscopy.
A great deal of experience is required to routinely and correctly perform differential counting. It is discouraged unless it is legally necessary. Then, only if a fiber is obviously not asbestos should it be excluded from the count. Further discussion of this technique can be found in reference."

"Paragraph 8.10.
If there is a question whether a fiber is asbestos or not, follow the rule:
"WHEN IN DOUBT, COUNT."

d. Accordingly, there is not conversion between PCM's f/cc and TEM's s/cc. This is regardless to the TEM method used (AHERA Mandatory method, NIOSH 7402 method, Yamate method, or Burdett & Rood method). The industry standard and "state of art" is the AHERA Mandatory method. The AHERA Mandatory method is the method that the labs used by Karl Gibson, Fort Leavenworth IH has used.

3. According to the Corps of Engineer paragraph 2 and 8. concern about one set of sample results.

a. The CGSC and DIS wanted to return workers back into the work space, so rush Clearance was requested and done. As Karl Gibson discussed in several e-mails and phone calls on and around 5 July, during the clearance testing in question, Karl Gibson reported that "the contamination appeared to the labs and him to have been stuffed with vacuum cleaner dust. The dust loading is not natural and does not represent the true space conditions. Karl Gibson recommended to his command that the rooms be retested and these results not taken into consideration." On 10 July 2006, Karl Gibson e-mailed to all involved that "I have concerns: 1) workers were in the rooms in question (as well as on the other floors) and 2) the locks have been changed to the old master key. I thought that the locks were to be changed to a new key."

b. For regular quarterly testing, Karl Gibson requests PCM results and if levels are .05 f/cc or greater, Karl Gibson requests the TEM analysis be done.

c. For Clearance following cleanup of the rooms, Karl Gibson requests PCM results and if levels are .005 f/cc or greater, Karl Gibson requests the TEM analysis be done. PM has found that TEM results do not always correspond to PCM levels.

4. According to the Corps of Engineer paragraphs 3. & 4 use of janitors and calibration.

a. Janitors have never been used for asbestos sampling. Karl Gibson used the sample strategy that CHPPM Main set up in 1998 on the second visit here to Fort Leavenworth dealing with this issue. Karl Gibson tests ¼ of the offices and rooms every quarter. There are about 500 rooms. This means 125 rooms are tested. Karl Gibson sets up the sampling in the afternoon (and verifies calibration). Karl Gibson verifies calibration using a calibrated BIOS DryCal DC-Lite Primary Flow Meter using the minimum of three calibration tests. Karl Gibson records room number, pump and sample number for each room/sample. Late evening, Bell Hall Contract Security officials go to each room and they turn on the sampling pumps. Security records the pump, sample #'s and start time. (Karl Gibson has provided training and written instructions on what to do.) The pumps run at 2 lpm to measure the 8 hr TWA. Karl Gibson comes in at 0600 hrs and pick up the security record sheets. Karl Gibson picks up the samples 8 hours after the security has started samples and then picks up the pumps. Karl Gibson records stop times. Karl Gibson

sends these samples to CHPPM Main Lab at APG. MD. Karl Gibson records all sample information, times and flow rate on the US Army CHPPM approved form CHPPM Form 9-R. Karl Gibson requests PCM results and if levels are .05 f/cc or greater, Karl Gibson requests the TEM analysis be done. Karl Gibson uses the CHPPM Main lab that is AIHA certified. For local labs, Karl Gibson uses both ACT (Asbestos Consulting Testing in Lenexa, KS) and Schneider Laboratories (in Richmond, VA). Both are AIHA certified.

b. When Karl Gibson is notified that levels exceed the OSHA PEL, Karl Gibson notifies C, PM, CAC Safety, DIS Environmental, and CGSC G4/Building Safety Officer. The CGSC G4 is to post the rooms involved and have the affected removed. (The workers in those offices may not leave, normally they refuse or they are in and out.) DIS Environmental coordinates repair and cleanup. Following these, Karl Gibson performs non-aggressive clearance to see if levels are below OSHA PEL. The CGSC and DIS want to return workers back into the work space, so rush is requested and done. As of last quarter, DIS has stopped repairing the damage and is just having the Asbestos Contractor clean up the rooms.

5. According to the Corps of Engineer paragraphs 5. concern about Secretary of Army's 1998 guidance.

a. Bell Hall is the Home of CGSC and a few other tenants. It is 500,000 plus square feet. On a normal day there are 1,200 military students and about 1,000 civilian and military employees. All were classified as Asbestos Workers in 1999. Most rooms have room AC/heat units and there is a supply and exhaust in each ceiling. There are over 500 offices and 26 large classrooms.

b. If the Corps of Engineer wants to use a different standard and methods other than prescribed by Secretary of Army's 1998 guidance, then they should raise the issue up their chain of command and request new guidance.

6. According to the Corps of Engineer paragraphs 6. concern of timing of samples.

a. It can be understood that sampling only 8 hours can be difficult. But it is not impossible to do. When areas are sampled longer or shorter time, those times are recorded.

b. It should be noted that all the Corps of Engineer's APEX (Contractor) sampling is also the same.

7. According to the Corps of Engineer paragraphs 7. concern of use of OSHA standards.

a. IAW OSHA 1910.1001(c)(1) "Time-weighted average limit (TWA). The employer shall ensure that no employee is exposed to an airborne concentration of asbestos in excess of 0.1 fibers per cubic centimeter of air as an eight (8)-hour time-weighted average (TWA) as determined by the method prescribed in Appendix A to this section, or by an equivalent method."

b. IAW OSHA 1910.1001(d)(1)(ii) "Representative 8-hour TWA employee exposures shall be determined on the basis of one or more samples representing full-shift exposures for each shift for each employee in each job classification in each work area. Representative 30-minute short-term employee exposures shall be determined on the basis of one or more samples representing 30 minute exposures associated with operations that are most likely to produce exposures above the excursion limit for each shift for each job classification in each work area."

c. IAW OSHA 1910.1001(d)(3) "Monitoring frequency (periodic monitoring) and patterns. After the initial determinations required by paragraph (d)(2)(i) of this section, samples shall be of such frequency and pattern as to represent with reasonable accuracy the levels of exposure of the employees. In no case shall sampling be at intervals greater than six months for employees whose exposures may reasonably be foreseen to exceed the TWA permissible exposure limit and/or excursion limit."

d. IAW OSHA Appendix B 5.2.4. "Select an appropriate flow rate for the situation being monitored. The sampling flow rate must be between 0.5 and 5.0 L/min for personal sampling and is commonly set between 1 and 2 L/min. Always choose a flow rate that will not produce overloaded filters."

e. IAW OSHA Appendix B *5.2.8.* "The most significant problem when sampling for asbestos is overloading the filter with non-asbestos dust. Suggested maximum air sample volumes for specific environments are":

Environment	Air vol. (L)
Asbestos removal operations (visible dust).....	100
Asbestos removal operations (little dust).....	240
Office environments.....	400 to 2,400

MCXN-PM (40-5f) 18 September 2006
SUBJECT: Preventive Medicine Comments to the US Army Corps of Engineers Asbestos Issues at Bell Hall – Observations dated 18 July 2006

8. POC is Mr. Karl Gibson, Industrial Hygienist at [redacted]@cen.amedd.army.mil.

Karl L. Gibson
KARL L. GIBSON
GS-11, Industrial Hygienist
USA MEDDAC

CF:
Deputy Commandant, Command and General Staff College, Bell Hall, BLDG #111, Fort Leavenworth, Kansas 66027
Chief of Staff, CAC and Fort Leavenworth, BLDG #52, Fort Leavenworth, Kansas 66027
Garrison Commander, BDLG #198, Fort Leavenworth, Kansas 66027
COL [redacted], Command Group, CGSC, Bell Hall, BLDG #111, Fort Leavenworth, Kansas 66027
Mr. [redacted], Chief of Staff, CGSC, Bell Hall, BLDG #111, Fort Leavenworth, Kansas 66027
CAC Safety, BLDG #198, Fort Leavenworth, Kansas 66027
Director DIS, BLDG #85,
SJA, Fort Leavenworth, Kansas 66027
DIS, Environmental, Fort Leavenworth, Kansas 66027
Occupational Health, Fort Leavenworth, Kansas 66027
Commander, US Army Corps of Engineers, Kansas City District
Mr. [redacted], US Army Corps of Engineers, Acting Chief, EC-EF
Mr. [redacted], US Army Corps of Engineers, PM-MO
Ms. [redacted], US Army Corps of Engineers, PM-M
Mr. [redacted], US Army Corps of Engineers, PM-MO

Enclosure B

MCXN-PM (40-5f) 13 November 2006

MEMORANDUM Thru Commander, USA MEDDAC, Fort Leavenworth, Kansas 66027

FOR Director, BCTID and BSTD, Bldg 275, Fort Leavenworth, Kansas 66027
Manager, CAC Safety, Bldg 198, Fort Leavenworth, Kansas 66027

SUBJECT: Bldg 275 Carbon Monoxide Exposures

1. The purpose of the employee requested due to concerns in BCTID and BSTD in the Occupational Health and Industrial Hygiene survey was to identify hazards from vehicle exhaust on 7-12 November 2006 in the basement offices to provide guidance for the utilization of appropriate control measures to protect the civilian and military employees from recognized occupational, safety, and health hazards.

2. Findings.

a. The testing showed **non-compliant** levels of the Carbon Monoxide and Sulfur Dioxide in the air in work areas. (See Appendix A for results)

b. The air change rate has improved to 9.6 Air Changes per day (AC/day) from 1 AC/ day or lower. The Temperature levels are **non-compliant**. The Relative Humidity is compliant. (See Appendix B for results)

c. HEPA filtering units and HEPA vacuum cleaners are not seen.

3. Recommendations:

a. Remove personnel or prevent vehicle exhaust from being sucked into the outside air intake.

b. DIS needs to open the Outside Air to provide required outside air.

c. HEPA filtering units lower the biological and fiber materials in the office area. Their use, with proper maintenance and sized to fit each room, is recommended. Provide HEPA air cleaner sized for the space and operate them 24/7. Replace filters that are full or clean blades when dirty.

d. Institute a more structured routine for internal housekeeping, to include dusting, cleaning with disinfect on all surfaces, and vacuuming using a HEPA vacuum in the areas on a weekly basis as a minimum. Provide HEPA vacuums to clean areas as needed. Remove trash daily.

MCXN-PM (40-5f) 13 November 2006
SUBJECT: Bldg 275 Carbon Monoxide Exposures

4. Please provide a status update of the above recommendations to CAC Safety and C, Preventive Medicine within 30 days of receipt of memorandum.

5. The survey results are official exposure records and must be maintained according to Title 29 Code of Federal Regulations (CFR) 1910.1020 "Access to Employee Exposure and Medical Records" and DA PAM 40-503 "Industrial Hygiene Program". This information should be provided to the supervisors to inform the employees. Please post this report in an accessible location to insure all employees have access to it. It is the supervisor's responsibility to ensure all workers have a chance to review and understand our recommendations. It is highly encouraged that the report be discussed during periodic detail safety briefings.

6. Point of contact is Mr. Karl Gibson, Industrial Hygienist, ext. [redacted] [redacted]@cen.amedd.army.mil.

[redacted]
LTC, AN
Chief, Preventive Medicine

CF:
D, DIS
Occ Health

APPENDIX A

Air samples were taken on 7-12 November 2006 and are reported in Parts Per Million (ppm) for the 8 hour Time Weighted Average (TWA) and ceiling limits (C):

BOLD is level of non-compliant.
Italic is level of concern.

LOCATION	CHEMICAL	WORKER EXPOSURE	Standard	Controlling Regulatory
Basement 7 Nov 06	Carbon Monoxide	**40 ppm TWA** 1200-1215 hrs **>1,000 ppm** C 1304-1320 hrs **>1,000 ppm** C 1402-1418 hrs **> 1,000 ppm** C 1446-1455 hrs **> 1,000 ppm** C 1503-1517 hrs **> 1,000 ppm** C	25 ppm TWA 200 ppm C 9 ppm	ACGIH NIOSH EPA office
Basement 7 Nov 06	Sulfur Dioxide	**10 ppm TWA**	2 ppm TWA 5 ppm TWA	ACGIH ACGIH
Basement 8 Nov 06	Carbon Monoxide	**37 ppm TWA** 1203-1209 hrs **>1,000 ppm** C 1214-1230 hrs **>1,000 ppm** C 1407-1418 hrs **> 1,000 ppm** C 1500-1527 hrs **> 1,000 ppm** C	25 ppm TWA 200 ppm C 9 ppm	ACGIH NIOSH EPA office
Basement 9 Nov 06	Carbon Monoxide	**47 ppm TWA** 1000-1027 hrs **>1,000 ppm** C 1301-1332 hrs **>1,000 ppm** C 1403-1415 hrs **> 1,000 ppm** C 1455-1511 hrs **> 1,000 ppm** C 1533-1547 hrs **> 1,000 ppm** C	25 ppm TWA 200 ppm C 9 ppm	ACGIH NIOSH EPA office
Basement 10 Nov 06	Carbon Monoxide	Day 2 ppm TWA Night 55 ppm 2300-0100 hrs **534 ppm**	25 ppm TWA 200 ppm C 9 ppm	ACGIH NIOSH EPA office
Basement 11 Nov 06	Carbon Monoxide	Day 3 ppm TWA Night 58 ppm 2300-0100 hrs **543 ppm**	25 ppm TWA 200 ppm C 9 ppm	ACGIH NIOSH EPA office

These health exposure level standards are used IAW AR 40-5,"Preventive Medicine," and DA PAM 40-11 paragraph 5-2 d. "Preventive Medicine". This Army regulation requires the use of the most stringent health standard.

APPENDIX B

Measurements were taken on 7-8 November 2006 to assess the worker exposures during a normal workday.

Bold is non-compliant.

Location	Substance	Exposure Results	Standard	Regulatory
BCTID Emergency Exit East Office	Temperature	72-73 deg F	72-78degF 68-72degF	US Army Energy Conservation Regulation
BCTID Emergency Exit East Office	Relative Humidity	46%	30-60%	ASHRAE 62-2004
BCTID Emergency Exit East Office	Carbon Dioxide	797 ppm .4 AC/hr	1,000 ppm	ASHRAE 62-2004
BCTID Main Office	Temperature	**73-77 deg F**	72-78degF 68-72degF	US Army Energy Conservation Regulation
BCTID Main Office	Relative Humidity	40%	30-60%	ASHRAE 62-2004
BCTID Main Office	Carbon Dioxide	891 ppm .4 AC/hr	1,000 ppm	ASHRAE 62-2004
BSTD South Office	Temperature	**76-79 deg F**	72-78degF 68-72degF	US Army Energy Conservation Regulation
BSTD South Office	Relative Humidity	36%	30-60%	ASHRAE 62-2001
BSTD South Office	Carbon Dioxide	817 ppm .32 AC/hr	1,000 ppm	ASHRAE 62-2001

Outside on 7 Nov 2006	Temperature	38 min- 53avg- 68max deg F
Outside on 7 Nov 2006	Relative Humidity	34-60 %
Outside on 7 Nov 2006	Carbon Dioxide	200 ppm

Enclosure C

MCXN-PM (40-5f) 5 February 2007

MEMORANDUM Thru Commander, USA MEDDAC, Fort Leavenworth, Kansas 66027

FOR Deputy Commander for Administration, USA MEDDAC, Fort Leavenworth, Kansas 66027
MEDDAC Safety, USA MEDDAC, Fort Leavenworth, Kansas 66027

SUBJECT: Air Sampling Because of Debris Falling into Commander's Office from Ceiling Tiles and Carpet Replacement Project January – February 2007

1. The purpose of the requested Industrial Hygiene air quality survey conducted on 31 January and 1 February 2007 was to provide guidance on the levels in Munson's Commander's Office in for the use of appropriate control measures can be done to protect the military and civilian employees, as well as, patients and visitors from recognized occupational, safety, and health hazards.

2. Findings

a. From the 8 hour testing as of 31 January, there was Fiberglass detected and **non-compliant** for fiberglass workers, for office workers, and patients. There were less amounts of fiberglass in the duct work diffuser than in the room. (See Appendix A for results. Results were received on 5 February 2007.)

b. From the 8 hour testing as of 31 January, there was Chrysotile Asbestos detected and **non-compliant** for Asbestos workers, for office workers, and patients. There were more amounts of asbestos in the duct work diffuser than in the room.

c. From the 8 hour testing as of 31 January, there was Total Dust detected and **non-compliant** for workers, for office workers, and patients.

d. From the testing as of 1 February, there was Total Fungal Spores were detected and compliant for in the office space and duct work. The office space had more fungal spores than the duct work, but both were lower than outside amounts.

MCXN-PM (40-5f) 5 February 2007
SUBJECT: Air Sampling Because of Debris Falling into Commander's Office from Ceiling Tiles and Carpet Replacement Project January – February 2007

3. Recommendations made by the Industrial Hygienist that has been trained and certified by the EPA approved Training and the State of Kansas in AHERA Asbestos Supervisor and AHERA Asbestos Inspector since 1991 and latest training on 23 October 2006:

a. Due to exposure problems in the Commander's Office, recommend the following office be closed immediately: Commander's Office because of Chrysotile Asbestos, Fiberglass, and Total Dust levels.

b. Because no isolation was occurring and doors were open to the adjacent offices, time sensitive testing of adjacent offices will be conducted in the following rooms: Commander's Secretary, DCA Office, Adjacent RMD office to South, RMD Offices across the hall [redacted], and other RMD office) because of Chrysotile Asbestos, Fiberglass, and Total Dust levels in the Commander's Office and her office door was left open.

c. Professional clean up of the Commander's Office will be required. Clearance sampling will be needed to ensure safe levels are achieved.

d. The MEDDAC needs to inform its own employees IAW OSHA's 29 CFR 1910.1001 Asbestos paragraph (d)(7) "The employer must as soon as possible, but within 15 working days after receipt of results of any monitoring performed under this section, notify each affected employee of these results either individually in writing or by posting the results in an appropriate location that is accessible to affected employees."

e. The MEDDAC needs to inform the contractors' employees IAW OSHA's 29 CFR 1926.1101 Asbestos paragraph (f)(5) "The employer must as soon as possible, but within 5 working days after receipt of results of any monitoring performed under this section, notify each affected employee of these results either individually in writing or by posting the results in an appropriate location that is accessible to affected employees."

f. The MEDDAC needs to work with DIS and Contractors who are working within the MEDDAC so their isolate their work and may need to shut off outside and return air to prevent hazards from entering the Health Center's air. The Infection Control Risk Assessment needs to be performed and isolation methods followed. During construction, replace gross filters every other week and higher filters monthly.

g. The exposures to Chrysotile Asbestos, Fiberglass, and Total Dust levels were at non-compliant and warrant medical surveillance. Because exposures to employees are occurring, OSHA's regulation found in Title 29 CFR 1910. "All employees who are or may be exposed to hazardous substances or health hazards at or above the Permissible Exposure Limit (PEL) or above the published exposure levels for these substances, without regard to the use of respirators,

for 30 days or more a year; All employees who wear respirator for 30 days or more per year or as required by 1910.134; All employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards." For the U.S. Army, AR 40-5 "Preventive Medicine" paragraph 5-9 states "Preplacement, job transfer, periodic, and termination examinations will be provided to all military personnel and civilian employees potentially exposed to health hazards in the work environment."

4. The survey results are official exposure records and must be maintained according to Title 29, Code of Federal Regulation (CFR) 1910.1020 "Access to Employee Exposure and Medical Records" and DA PAM 40-503. This memorandum should be provided to the supervisor to inform the workers. Please post this report in an accessible location to insure all employees have access to it. It is the supervisor's responsibility to ensure all workers have an opportunity to review and understand these recommendations. It is highly encouraged that the report be discussed during periodic safety briefings.

5. Point of contact is Mr. Karl Gibson, Industrial Hygienist, ext. [redacted]
[redacted]n@cen.amedd.army.mil.

[redacted]
LTC, AN
Chief, Preventive Medicine

CF:
DCN
Infection Control
Patient Safety Officer
QI Manager
CAC Safety
CAC Safety
Occ Health

APPENDIX A

Air sampling for fiberglass was conducted by Transmission Electron Microscopy (TEM). DA guidance states that Total Fungal Spores levels should be maintained below the outside levels. The health standard exposure levels are used IAW AR 40-5,"Preventive Medicine," and DA PAM 40-11 paragraph 5-2 d. "Preventive Medicine". This Army regulation requires the use of the most stringent health standard.

Sampling on 31 January to 1 February 2007. Results were received on 5 February 2007. Bold is non-compliant

LOCATION	CHEMICAL	WORKER EXPOSURE	STANDARD	Regulatory
Commander's Office	Fiberglass *	**1.6 f/cc fiberglass 8hr TWA**	1 f/cc or 5mg/m3	ACGIH
Commander's Duct Work	Fiberglass *	.06 f/cc fiberglass 10 min sample	1 f/cc or 5mg/m3	ACGIH
Commander's Office	Chrysotile Asbestos *	**210 S/cc 8hr TWA**	70 S/cc	EPA
Commander's Duct Work	Chrysotile Asbestos *	**1,510 S/cc** 10 min sample	70 S/cc	EPA
Commander's Office	Total Dust	**> 16 mg/m3 8hr TWA**	15 mg/m3 10 mg/m3	OSHA PEL ACGIH
Commander's Office	Total Fungal Spores	40 C/m3 Aspergillus	Less than Outside	US Army
Commander's Duct Work	Total Fungal Spores	10 C/m3 Epicoccum	Less than Outside	US Army
Outside	Total Fungal Spores	53 C/m3 Smuts		US Army

* TEM samples analysis by Schneider Laboratories, Accredited Lab.

These health exposure level standards are used IAW AR 40-5,"Preventive Medicine," and DA PAM 40-11 paragraph 5-2 d. "Preventive Medicine". This Army regulation requires the use of the most stringent health standard.

Enclosure D

MCXN-PM (40-5f) 8 May 2007

MEMORANDUM Thru Commander, USA MEDDAC, Fort Leavenworth, Kansas 66027

FOR D, DPTM, BLDG #77, Fort Leavenworth, Kansas 66027
S, SAAF, BLDG #132, Fort Leavenworth, Kansas 66027
M, CAC Safety, BLDG #198, Fort Leavenworth, Kansas 66027

SUBJECT: Lead in the Air in the SAAF Hanger Building #132 – Report #4 for 2007

1. The purpose of the Industrial Hygiene survey conducted on 30 January, 28 February, and 8 March 2007 was to provide guidance for the use of appropriate control measures to protect Sherman Army Air Field Hangar's military and civilian personnel from recognized occupational health hazards from the lead-based paint in the Hangar when the hangar doors were kept closed.

SAAF Hangar BLDG #132

MCXN-PM (40-5f) 8 May 2007
SUBJECT: Lead in the Air in the SAAF Hanger Building #132 – Report #4 for 2007

2. Observations

a. Observed on 10 April 2007. All planes were in the hangar. A clean up the lead contaminated dust with professionally trained Lead Cleaners had been done. Licensed lead workers stabilize the flaking paint and repaint to stabilize the paint in the hangar. There was no visible dirt and dust in the hangar. The large HVAC were operating and were not blowing particulate into the air.

b. Observed on 8 March 2007. All but one plane have been moved out of the hangar. It is not known if the planes were started up in the hangar or pulled out. (Aviation fuel contains lead.) There was still dirt and dust in the hangar. The large HVAC were not operating and were not blowing particulate into the air. A roofing contractor's employees had set up and were working on the roof. An officer and small child was seen by 2LT [redacted] walking through the hanger during the testing day.

c. Observed on 28 February 2007. All but two planes have been moved out of the hangar. It is not known if the planes were started up in the hangar or pulled out. (Aviation fuel contains lead.) There was still dirt and dust in the hangar. The large HVAC were operational and blowing particulate into the air. The IH could feel it hitting his face while setting and checking sampling. The outdoor weather (as recorded at KCI) was 39 to 61 degrees F with 10 miles per hour winds. There was also a roofing contractor set up with ladders to work on the roof. There were contractor electricians that were starting work on running lines in the Hangar building. Any of these may cause the lead levels to rise.

3. Findings.

a. Lead in the paint. The Lead concentration in parts per million (ppm) for the analyzed paint chip was 102,398 ppm for Lead, which exceeds the regulated Lead threshold of 5 ppm. (See APPENDIX C for photos of locations.)

b. Lead in the air.

1) According to the 10 April 2007 8 hour Time Weighted Average (8hr TWA), the workers' exposures in the Hangars to Lead are **compliant** IAW Upper Tolerance Level using Normal Parametric Statistics of 95% confidence of the lead exposure required by OSHA's regulation 29 CFR 1910.1025 (c)(1). Side by side samples were collected. It should be noted that the Air Force Institute for Occupational Health (AFIOH) lab detected lead in the air, but Schneider Laboratories Inc. lab did not detect lead in the air. (See Appendix A)

2) According to the 8 March 2007 8 hour Time Weighted Average (8hr TWA), the workers' exposures (based on samples whose analysis was done by the Army lab at Brooke Army Medical Center) in the Hangars to Lead might be compliant IAW Upper

Tolerance Level using Normal Parametric Statistics of 95% confidence of the lead exposure required by OSHA's regulation 29 CFR 1910.1025 (c)(1). (See Appendix A)

3) According to the 28 February 2007 8 hour Time Weighted Average (8hr TWA), the workers' exposures (based on samples whose analysis was done by nationally and state accredited Schneider Laboratories Inc.) in the Hangar to Lead are non-compliant IAW Upper Tolerance Level using Normal Parametric Statistics of 95% confidence of the lead exposure required by OSHA's regulation 29 CFR 1910.1025 (c)(1). (See Appendix A) Lead is a metal found in paint, fuel and dirt/debris. Lead is a potent, systemic poison that serves no known useful function once absorbed by the body. The standard is intended to protect you not only from the immediate toxic effects of lead, but also from the serious toxic effects that may not become apparent until years of exposure have passed. Being exposed to higher than background lead levels can cause adverse health effects such as blood-forming, nervous, urinary and reproductive systems. The results were received on 8 March 2007 and the Notice of Sampling was written on this date. (See Appendix A)

4) According to the 30 January 2007 8hr TWA, the workers' exposures (based on samples whose analysis was done by nationally and state accredited Schneider Laboratories Inc.) in the South Hangar to Lead are non-compliant IAW Upper Tolerance Level using Normal Parametric Statistics of 95% confidence of the lead exposure required by OSHA's regulation 29 CFR 1910.1025 (c)(1). The results were received on 6 February 2007 and the Notice of Sampling was written on this date. (See Appendix A)

5) According to the 30 January 2007 8hr TWA, the workers' exposures in the North Hangar, 1st Floor Office/Classrooms, 1st Floor Waiting Room, and 2nd Floor Offices/Rooms to Lead are compliant in the South Hangar IAW Upper Tolerance Level using Normal Parametric Statistics of 95% confidence of the lead exposure required by OSHA's regulation 29 CFR 1910.1025 (c)(1). The results were received on 6 February 2007 and the Notice of Sampling was written on this date. (See Appendix A)

c. Lead in dust. To do a proper Risk Assessment IAW Kansas law, EPA and OSHA regulations, wipe samples need to be taken to measure the risk of lead in the dust in the work areas and areas where food is eaten, drinks are drunk, and cosmetics are applied. The Industrial Hygienist was prohibited from taking these samples. DIS, Environmental collected wipe samples on 23 and 26 February 2007. Only 3 of 27 floor lead wipe samples were compliant with EPA Lead Hazard Standards and all wipe samples detected lead. (See Appendix B)

d. The Risk Assessment Code (RAC) for operations in the Hangar with doors closed and ventilation running is RAC 3 (moderate health risk).

3. Recommendations.

a. Employee notification. The employer must, within 15 working days after receipt of the results of any monitoring performed notify each affected employee of these results either individually in writing or by posting the results in an appropriate location that is accessible to affected employees. The US Army MEDDAC, Fort Leavenworth received the Schneider Laboratories Inc. lab results on 16 April 2007. The US Army MEDDAC, Fort Leavenworth received AFIOH lab results on 23 April 2007. [**Regulatory**, 29 CFR 1910.1025, Lead paragraph (d)(8) Employee notification (reference 2)]. (**RAC 2**)

b. MAINTENANCE AND HYGIENE

1) MAINTENANCE

- Provide a HEPA vacuum cleaner should be available. [**Regulatory**, 29 CFR 1910.1025, Lead paragraph (h) Housekeeping (reference 2)]. (**RAC 2**)

- Staff should vacuum all horizontal surfaces weekly with the HEPA vacuum cleaner. [**Regulatory**, 29 CFR 1910.1025, Lead paragraph (h) Housekeeping (reference 2)]. (**RAC 2**)

- Wet mop/wipe weekly after HEPA vacuuming. [**Regulatory**, 29 CFR 1910.1025, Lead paragraph (h) Housekeeping (reference 2)]. (**RAC 2**)

- Mop water must be disposed of in a sanitary sewer. [**Regulatory**, 29 CFR 1910.1025, Lead paragraph (h) Housekeeping (reference 2)]. (**RAC 2**)

- Call DIS Environmental Division (4-8980, 4-3304) to have vacuum bag changed and disposed of. It will contain hazardous waste. [**Regulatory**, 29 CFR 1910.1025, Lead paragraph (h) Housekeeping (reference 2)]. (**RAC 2**) [**Regulatory**, EPA's 40 CFR Parts 239 through 259 contain the regulations for solid waste, while Parts 260 through 279 contain the hazardous waste regulations, Resource Conservation and Recovery Act (RCRA) (reference 5)] (No RAC assigned)

2) FULL TIME PERSONNEL

- Supervisors need to ensure that proper cleaning is performed. [**Regulatory**, 29 CFR 1910.1025, Lead paragraph (l) Employee information and training (reference 2)]. (**RAC 2**)

- Supervisors need to develop a written SOP on cleaning procedures. [**Regulatory**, 29 CFR 1910.1025, Lead paragraph (l) Employee information and training (reference 2)]. (**RAC 2**)

- Supervisors need to insure all full time employees or military are enrolled in a medical surveillance program for lead with Occupation Health Clinic at 913-684-6546. [**Regulatory**, 29 CFR 1910.1025, Lead paragraph (j) Medical surveillance (reference 2)]. (**RAC 3**)

- Supervisors need to insure cleaning staff wear gloves and smocks with arms when cleaning. [**Regulatory**, 29 CFR 1910.1025, Lead paragraph (g) Protective clothing and equipment (reference 2)]. (**RAC 3**)

- Exclude pregnant or lactating females from the cleaning staff. [Prudent IH Practice] (No RAC assigned)

- Turn in cleaning materials to DIS Environmental Division for testing and/or disposal (684-8980). [**Regulatory**, EPA's 40 CFR Parts 239 through 259 contain the regulations for solid waste, while Parts 260 through 279 contain the hazardous waste regulations, Resource Conservation and Recovery Act (RCRA) (reference 5)] (No RAC assigned)

3) FOR ALL PERSONNEL

- Training in lead awareness given by Supervisors. Assistance can be obtained by the Industrial Hygienist and to DIS Environmental Division [**Regulatory**, 29 CFR 1910.1025, Lead paragraph (l) Employee information and training (reference 2)]. (**RAC 2**)

- No eating, drinking, chewing gum, use of tobacco products, application of lip balm or cosmetics. [**Regulatory**, 29 CFR 1910.1025, Lead paragraph (h) Housekeeping (reference 2)]. (**RAC 2**)

- Collect cleaning materials in an appropriate closed container. [**Regulatory**, EPA's 40 CFR Parts 239 through 259 contain the regulations for solid waste, while Parts 260 through 279 contain the hazardous waste regulations, Resource Conservation and Recovery Act (RCRA) (reference 5)] (No RAC assigned)

c. For general Indoor Air Quality, Stop the water leaks in the roof, HVAC systems, and ceilings. Institute a more structured routine for internal housekeeping, to include dusting, cleaning with disinfect on all surfaces, and vacuuming using a HEPA vacuum in the areas on a weekly basis as a minimum. Remove trash daily. [**Regulatory**, 29 CFR 1910.141, Sanitation (reference 4)]. (**RAC 3**)

MCXN-PM (40-5f) 8 May 2007
SUBJECT: Lead in the Air in the SAAF Hanger Building #132 – Report #4 for 2007

4. Please provide a status update of the above recommendations to CAC Safety and C, Preventive Medicine within 30 days of receipt of memorandum.

5. The survey results are official exposure records and must be maintained according to Title 29 Code of Federal Regulations (CFR) 1910.1020 "Access to Employee Exposure and Medical Records" and DA PAM 40-503 "Industrial Hygiene Program". This information should be provided to the supervisors to inform the employees. **Please post this report in an accessible location to insure all employees have access to it.** It is the supervisor's responsibility to ensure all workers have an opportunity to review and understand our recommendations. It is highly encouraged that the report be discussed during periodic detail safety briefings.

6. Point of contact is Mr. Karl Gibson, Industrial Hygienist, [redacted]@cen.amedd.army.mil.

[redacted]
LTC, AN
Chief, Preventive Medicine

CF:
D, DIS
C, DIS Environmental
Lead POC, DIS Environmental

APPENDIX A

Evaluation Data and Risk Assessment Codes (RAC).

The evaluation data collected is assessed into categories based upon Army regulations, Occupational Safety and Health Administration (OSHA) regulations, and consensus standards. Assessment categories are assigned as shown in Table B1, below.

Table B1 – Evaluation Data Assessment

Symbol	Definition
●	Did not meet standard/guideline
△	Levels of Concern, but meets standard/guideline.
■	Meets standard/guideline
?	Insufficient data to assess

Risk Assessment Codes (RACs) [based on Accident Probability and Safety Hazard Severity for safety hazards; or Health Hazard Severity Categories (HHSCs) and Illness Probability Categories (IPCs) for health hazards; or Mishap Probability Categories (MPCs) for noise hazards] were assigned to each recommendation below. These assigned RACs are meant to assist the facility and occupational health program managers in allocating limited resources. The assignment of these RACs is based on guidance contained in Department of Defense Instruction 6055.1 (reference 1), USACHPPM Technical Guide 181 (reference 2), and professional judgment.

Standard. The permissible exposure limit (PEL) for lead is .05 milligrams per cubic meter (mg/m3) of air for an 8-hour TWA as found in 29 CFR 1910.1025 Lead (reference 2). The 29 CFR 1910.1025 (c)(1) states that an employee shall not be exposed to an airborne concentration of lead in excess of fifty micrograms per cubic meter as averaged over a sampling period of 8-hour period. The 29 CFR 1910.1025 (b) Action Level means employee exposure to an airborne concentration of lead of 30 micrograms per cubic meter of air averaged over a sampling period of 8-hour period.

Laboratory.

For the 10 April 2007 samples, the Industrial Hygiene used the Schneider Laboratories Inc. and Air Force Institute for Occupational Health (AFIOH) for sample analysis. The Schneider Laboratories Inc. lab is **national accreditation** from: Industrial Hygiene Laboratory Accreditation Program (IHLAP): Metals, Asbestos PCM, Organic Solvents, Silica, Asbestos PCM, Diffusive Samples; Environmental Lead Laboratory Accreditation Program (ELLAP/NLLAP): Paint Chips, Dust Wipes, Air, Soil ID NUMBER *CERTIFICATE NUMBER*

100527 and **state accreditation** from Kansas Department of Health & Environment, Bureau of Health and Environmental Laboratories (NELAP Secondary Certification); Lead ID NUMBER *CERTIFICATE NUMBER* E-10348. The AFIOH is **national accreditation** from: Industrial Hygiene Laboratory Accreditation Program (IHLAP): Metals, Asbestos PCM, Organic Solvents, Silica, Asbestos PCM, Diffusive Samples; Environmental Lead Laboratory Accreditation Program (ELLAP/NLLAP): Paint Chips, Dust Wipes, Air, Soil ID NUMBER *CERTIFICATE NUMBER* E67593FL.

For the 8 March 2007 samples, they were sent to the Army lab at Brooke Army Medical Center (BAMC). It is not know if it is nationally or state accredited. According to **national accreditation** from: Industrial Hygiene Laboratory Accreditation Program (IHLAP): or Environmental Lead Laboratory Accreditation Program (ELLAP) web site does not document BAMC lab as an accredited lab on 20 March 2007.

For the 30 January, 28 February 2007 samples, the Industrial Hygiene used the Schneider Laboratories Inc. for sample analysis. The lab is **national accreditation** from: Industrial Hygiene Laboratory Accreditation Program (IHLAP): Metals, Asbestos PCM, Organic Solvents, Silica, Asbestos PCM, Diffusive Samples; Environmental Lead Laboratory Accreditation Program (ELLAP/NLLAP): Paint Chips, Dust Wipes, Air, Soil ID NUMBER *CERTIFICATE NUMBER* 100527 and **state accreditation** from Kansas Department of Health & Environment, Bureau of Health and Environmental Laboratories (NELAP Secondary Certification); Lead ID NUMBER *CERTIFICATE NUMBER* E-10348.

These health exposure level standards are used IAW AR 40-5,"Preventive Medicine," and DA PAM 40-11 paragraph 5-2 d. "Preventive Medicine". This Army regulation requires the use of the most stringent health standard.

For the 10 April 2007 side by side samples, the Industrial Hygiene used the Schneider Laboratories Inc. and AFIOH for sample analysis. Schneider Laboratories Inc. results are on top and AFIOH results are on bottom. Air samples were taken on 10 April 2007 and are reported in Parts Per Million (ppm) or Milligrams Per Cubic Meter (mg/m3) for the 8 hour Time Weighted Average (TWA):

Chemical	**Sample Type**	**Calculated 8-hr TWA[1] Employee Concentration**	**Standard Carcinogenic**	**Meets Standard**	**Controlling Regulatory**
Lead	SHGA[2]	<.002 mg/m3 .00108 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	[redacted]	OSHA
Lead	SHGA[2]	<.002 mg/m3 .00132 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	[redacted]	OSHA
Lead	SHGA[2]	<.002 mg/m3 .00118 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	[redacted]	OSHA
Lead	SH UTL	.005 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	[redacted]	OSHA
Lead	NHGA[3]	<.002 mg/m3 .00179 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	[redacted]	OSHA
Lead	NHGA[3]	<.002 mg/m3 .00120 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	[redacted]	OSHA
Lead	NHGA[3]	<.002 mg/m3 .00110 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	[redacted]	OSHA
Lead	NH UTL	.005 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	[redacted]	OSHA

[1]In calculating the 8-hour TWA, it was assumed some task involving lead is conducted once a work-day for about a 8 hour period
SHGA[2] stands General Area samples for South Hanger
NHGA[3] stands General Area samples for South Hanger
[4]BDL: Below the detectable limit
PEL stands for the OSHA Permissible Exposure Limit as found in 29 CFR 1910.
AL stands for the OSHA Action Limit as found in 29 CFR 1910.
UTL stands for the Upper Tolerance Level using Normal Parametric Statistics of 95% confidence of the lead exposure in each hangar.

For the 8 March 2007 samples, they were sent to the Army lab at Brooke Army Medical Center (BAMC). Air samples were taken on 8 March 2007 and are reported in Parts Per Million (ppm) or Milligrams Per Cubic Meter (mg/m3) for the 8 hour Time Weighted Average (TWA):

Chemical	Sample Type	Calculated 8-hr TWA[1] Employee Concentration	Standard Carcinogenic	Meets Standard	Controlling Regulatory
Lead	SHGA[2]	<.000651 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	?	OSHA
Lead	SHGA[2]	<.000651 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	?	OSHA
Lead	SHGA[2]	<.000651 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	?	OSHA
Lead	SH UTL	<.000651 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	?	OSHA
Lead	NHGA[3]	<.000651 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	?	OSHA
Lead	NHGA[3]	<.000651 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	?	OSHA
Lead	NHGA[3]	<.000651 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	?	OSHA
Lead	NH UTL	<.000651 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	?	OSHA

[1]In calculating the 8-hour TWA, it was assumed some task involving lead is conducted once a work-day for about a 8 hour period
SHGA[2] stands General Area samples for South Hanger
NHGA[3] stands General Area samples for South Hanger
[4]BDL: Below the detectable limit

Air samples were taken on 28 February 2007 and are reported in Parts Per Million (ppm) or Milligrams Per Cubic Meter (mg/m3) for the 8 hour Time Weighted Average (TWA):

Chemical	Sample Type	Calculated 8-hr TWA[1] Employee Concentration	Standard Carcinogenic	Meets Standard	Controlling Regulatory
Lead	SHGA[2]	.644 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	●	OSHA
Lead	SHGA[2]	.708 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	●	OSHA
Lead	SHGA[2]	.605 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	●	OSHA
Lead	SH UTL	1.01 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	●	OSHA
Lead	NHGA[3]	.067 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	●	OSHA
Lead	NHGA[3]	.010 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	■	OSHA
Lead	NHGA[3]	.53 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	●	OSHA
Lead	NH UTL	.27 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	●	OSHA

[1]In calculating the 8-hour TWA, it was assumed some task involving lead is conducted once a work-day for about a 8 hour period
SHGA[2] stands General Area samples for South Hanger
NHGA[3] stands General Area samples for South Hanger
[4]BDL: Below the detectable limit

Air samples were taken on 30 January 2007 while no flight operations were occurring and are reported in Micrograms Per Cubic Meter (ug/m3) for the 8 hour Time Weighted Average (TWA):

Chemical	Sample Type	Calculated 8-hr TWA[1] Employee Concentration	Standard Carcinogenic	Meets Standard	Controlling Regulatory
Lead	2nd Floor Control Office GA	<.002 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	■	OSHA
Lead	2nd Floor Large Office	<.002 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	■	OSHA
Lead	1st Floor Waiting Room	<.002 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	●	OSHA
Lead	Battery Shop	<.002 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	●	OSHA
Lead	South Office Class Room	<.002 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	■	OSHA
Lead	North Office Class Room	<.002 mg/m3	.05 mg/m3 PEL .03mg/m3AL YES	■	OSHA

APPENDIX B

Lead Wipes

Chemical	Sample Type	Physical Description	Concentration	EPA Standard Carcinogenic	Meets Standard
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like in N. Hanger Wall Vest floor	704.3 ug/ft2	40 ug/ft2 YES	
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like N. Hanger W Center floor	1,529.8 ug/ft2	40 ug/ft2 YES	
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like N. Hanger N WA center	32.0 ug/ft2	40 ug/ft2 YES	
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like S. Hanger S WA Center floor	1,529.8 ug/ft2	40 ug/ft2 YES	
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like S. Hanger S WA West floor	860.7 ug/ft2	40 ug/ft2 YES	
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like S. Hanger S WA Center Dr floor	11.5 ug/ft2	40 ug/ft2 YES	
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like Floor Swiper	104.6 ug/ft2	40 ug/ft2 YES	
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like floor of Plane N108SV	1,641.5 ug/ft2	40 ug/ft2 YES	
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like floor of Plane N1806Y	1,660.1 ug/ft2	40 ug/ft2 YES	

Chemical	Sample Type	Physical Description	Concentration	EPA Standard Carcinogenic	Meets Standard
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like floor of Plane N2402L	1,138.9 ug/ft2	40 ug/ft2 YES	
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like floor of Plane N26WA	551.7 ug/ft2	40 ug/ft2 YES	
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like floor of Plane N26410	991.0 ug/ft2	40 ug/ft2 YES	
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like floor of Plane N459EZ	443.4 ug/ft2	40 ug/ft2 YES	
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like floor of Plane N47330	391.2 ug/ft2	40 ug/ft2 YES	
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like floor of Plane N5137V	1,697.4 ug/ft2	40 ug/ft2 YES	
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like floor of Plane N6972U	277.7 ug/ft2	40 ug/ft2 YES	
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like floor of Plane N73209	737.8 ug/ft2	40 ug/ft2 YES	
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like floor of Plane N79823	1,343.7 ug/ft2	40 ug/ft2 YES	
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like floor of Plane N82747	734.1 ug/ft2	40 ug/ft2 YES	

Chemical	Sample Type	Physical Description	Concentration	EPA Standard Carcinogenic	Meets Standard
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like floor of Plane N9104V	700.6 ug/ft2	40 ug/ft2 YES	[redacted]
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like floor of Plane N95550	2,162.7 ug/ft2	40 ug/ft2 YES	[redacted]
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like floor of Plane NC48867	462.0 ug/ft2	40 ug/ft2 YES	[redacted]
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like OPS OFC floor	45.0 ug/ft2	40 ug/ft2 YES	[redacted]
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like on Hall Floor	108.3 ug/ft2	40 ug/ft2 YES	[redacted]
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like on FLAFA OFC floor	246.1 ug/ft2	40 ug/ft2 YES	[redacted]
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like on Plan OFC Floor	35.7 ug/ft2	40 ug/ft2 YES	[redacted]
Lead	Wipe EPA7420 Method	Black/Brown Dirt-like on Hanger floor at door	6,410.2 ug/ft2	40 ug/ft2 YES	[redacted]

MCXN-PM (40-5f) 6 February 2007

MEMORANDUM Thru Commander, USA MEDDAC, Fort Leavenworth, Kansas 66027

FOR D, DPTM, BLDG #77, Fort Leavenworth, Kansas 66027
S, SAAF, BLDG #132, Fort Leavenworth, Kansas 66027
M, CAC Safety, BLDG #198, Fort Leavenworth, Kansas 66027

SUBJECT: Lead in the Air in the SAAF Hanger Building #132 – January 2007

1. The purpose of the Industrial Hygiene survey conducted on 30 January 2007 was to provide guidance for the use of appropriate control measures to protect Sherman Army Air Field Hangar's military and civilian personnel from recognized occupational health hazards from the lead-based paint in the Hangar when the hangar doors were kept closed.

SAAF Hangar BLDG #132

2. Findings.

a. Lead in the paint. The Lead concentration in parts per million (ppm) for the analyzed paint chip was 102,398 ppm for Lead, which exceeds the regulated Lead threshold of 5 ppm. (See APPENDIX C for photos of locations.)

c. Lead in the air. (See Appendix A)

1) Workers' breathing zone exposures in the South Hangar to Lead are **non-compliant.**

2) Workers' breathing zone exposures in the North Hangar, 1st Floor Office/Classrooms, 1st Floor Waiting Room, and 2nd Floor Offices/Rooms to Lead are compliant in the South Hangar.

c. Lead in dust. To do a proper Risk Assessment IAW Kansas law, EPA and OSHA regulations, wipe samples need to be taken to measure the risk of lead in the dust in the work areas and areas where food is eaten, drinks are drunk, and cosmetics are applied. The Industrial Hygienist was prohibited from taking these samples.

d. The Risk Assessment Code (RAC) for operations in the South Hangar with doors closed and ventilation running is RAC 2 (serious health risk). All other airborne lead risks are RAC 3 (moderate health risk).

3. Recommendations.

a. The South Hangar workers need to wear HEPA/P100 respirators when working or doing flight maintenance operations when the hangar doors remain closed because the lead levels and there is no dust exhaust system.

b. Clean up the lead contaminated dust with professionally trained Lead Cleaners. Have licensed lead workers stabilize the flaking paint and repaint to stabilize the paint in the hangar. If this is not done, then install a dust exhaust system to lower dust levels. Ensure supply air is adequate to support the exhaust. Ventilation levels and air flow ratios recommended for this operation is found in and published in American Conference of Governmental Industrial Hygienists (ACGIH) Twenty fourth Edition manual, "The Industrial Ventilation Handbook – A Manual of Recommend Practice", Table in Section 10 and American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 62-2004 "Ventilation for acceptable Indoor Air Quality" and are also required by Occupational Safety and Health Administration (OSHA)'s Title 29 CFR 1910.6. The OSHA regulation has adopted the ACGIH's and ASHRAE's recommended ventilation levels. The mechanical engineers can assist from DIS or CHPPM-Main if the command requests their assistance.

c. MAINTENANCE AND HYGIENE

1) MAINTENANCE

- Provide a HEPA vacuum cleaner should be available.
- Staff should vacuum all horizontal surfaces weekly with the HEPA vacuum cleaner.
- Wet mop/wipe weekly after HEPA vacuuming.
- Mop water must be disposed of in a sanitary sewer.
- Call DIS Environmental Division (4-8980, 4-3304) to have vacuum bag changed and disposed of. It WILL contain hazardous waste.

2) FULL TIME PERSONNEL

- Display appropriate signage. See APPENDIX B. Please print or copy on yellow paper.
- Supervisors need to ensure that proper cleaning is performed.
- Supervisors need to develop a written SOP on cleaning procedures.
- Supervisors need to insure all full time employees or military are enrolled in a medical surveillance program for lead with Occupation Health Clinic at 913-684-6546.
- Supervisors need to insure cleaning staff wear gloves and smocks with arms when cleaning.
- Exclude pregnant or lactating females from the South Hangar.
- Turn in cleaning materials to DIS Environmental Division for testing and/or disposal (684-8980).

3) FOR ALL PERSONNEL

- Training in lead awareness given by Supervisors. Assistance can be obtained by the Industrial Hygienist and to DIS Environmental Division
- No eating, drinking, chewing gum, use of tobacco products, application of lip balm or cosmetics.
- All soldiers and civilians should wash hands and face carefully if they have been in the South Hangar.
- Collect cleaning materials in an appropriate closed container

d. For general Indoor Air Quality, Stop the water leaks in the roof, HVAC systems, and ceilings. Institute a more structured routine for internal housekeeping, to include dusting, cleaning with disinfect on all surfaces, and vacuuming using a HEPA vacuum in the areas on a weekly basis as a minimum. Remove trash daily.

MCXN-PM (40-5f) 6 February 2007
SUBJECT: Lead in the Air in the SAAF Hanger Building #132 – January 2007

e. The exposures in the shredding room to Lead exposures in the South Hangar were non-compliant and warrant medical surveillance. Because exposures to employees are occurring, OSHA's regulation found in Title 29 CFR 1910. "All employees who are or may be exposed to hazardous substances or health hazards at or above the Permissible Exposure Limit (PEL) or above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year; All employees who wear respirator for 30 days or more per year or as required by 1910.134; All employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards." For the U.S. Army, AR 40-5 "Preventive Medicine" paragraph 5-9 states "Preplacement, job transfer, periodic, and termination examinations will be provided to all military personnel and civilian employees potentially exposed to health hazards in the work environment."

4. Please provide a status update of the above recommendations to CAC Safety and C, Preventive Medicine within 30 days of receipt of memorandum.

5. The survey results are official exposure records and must be maintained according to Title 29 Code of Federal Regulations (CFR) 1910.1020 "Access to Employee Exposure and Medical Records" and DA PAM 40-503 "Industrial Hygiene Program". This information should be provided to the supervisors to inform the employees. **Please post this report in an accessible location to insure all employees have access to it.** It is the supervisor's responsibility to ensure all workers have an opportunity to review and understand our recommendations. It is highly encouraged that the report be discussed during periodic detail safety briefings.

MCXN-PM (40-5f) 6 February 2007
SUBJECT: Lead in the Air in the SAAF Hanger Building #132 – January 2007

6. Point of contact is Mr. Karl Gibson, Industrial Hygienist, ext. [redacted]@cen.amedd.army.mil.

[redacted]
LTC, AN
Chief, Preventive Medicine

CF:
D, DIS
C, DIS Environmental
Lead POC, DIS Environmental

APPENDIX A

Air samples were taken on 30 January 2007 while no flight operations were occuring and are reported in Micrograms Per Cubic Meter (ug/m3) for the 8 hour Time Weighted Average (TWA):

BOLD is level of non-compliant.
Italic is level of concern.

LOCATION	CHEMICAL	WORKER EXPOSURE	Standard	Controlling Regulatory
2nd Floor Control Office	Lead	<2. ug/m3	50 ug/m3 30 ug/m3AL	OSHA
2nd Floor Large Office	Lead	<2. ug/m3	50 ug/m3 30 ug/m3AL	OSHA
1st Floor Waiting Room	Lead	<2. ug/m3	50 ug/m3 30 ug/m3AL	OSHA
Battery Shop	Lead	<2. ug/m3	50 ug/m3 30 ug/m3AL	OSHA
South Office Class Room	Lead	<2. ug/m3	50 ug/m3 30 ug/m3AL	OSHA
North Office Class Room	Lead	<2. ug/m3	50 ug/m3 30 ug/m3AL	OSHA
North Hangar NE Side	Lead	14 ug/m3	50 ug/m3 30 ug/m3AL	OSHA
North Hangar S Side	Lead	17 ug/m3	50 ug/m3 30 ug/m3AL	OSHA
South Hangar SE Side	Lead	*47 ug/m3*	50 ug/m3 30 ug/m3AL	OSHA
South Hangar SW Side	Lead	**58 ug/m3**	50 ug/m3 30 ug/m3AL	OSHA

These health exposure level standards are used IAW AR 40-5,"Preventive Medicine," and DA PAM 40-11 paragraph 5-2 d. "Preventive Medicine". This Army regulation requires the use of the most stringent health standard.

APPENDIX B

CAUTION

POISON

LEAD HAZARD AREA

DO NOT ENTER WORK AREA
UNLESS AUTHORIZED

NO EATING, DRINKING OR
SMOKING PERMITTED

Enclosure E

DEPARTMENT OF THE ARMY
INDUSTRIAL HYGIENE SECTION
PREVENTIVE MEDICINE

MCXN-PM 1 February 2007

Standard Operating Procedure
PERSONAL SAMPLING FOR AIR CONTAMINANTS AND QUALITY ASSURANCE

1. PURPOSE: To establish Industrial Hygiene Program Manager role in personal sampling for air contaminants program.

2. REFERENCES:

A. DA PAM 40-503 dated Jan 1998, Industrial Hygiene Program

B. TG 141, Industrial Hygiene Sampling

C. OSHA/ DOL 29 CFR 1910 and 29 CFR 1926

D. NIOSH Occupational Exposure Sampling Strategy Manual

3. APPLICABILITY: This SOP is applicable to all IH personnel assigned or attached to the Fort Leavenworth MEDDAC.

4. RESPONSIBILITY: The IHPM will follow the following air monitoring procedures.

5. GENERAL PROCEDURES:

A. Unnecessary air sampling can tie up laboratory resources and produce delays in reporting results of necessary sampling. Evaluate the potential for employee overexposure through observation and screening samples before any partial or full-shift air sampling is conducted. Do not overexpose the employee to gather a sample.

B. Screening with portable monitors, gravimetric sampling, or detector tubes can be used to evaluate the following:

1. Processes, such as electronic soldering.

2. Exposures to substances with exceptionally high PELs (Permissible Exposure Limits) in relatively dust-free atmospheres, e.g., ferric oxide and aluminum oxide.

3. Intermittent processes with substances without STELs (Short Term Exposure Limits)

4. Engineering controls, work practices, or isolation of process.

5. The need for IH personal protection equipment.

C. Take a sufficient number of samples to obtain a representative estimate of exposure. Contaminant concentrations vary seasonally, with weather, with production levels, and in a single location or job class.

D. The number of samples taken depends on the error of measurement and differences in results. Consult the NIOSH Occupational Exposure Sampling Strategy Manual for further information.

E. If the employer has conducted air sampling and monitoring in the past, review the records.

F. Bulk Samples are often required to assist the Lab in the proper analysis of field samples. Some contaminants which fall into these categories include:

- silca
- portland cement
- asbestos
- mineral oil and oil mist
- chlorodiphenyl
- hydrogenated terphenyls
- chlorinated camphene
- fugitive grain dust
- explosibility testing.

6. GENERAL SAMPLING PROCEDURES:

A. Screen the sampling area using detector tubes, if appropriate. Determine the appropriate sampling technique (see Chemical Information manual). Prepare and calibrate the equipment and prepare the filter media.

B. Select the employee to be sampled and discuss the purpose of the sampling. Inform the employee when and where the equipment will be removed. Stress the importance of not removing or tampering with the sampling equipment. Turn off or remove sampling pumps before an employee leaves a potentially contaminated area (such as when he/she goes to lunch or on a break).

C. Instruct the employee to notify the supervisor or the IH if the sampler requires temporary removal.

D. Place the sampling equipment on the employee so that it does not interfere with work performance.

E. Attach the collection device (filter cassette, charcoal tube, etc.) To the shirt collar or as close as practical to the nose and mouth of the employee, i.e., in a hemisphere forward of the shoulders with a radius of approximately 6 to 9 inches. The inlet should always be in downward vertical position to avoid gross contamination. Position the excess tubing so as not to interfere with the work of the employee.

F. Turn on the pump and record the starting time.

G. Observe the pump operation for a short time after starting to make sure it is operating correctly.

H. Record the information required by the Air Sampling Data Form (CHPPM Form 9-R).

I. Check pump status every two hours. More frequent checks may be necessary with heavy filter loading. Ensure that the sampler is still assembled properly and that the hose has not become pinched or detached from the cassette or the pump. For filters, observe for symmetrical deposition, finger prints, or large particles, etc. Record the flow rate.

J. Periodically monitor the employee throughout the work day to ensure that sample integrity is maintained and cyclical activities and work practices are identified.

K. Take photographs, as appropriate, and detailed notes concerning visible airborne contaminants, work practices, potential interferences, movements, and other conditions to assist in determining appropriate engineering controls.

L. Prepare a blank (s) during the sample period for each type of sample collected. See the Sample Shipping and Handling Chapter. For any given analysis, one blank will suffice for up to 20 samples collected, except for asbestos which requires a minimum of two field blanks. These blanks may include opened but unused charcoal tubes, and so forth.

M. Before removing the pump at the end of the sample period, check the flow rate to ensure that the rotameter ball is still at the calibrated mark (if there is a pump rotameter). If the ball is no longer at the mark, record the pump rotameter reading.

N. Turn off the pump and record the ending time.

O. Remove the collection device from the pump and seal it with an lid as soon as possible. The seal should be attached across sample inlet and outlet so that tampering is not possible.

P. Prepare the samples for mailing to the CHPPM or other Analytical Laboratory for analysis.

Q. Recalibrate pumps after each day of sampling (before charging).

R. For unusual sampling conditions, such as wide temperature and pressure differences from the calibration conditions, call the CHPPM technical support section if needed.

7. SAMPLING TECHNIQUES:

A. Detector Tubes

1. Each pump should be leak-tested before use.

2. Calibrate the detector tube pump for proper volume at least quarterly or after 100 tubes. (See Appendix A)

B. Total Dust and Metal Fume

1. Collect total dust on a pre-weighed, low-ash polyvinyl chloride filter at a flow rate of about 2 liters per minute (1pm), depending on the rate required to prevent overloading.

2. Collect metal fumes on a 0.8 micron mixed cellulose ester filter at a flow rate of approximately 1.5 1pm, not to exceed 2.0 1pm. When the gravimetric weight needs to be determined for welding fumes, collect these fumes on a low ash polyvinyl chloride filter.

3. Take care to avoid any overloading of the filter, as evidenced by any loose particulate.

4. Calibrate personal sampling pumps before and after each day of sampling, using a bubble meter method (electronic or mechanical) or the precision method (that has been calibrated against a bubble meter), as described in Section E.

5. Weigh PVC filters before and after taking the sample. See Section F.

C. Respirable Particulate or Dust:

1. Collect respirable particulate or dust using a clean cyclone equipped with a pre-weighed low-ash polyvinyl chloride filter at a flow rate of 1.7 +/- 0.2 Lpm.

2. Collect silica only as a respirable dust. A bulk sample should be submitted to the CHPPM Analytical Laboratory.

3. All filters used shall be pre-weighed and post-weighed.

4. Calibration Procedures:

(a) Do the calibration at the pressure and temperature where the sampling is to be conducted.

(b) For respirable dust sampling using a cyclone or for total dust sampling using an open face filter cassette, set up the calibration apparatus.

(c) Place the open face filter cassette or cyclone assembly in a 1 liter jar. The jar is provided with a special cover.

(d) Connect the tubing from the electronic bubble meter to the inlet of the jar.

(e) Connect the tubing from the outlet of the cyclone holder assembly or from the filter cassette to the outlet of the jar and then to the sampling pump.

(f) Calibrate the pump. The calibration readings must be within 5% of each other.

5. Cyclone cleaning:

(a) Unscrew the grit pot from the cyclone. Empty the grit pot by turning it upside down and tapping it gently on a solid surface.

(b) Clean the cyclone thoroughly and gently after each use in warm soapy water or, preferably, wash in an ultrasonic bath. Rinse thoroughly in clean water, shake off excess water and set aside to dry before reassembly. Never insert anything into the cyclone during cleaning.

(c) Inspect the cyclone parts for signs of wear or damage, such as scoring, rifling, or a loose coupler. Replace the units or parts if they appear damaged.

(d) Leak test the cyclone at least once a month with regular usage.

(e) Detailed instructions on leak testing are available from the Directorate of Technical Support.

D. Organic Vapors and Gases:

1. Organic vapors and gases may be collected on activated charcoal, silica gel, or other adsorption tubes using low flow pumps.

2. Immediately before sampling, break off the ends of the charcoal tube as so as to provide an opening approximately one half the internal diameter of the tube. Wear eye protection when breaking ends. Use tube holders, if available, to minimize the hazards of broken glass. Do not use the charging inlet or the exhaust outlet of the pump to break the ends of the charcoal tubes.

3. Use the smaller section of the charcoal tube as a back-up and position it near the sampling pump. The charcoal tube shall be held or attached in an approximately vertical position with the inlet either up or down during sampling.

4. Draw the air to be sampled directly into the inlet of the charcoal tube. This air is not to be passed through any hose or tubing before entering the charcoal tube.

5. Cap the charcoal tube with the supplied plastic caps immediately after sampling and seal with an lid as soon as possible. Do not ship with bulk material.

6. For other adsorption tubes, follow the same procedures as those for the charcoal tube, with the following exceptions:

(a) Tubes may be furnished by CHPPM with either caps or flame sealed glass ends. If using the capped version, simply uncap during the sampling period and recap at the end of the sampling period.

(b) The ends of the flame-sealed glass tubes are broken at the beginning of the sampling period and capped at the end of the sampling period.

7. For organic vapors and gases, low flow pumps are required. Refer to the TG 141 Sample Manual to determine the appropriate flow rates recommended for specific chemicals.

8. With sorbent tubes, flow rates may have to be lowered or smaller air volumes (1/2 the maximum) used when there is high humidity (above 90%) in the sampling area or relatively high concentrations of other organic vapors.

9. Calibration Procedures:

(a) Set up the calibration apparatus replacing the cassette with the solid sorbent tube to be used in the sampling (e.g., charcoal, silica gel, etc.). If a sampling protocol requires the use of two charcoal tubes, then the calibration train must include two charcoal tubes. The air flow must be in the direction of the arrow on the tube.

(b) Calibrate the pump.

E. Midget Impingers/Bubblers:

1. Method

(a) Take care in preparing bubblers and impingers to see that fits or tips are not damaged and that joints can be securely tightened.

(b) Rinse the impinger/bubbler, with the appropriate reagent (see the Chemical Information Manual and Appendix 1-D). Then, add the specified amount of reagent to the impinger flask either in the office or at the sampling location. If flasks containing the regent are transported, caps must be placed on the impinger stem and side arm. To prevent overflowing, do not add over 10 milliliters of liquid to the midget impingers.

(c) Collect contaminants in an impinger at a maximum flow rate of 1.0 1pm. Contact the SLCAL prior to collecting samples for dust counting.

(d) The impinger may either be hand held by the industrial hygienist or attached to the employee's clothing using an impinger holster. In either case, it is very important that the impinger does not tilt, causing the reagent to flow down the side arm top the hose and into the pump. NOTE: Attach a trap in line to the pump, if possible.

(e) In some instances, it will be necessary to add additional reagent during the sampling period to prevent the amount of reagent from dropping below one-half of the original amount.

(f) After sampling, remove the glass stopper and stem from the impinger flask.

(g) Rinse the absorbing solution adhering to the outside and inside of the stem directly into the impinger flask with a small amount (1 or 2 ml.) Of the sampling reagent. Stopper the flask tightly with the plastic cap provided or pour the contents of the flask into a 20 cc.glass bottle. Rinse the flask with a small amount (1 or 2ml.) of the reagent and pour the rinse solution into the bottle. Tape the cap shut to prevent it from coming loose due to vibration. If electrical tape is used, do not stretch tape since it will contract and loosen cap.

2. Calibration Procedure:

(a) Set up the calibration apparatus as shown in replacing the cassette with the impinger/bubbler filled with the amount of liquid reagent specified in the sampling method. (Refer to Chemical Information Manual.)

(b) Connect the tubing from the electronic bubble meter to the inlet of the impinger/bubbler.

(c) Connect the outlet of the impinger/bubbler to the tubing to the pump.

(d) Calibrate the pump at a maximum flow rate of 1.0 1pm.

F. Mailing:

Mail bulks and air samples separately to avoid cross contamination. Pack the samples securely to avoid any rattle or shock damage (do not use expanded polystyree packing. Use bubble sheeting as packing. Put identifying paperwork in every package. Do not send samples in plastic bags or in envelopes. Use CHPPM Form 9-R. PRINT LEGIBLY ON ALL FORMS.

G. Vapor Badges:

1. Passive diffusion sorbent badges, are useful for screening and monitoring certain chemical exposures, especially vapors and gases. Few badges have been validated for use in compliance.

2. Badges are available from the local lab companies to detect mercury, nitrous oxides, ethylene oxide, formaldehyde, etc.

c. Interfering substances should be noted.

8. SPECIAL SAMPLING PROCEDURES:

A. Asbestos

1. Collect asbestos on special 0.45 micrometer pore size, 25 mm diameter mixed cellulose ester filter, using a back up pad.

2. Use fully conductive cassette with conductive extension cowl.

3. Sample open face in worker's breathing zone.

4. Assure that the bottom joint (between the extension and the conical black piece) of the cassette is sealed tightly with a shrink band or electrical tape. Point the open end of the cassette down to minimize contamination.

5. Use a flow rate in the range of 0.5 to 2.5 liters per minute. One liter per minute is suggested for general sampling. Office environments allow flow rates of up to 2.5 1pm. Calibrate pump before and after sampling. Calibration may be done either as stated before. Do not use nylon or stainless steel adaptors if in-line calibration is done.

6. Sample for as long a time as possible without overloading (obscuring) the filter.

7. Submit 10% blanks, with a minimum in all cases of 2 blanks per 10 samples.

8. Where possible, collect and submit to the lab a bulk sample of the material suspected to be in the air.

9. Mail bulks and air samples separately to aid cross contamination. Pack the samples securely to avoid any rattle or shock damage (do not use expanded polystyrene packing). Use bubble sheeting as packing. Put identifying paperwork in every package. Do not send samples in plastic bags or in envelopes. PRINT LEGIBLY ON ALL FORMS.

10. Instruct the employee to avoid knocking the cassette and to avoid using a compressed air source that might dislodge the sample.

11. This procedure has been revised as of May 1989. For exceptional sampling conditions or high flow rates, contact the CHPPM lab.

B. Sampling for welding fumes:

1. When sampling for welding fumes, the filter cassette must be placed inside the welding helmet to achieve an accurate characterization of the employee's exposure.

2. Welding fume samples are normally taken using 37-mm filters and cassettes; however, if these cassettes will not fit inside the helmet, 25-mm filters and cassettes can be used. Care must be taken not to overload the 25-mm, cassette when sampling.

3. The Assistant Regional Administrator for Technical Support should be consulted in the case of any technical difficulties.

9. EQUIPMENT PREPARATION AND CALIBRATION:

A. Replace alkaline batteries frequently (once a month). Also carry fresh replacement batteries with the equipment.

B. Check the rechargeable Ni-Cad batteries in older pumps under load (e.g., turn pump on and check voltage at charging jack) before use.

C. Calibrate personal sampling pumps before and after each day of sampling, using either the electronic bubble meter method or the precision rotameter method (that has been calibrated against a bubble meter).

D. Electronic Flow Calibrators:

1. These units are high accuracy electronic bubble flow meters that provide instantaneous air flow readings and a cumulative averaging of multiple samples. These calibrators measure the flow rate of gases and present the results as volume per unit of time.

2. These calibrators should be used to calibrate all air sampling pumps.

3. See manufacture instructions for more details on this piece of equipment.

E. When a sampling train requires an unusual combination of sampling media (e.g., glass fiber filter preceding impinger), the same media/devices should be in line during calibration.

1. Electronic Bubble Meter Method:

(a) Allow the pump to run 5 minutes prior to voltage check and calibration.

(b) Assemble the polystyrene cassette filter holder, using the appropriate filter for the sampling method. Compress cassette by using a mechanical press or other means of applying pressure. Use shrink tape around cassette to cover joints and prevent leakage. If a cassette adaptor is used, care should be taken to ensure that it does not come in contact with the back-up pad. NOTE: When calibrating with a bubble meter, the use of cassette adaptors can cause moderate to severe pressure drop at high flow rates in the sampling train, which will affect the calibration result. If adaptors are used for sampling, then they should be used when calibrating.

CAUTION: Nylon adapters can restrict air flow due to plugging over time. Stainless steel adapters are preferred.

(c) Connect the collection device, tubing, pump and calibration apparatus, cassette and cyclone samplers, respectively.

(d) A visual inspection should be made of all Tygon tubing connections.

(e) Wet the inside of the electronic flow cell with the supplied soap solution by pushing on the button several times.

(f) Turn on the pump and adjust the pump rotameter, if available, to the appropriate flow rate setting.

(g) Press the button on the electronic bubble meter. Visually capture a single bubble and electronically time the bubble. The accompanying printer will automatically record the calibration reading in liters per minute.

(h) Repeat step 7 until two readings are within 5%.

(i) While the pump is still running, adjust the pump, if necessary.

(j) Repeat the procedures described above for all pumps to be used for sampling. The same cassette and filter may be used for calibrations involving the same sampling method.

2. Precision Rotameter Method. The precision rotameter, is a secondary calibration device. If it is to be used in place of a primary device such as a bubble meter, care must be taken to ensure that any introduced error will be minimal and noted.

(a) Replacing the Bubble Meter. The precision rotameter may be used for calibrating the personal sampling pump in lieu of a bubble meter provided it is:

1. Calibrated with an electronic bubble meter or a bubble meter, as described in Appendix C, on a regular basis (at least monthly).

2. Disassembled, cleaned as necessary, and recalibrated. It should be used with care to avoid dirt and dust contamination which may affect the flow.

3. Not used at substantially different temperature and/or pressure from those conditions present when the rotameter was calibrated against the primary source.

4. Used such that pressure drop across it is minimal.

(b) Unusual conditions. If altitude or temperature at the sampling site are substantially different from the calibration site, it is necessary to calibrate the precision rotameter at the sampling site where the same conditions are present.

3. See Manual for Buret Bubble meter method.

10. FILTER WEIGHING PROCEDURE:

The step-by-step procedure for weighing filters depends on the make and model of the balance. Consult the manufacturer's instruction book for directions. In addition, follow these guidelines:

A. There shall be no smoking or eating in the weighing area. All filters will be handled with tongs or tweezers. Do not handle the filters with bare hands.

B. Desiccate all filters at least 24 hours before weighing and sampling. Change desiccant before it completely changes color (e.g., before blue desiccant turns all pink). Evacuate desiccator with a sampling or vacuum pump.

C. Zero the balance prior to use.

D. Calibrate the balance prior to use and after every 10 samples.

E. Immediately prior to placement on the balance, pass all filters over an ionization unit to remove static charges. (Return the unit after 12 months of use to the distributor for disposal.)

F. Weigh all filters at least twice.

1. If there is more than 0.005 milligram difference in the two weighings, repeat the zero and calibration and reweigh the filter.

2. If there is less than 0.005 milligram difference in the two weighings, average the weights for the final weight.

G. Record all the appropriate weighing information (in ink) in the Weighing Log.

H. In reassembling the cassette assembly, remember to add the unweighed backup pad.

I. When weighing the filter after sampling, dessicate first and include any loose material from an overloaded filter and cassette.

NOTE: At all times care not to exert downward pressure on the weighing pan(s). Such action may damage the weighing mechanism.

APPENDIX A

DETECTOR TUBES/PUMPS

A. Principle/Description

1. Detector tube pumps are portable equipment which, when used with a variety of commercially available detector tubes, are capable of measuring the concentrations of a wide variety of compounds in industrial atmospheres.

2. Operation consists of using the pump to draw a known volume of air through a detector tube designed to measure the concentration of the substance of interest. The concentration is determined by a colorimetric change of an indicator which is present in the tube contents.

3. Some of the more frequently used detector tubes are available from the CHPPM Lab. Most tubes can be obtained locally.

B. Applications/Limitations:

1. Detector tubes/pumps are screening instruments which may be used to measure over 200 organic and inorganic gases and vapors or for leak detection. Some aerosols can also be determined.

2. Detector tubes of a given brand are to be used only with a pump of the same brand. The tubes are calibrated specifically for the same brand of pump and may give erroneous results if used with a pump of another brand.

3. A limitation of many detector tubes is the lack of specificity. Many indicators are highly selective and can cross-react with other compounds. Manufacturer's manuals describe the effects of interfering contaminants.

4. Another important consideration is sampling time. Detector tubes give only an instantaneous interpretation of environmental hazards. This may be beneficial in potentially dangerous situations or when ceiling exposure determinations are sufficient. When long-term assessment of occupational environments is necessary, short-term detector tube measurements may not reflect time-weighted average levels of the hazardous substances present.

5. Detector tubes normally have a shelf-life at 25o C of 1 to 2 years. Refrigeration during storage lengthens the shelf-life. Outdated detector tubes (i.e., beyond the printed expiration date) should never be used. The Fire Department can sometimes use these outdated tubes for training purposes.

C. Performance Data:

1. Specific manufacturers' models of detector tubes are listed in the Chemical Information Manual. The specific tubes listed are designed to cover a concentration range that is near the PEL. Concentration ranges are tube-dependent and can be anywhere from one-hundredth to several thousand ppm. The limits of detection depend on the particular detector tube.

2. Accuracy ranges vary with each detector tube.

3. The pump may be handheld during operation (weighing from 8 to 11 ounces), or it may be an automatic type (weighing about 4 pounds) which collects a sample using a preset number of pump strokes. A full pump stroke for either type of short-term pump has a volume of about 100 cc.

4. In most cases where only one pump stroke is required, sampling time is about one minute. Determinations for which more pump strokes are required take proportionately longer.

D. Maintenance

Contact the TMDE Calibration Laboratory in Ft Riley for long-term maintenance.

E. Leakage Test

1. Each day prior to use, perform a pump leakage test by inserting an unopened detector tube into the pump and attempt to draw in 100 ml of air. After a few minutes, check for pump leakage by examining pump compression for bellows-type pumps or return to resting position for piston-type pumps. Automatic pumps should be tested according to the manufacturer's instructions.

2. In the event of leakage which cannot be repaired in the field, send the pump to the TMDE or Medical Maintenance for repair.

3. Record that the leakage test was made on the Direct-Reading Data Form.

F. Calibration Test

1. Calibrate the detector tube pump for proper volume measurement at least quarterly.

2. Simply connect the pump directly to the bubble meter with a detector tube in-line. Use a detector tube and pump from the same manufacturer.

3. Wet the inside of the 100 cc bubble meter with soap solution.

4. For volume calibration, experiment to get the soap bubble even with the zero ml mark of the buret.

a. For piston-type pumps, pull the pump handle all the way out (full pump stroke) and note where the soap bubble stops; for bellows-type pumps, compress the bellows fully; for automatic pumps, program the pump to take a full pump stroke. For either type pump, the bubble should stop between the 95 cc and 105 cc marks. Allow 4 minutes for the pump to draw the full amount of air (This time interval varies with the type of detector tube being used in-line with the calibration setup).

b. Also check the volume for 50 cc (1/2 pump stroke) and 25 cc (1/4 pump stroke) if pertinent. As in Section 1 above, a +/-5 percent error is permissible. If error is greater than +/-5 percent, send the pump to OCL of repair and recalibraton.

5. Record the calibration information required on the Calibration Log.

6. It may be necessary to clean or replace the rubber bung or tube holder if a large number of tubes have been taken with the pump.

G. Additional Information.

1. Draeger, Model 31 (bellows) when checking the pump for leaks with an unopened tube, the bellows should not be completely expanded after 10 minutes.

2. Drager, Quantiemter 1000, Model 1 (automatic) a battery pack is an integral part of this pump. The pack must be charged prior to initial use. One charge is good for 1000 pump strokes. During heavy use, it should be recharged daily. If a "U" (under voltage) message is continuously displayed in the readout window of this pump, the battery pack should be immediately recharged.

3. Matheson-Kitagawa, Model 8014-400A (piston) when checking the pump for leaks with an unopened tube, the pump handle should be pulled back to the 100-ml mark and locked. After 2 minutes, the handle should be released carefully. It should return to a point <6mm from zero or resting position. After taking 100 to 200 samples, the pump should be cleaned and relubricated. This involves removing the piston from the cylinder, removing the inlet and pressure-relief valve from the front end of the pump, cleaning, and relubricating.

4. Mine Safety Appliances, Sampler Pump, Model A, Part No. 46399 (piston) the pump contains a flow-rate control orifice protected by a plastic filter which periodically needs to be cleaned or replaced. To check the flow rate, the pump is connected to a buret and the piston is withdrawn to the 100-ml position with no tube in the tube holder. After 24-26 seconds, 80 ml of air should be admitted to the pump. Every 6 months the piston should be relubricated with the oil provided.

5. Sensidyne-Gastec, Model 800, Part No. 7010657-1 (piston) this pump can be checked for leaks as mentioned for the Kitagawa pump; however, the handle would be released after 1 minute. Periodic relubrication of the pump head, the piston gasket, the piston check valve is needed and is use-dependent.

H. Special considerations.

1. Detector tubes should be refrigerated when not in use to prolong shelf life.

2. Detector tubes should not be used when cold. They should be kept at room temperature or in a shirt pocket for one hour prior to use.

3. Lubrication of the piston pump may be required if volume error is greater than 5 percent.

APPENDIX B

ELECTRONIC FLOW CALIBRATORS

A. Description

1. These units are high accuracy electronic bubble flowmeter that provide instantaneous air flow readings and a cumulative averaging of multiple samples. These calibrators measure the flow rate of gases and report volume per unit of time.

2. The timer is capable of detecting a soap film at 80 microsecond intervals. This speed allows under steady flow conditions an accuracy of +/-0.5% of any display reading. Repeatability is +/- 0.5% of any display.

3. The range with different cells is from 1 cc/min to 30 Lpm.

4. Battery power will last 8 hours with continuous use. Charge for 16 hours. Can be operated from A/C charger.

B. Maintenance of Calibrator:

1. Cleaning before use:

Remove the flow cell and gently flush with tap water. The acrylic flow cell can be easily scratched. Wipe with cloth only. Do not allow center tube, where sensors detect soap film to be scratched or get dirty. NEVER clean with ACETONE. Use only soap and warm water. When cleaning prior to storage, allow flow cell to air dry. If stubborn residue persists, it is possible to remove the bottom plate. Squirt a few drops of soap into the slot between base and flow cell to ease removal.

2. Leak Testing:

The system should be leak checked at 6" H2O by connecting a manometer to the outlet boss and evacuate the inlet to 6" H2O. No leakage should be observed.

3. Verification of Calibration:

The calibrator is factory calibrated using a standard traceable to National Institute of Standards and Technology, formerly called the national Bureau of Standards, (NBS). Attempts to verify calibrator against a glass one liter burette should be conducted at 1000 cc/min. of maximum accuracy. The calibrator is linear throughout the entire range.

C. Shipping/Handling

1. When transporting, especially by air, it is important that one side of the seal tube which connects the inlet and outlet boss, be removed for equalizing internal pressure within the calibrator.

2. Do not transport unit with soap solution or storage tubing in place.

D. Precautions/Warnings

1. Avoid the use of chemical solvents on flow cell, calibrator case and faceplate. Generally, soap and water will remove any dirt.

2. Never pressurize the flow cell at any time with more than 25 inches of water pressure.

3. Do not charge batteries for longer than 16 hours.

4. Do not leave A/C adapter plugged into calibrator when not in use as this could damage the battery supply.

5. Black close fitting covers help to reduce evaporation of soap in the flow cell when not in use.

6. Do not store flow cell for a period of one week or longer with soap. Clean and store dry.

7. The Calibrator Soap is a precisely concentrated and sterilized solution formulated to provide a clean, frictionless soap film bubble over the wide, dynamic range of the calibrator. The sterile nature of the soap is important in the prevention of residue build-up in the flow cell center tube, which could cause inaccurate readings. The use of any other soap is not recommended.

APPENDIX C
MANUAL BURET BUBBLE METER TECHNIQUE

When a sampling train requires an unusual combination of sampling media (e.g., glass fiber filter preceding impinger), the same media/devices should be in line during calibration. Calibrate personal sampling pumps before and after each day of sampling.

A. Bubble Meter Method:

1. Allow the pump to run 5 minutes prior to voltage check and calibration.

2. Assemble the polystyrene cassette filter holder using the appropriate filter for the sampling method. If a cassette adaptor is used, care should be taken to ensure that it does not come in contact with the back-up pad. NOTE: When calibrating with a bubble meter, the use of cassette adaptors can cause moderate to severe pressure drop in the sampling train, which will affect the calibration result. If adaptors are used for sampling, then they should be used when calibrating.

3. Connect the collection device, tubing, pump and calibration apparatus.

4. A visual inspection should be made of all Tygon tubing connections.

5. Wet the inside of a 1-liter buret with a soap solution.

6. Turn on the pump and adjust the pump rotameter to the appropriate flow rate setting.

7. Momentarily submerge the opening of the buret in order to capture a film of soap.

8. Draw three bubbles up the buret in order to ensure that the bubbles will complete their run.

9. Visually capture a single bubble and time the bubble from 0 to 1000 ml for high flow pumps or 0 to 100 ml for low flow pumps.

10. The timing accuracy must be within +1 second of the time corresponding to the desired flow rate.

11. If the time is not within the range of accuracy, adjust the flow rate and repeat steps 9 and 10 until the correct flow rate is achieved. Perform steps 9 and 10 at least twice, in any event.

12. While the pump is still running, mark the pump or record on the CHPPM form 9-R the position of the float in the pump rotameter as a reference.

13. Repeat the procedures described above for all pumps to be used for sampling. The same cassette and filter may be used for all calibrations involving the same sampling method.

APPENDIX D
SHELF-LIFE OF SAMPLING MEDIA

Sampling Medium	Shelf-Life	Comments
Sodium Hydroxide (all normalities)	6 months	
Hydrochloric acid	One year	Same for all Sulfuric acid concentrations
Methanol in water		Of all solutions.
All organic solvents in pure state	4 years	
Bis-chloromethyl ether (BCME) and Chloromethyl methyl ether (CMME) collecting solution	2 months	Must be stored In a dark bottle In a refrigerator.
Hydroxyl ammonium chloride solutions (for acetic anhydride, ketene)	2 weeks	Should be Stored in a refrigerator in a light-protected container.
Hydroxyl ammonium chloride-Sodium hydroxide mixed solutions (for acetic anhydride, ketene collection)	Stable only 2 hour	Must be prepared fresh just prior to use.
Hydrogen peroxide (0.3N) for sulfur dioxide collection	6 months	Stable if it is Protected from light and refrigerated.
Girard T Reagent	2 weeks	Store in glassware in the dark.
Passive Monitors		Must be used before the expiration date (if given) printed on the monitor package.
Nitrogen oxides collection tubes		Should be stored in a refrigerator.

APPENDIX E

SAMPLING FOR SPECIAL ANALYSES

A. Silica Samples Analyzed by X-Ray Diffraction (XRD)

1. Air Samples. Respirable dust samples are analyzed for quartz and cristobalite by X-ray diffraction (XRD). XRD is the preferred analytical method due to its sensitivity, minimum requirements for sample preparation and ability to identify polymorphs (different crystalline forms) of free silica.

a. The analysis of free silica by XRD requires that the particle size distribution of the samples be matched as closely as possible to the standards. This is best accomplished by collecting a respirable sample.

1. Respirable dust samples are collected on tared low ash PVC filter using a 10mm nylon cyclone at a flow rate of 1.7 1pm.

2. A sample not collected in this manner is considered a total dust (or nonrespirable) sample. Techinicans are discouraged from submitting total dust samples since accurate analysis cannot be provided by XRD for such samples.

3. If the sample collected is nonrespirable, the laboratory must be advised on sample Form.

b. Quartz and cristobalite are the only two polymorphs of free silica which are presently being analyzed by the laboratory. Tridymite is not currently being analyzed. Samples are analyzed for cristobalite only upon request.

c. Quartz (or cristobalite) is identified by its major (primary) X-ray diffraction peak. Because other substances also have peaks at the same position, it is necessary to confirm quartz (or cristobalite) principally by the presence of secondary and/or tertiary peaks.

d. If they are considered to be present in the work environment, the following major chemicals which can interfere with an analysis should be noted:

Aluminum phosphate; Feldspars (microcline, othoclase, plagioclase);
Graphite; Iron carbide; Lead sulfate; Micas (biotite, muscovite);
Montmorillonite; Potash; Sillimanite; Silver chloride; Talc;
Zircon (Zirconium silicate)

NOTE: Specific additional chemicals should be listed in Item 37 of the OSHA-91 Form only if they are suspected to be present.

e. A sample weight and total air volume shall accompany all filter samples. Sample weights of 0.5 to 3.0 milligrams are preferred.

1. Do not submit a sample(s) unless its weight or the combined weights of all filters representing an individual exposure exceed 0.05 milligram.

2. If heavy sample loading is noted during the sampling period, it is recommended that the filter cassette be changed to avoid collecting a sample with a weight greater than 5.0 milligrams.

3. If a sample weight exceeds 5.0 mg, another sample of a smaller air volume, whenever possible, should be collected to obtain a sample weight of less than 5.0 mg.

f. Laboratory results for air samples are usually reported under one of four categories:

1. Percent Quartz (or Cristobalite). Applicable for a respirable sample in which the amount of quartz (or cristobalite) in the sample was confirmed.

2. Less Than or Equal To Value in Units of Percent. Less or equal to values are used when the adjusted 8-hour exposure is found to be less than the PEL, based on the sample's primary diffraction peak. The value reported represents the maximum amount of quartz (or cristobalite) which could be present. However, the presence of quartz (or cristobalite) was not confirmed using secondary and/or tertiary peaks in the sample since the sample could not be in violation of the PEL.

3. Approximate Values in Units of Percent. The particle size distribution in a total dust sample is unknown and error in the XRD analysis may be greater than for respirable samples. Therefore, for total dust samples, an approximate result is given.

4. Nondetected. A sample reported as nondetected indicates that the quantity of quartz (or cristobalite) present in the sample is not greater than the detection limit of the instrument. The detection limit is usually 10 micrograms for quartz and 30 micrograms for cristobalite.

* If less than a full-shift sample was collected, the CSHO should evaluate a nondetected result to determine whether adequate sampling was performed.

* If the presence of quartz (or cristobalite) is suspected in this case, the Industrial Hygienist may want to sample for a longer period of time to increase the sample weights.

2. Bulk Samples. Bulk samples must be submitted for all silica analyses.

a. They have two purposes:

1. For laboratory use only, to confirm the presence of quartz or cristoblite in respirable samples, or to assess the presence of other substances that may interfer in the analysis of respirable samples.

2. To determine the approximate percentage of quartz (or cristobalite) in the bulk sample.

b. A bulk sample submitted "for laboratory use only" must be representative of the airborne free silica content of the work environment sampled; otherwise, it will be of no value.

c. The laboratory's order of preference for bulk samples for an evaluation of personal exposure is:

1. A high volume respirable area sample.
2. A high volume area sample.
3. A representative settled dust (after) sample.
4. A bulk sample of the raw material used in the manufacturing process.

* This is the last choice and the least desirable.
* It should be submitted "for laboratory use only" if there is a possibility of contamination by other materials during the manufacuring process.

d. The type of bulk sample submitted to the laboratory should be stated on the Bulk Sample Form and cross-referenced to the appropriate air samples.

e. A bulk sample analysis for percent quartz (or cristobalite) will be reported only upon specific request by the IHPM.

f. A reported bulk sample analysis for quartz (or cristobalite) will be semi-quantitative in nature because:

1. The XRD analysis procedure requires a thin layer deposition for an accurate analysis.

2. The error for bulk samples analyzed by XRD is unknown because the particle size of nonrespirable bulk samples varies from sample to sample.

B. Samples Analyzed by Inductively Coupled Plasma (ICP).

1. Metals. Where two or more of the following analyzes are requested on the same filter, an ICP analysis may be conducted. However, the Industrial Hygienist should specify the metals of interest in the event samples cannot be analyzed by the ICP method. A computer print-out of the following 13 analyzes may be reported:

Antimony
Beryllium
Cadmium
Chromium
Cobalt
Copper
Iron
Lead
Manganese
Molybdenum
Nickel
Vanadium
Zinc

2. Arsenic. Samples analyzed for the 13 analyzes mentioned above can also be analyzed for arsenic by request. The arsenic analysis is performed by a different technique and results are reported separate from ICP results.

3. If requested, the laboratory can analyze for "solder-type" elements, such as:

Antimony
Beryllium
Cadmium
Copper
Lead
Silver
Tin
Zinc

Samples Analyzed by X-ray Fluorescence (XRF).

1. Filter, wipe and bulk samples can be qualitatively analyzed by XRF.

2. Requests for XRF analyses should be preceded by a phone call to CHPPM Lab to determine the extent and value of the analysis.

3. Packaging and shipping of such samples should be done in a manner consistent with directions previously given in this SOP.

APPENDIX F

SAMPLING AND ANALYTICAL ERRORS (SAE'S)

1. Definition of SAE's. When an employee is sampled and the results analyzed, the measured exposure will rarely be the same as the true exposure. This variation is due to sampling and analytical errors (SAE's). The total error is dependent upon the combined effects of the contributing errors inherent in sampling, analysis, and pump flow.

2. Definition of Confidence Limits. Error factors determined by statistical methods shall be incorporated into the sample results to obtain the lowest value that the true exposure could be (with a given degree of confidence) and also the highest value the true exposure could be (also with some degree of confidence).

a. The lower value is termed the lower confidence limit (LCL) and the upper value is termed the upper confidence limit (UCL).

b. These confidence limits are termed one-sided since the only concern is with being confident that the true exposure is on one side of the PEL.

3. Determining SAE's. SAE's which provide a 95 percent confidence limit have been developed and are listed on each OSHA-91B report form (most current SAEs) and are also presented in the Chemical Information Manual. If there is no SAE listed in the manual for a specific substance, apply the manufacturer's recommended error.

4. Environmental Variables. Environmental variables generally far exceed sampling and analytical errors. Samples taken on a given day are used by IHPM to determine compliance with PEL's. However, where samples are taken over a period of time (as is the practice of some employers) the IHPM should review the long term pattern and compare it with the results he/she obtains. Where IHPM's samples fit the long term pattern this helps to support the compliance determination. Where IHPM's results differ substantially from the historical pattern, the IHPM should investigate the cause of this difference and perhaps conduct additional sampling.

5. Confidence Limits. One-sided confidence limits can be used to classify the measured exposure into one of three categories.

a. If the measured results do not exceed the standard and the UCL also does not exceed the standard, we can be 95 percent confident that the employer is in compliance. (See equation F-6.)

b. If the measured exposure exceeds the PEL and the LCL of that exposure also exceeds the PEL, we can be 95 percent confident that the employer is in noncompliance and a violation is established. (See equation F-7.)

c. If the measured exposure does not exceed the PEL, but the UCL of that exposure does exceed the PEL, we cannot be 95 percent confident that the employer is in compliance. (See equation F-6.) Likewise, if the measured exposure exceeds the PEL, but the LCL of that exposure is below the PEL, we cannot be 95 percent confident that the employer is in noncompliance. (See equation F-7.) In both of these cases, our measured exposure falls into a region which is termed "possible over-exposure."

1. A violation is not established if the measured exposure falls into the "possible overexposure" region. It should be noted that the closer the LCL comes to exceeding the PEL, the more probable it becomes that the employer is in noncompliance.

2. If measured results are in this region, the CSHO should consider further sampling, taking into consideration the seriousness of the hazard, pending citations, and how close the LCL is to exceeding the PEL.

3. If further sampling is not conducted, or if additional measured exposures still fall into the "possible overexposure" region, the CSHO should carefully explain to the employer and employee representative in the closing conference that the exposed employee(s) may be overexposed but that there was insufficient data to document noncompliance. The employer should be encouraged to voluntarily reduce the exposure and/or to conduct further sampling to assure that exposures are not in excess of the standard.

6. Sampling Methods. The LCL and UCL are calculated differently depending upon the type of sampling method used. Sampling methods can be classified into one of three categories:

a. Full-period, Continuous Single Sampling. Full-period, continuous single sampling is defined as sampling over the entire sample period with only one sample. The sampling may be for a full-shift sample or for a short period ceiling determination.

b. Full-period, Consecutive Sampling. Full-period, consecutive sampling is defined as sampling using multiple consecutive samples of equal or unequal time duration which, if combined, equal the total duration of the sample period. An example would be taking four 2-hour charcoal tube samples. There are several advantages to this type of sampling.

1. If a single sample is lost during the sampling period due to pump failure, gross contamination, etc., at least some data will have been collected to evaluate the exposure.

2. The use of multiple samples will result in slightly lower sampling and analytical errors.

3. Collection of several samples allows conclusions to be reached concerning the manner in which differing segments of the workday affect overall exposure.

c. Grab Sampling. Grab sampling is defined as collecting a number of short-term samples at various times during the sample period which, when combined, provide an estimate of exposure over the total period. Common examples include the use of detector tubes or direct-reading instrumentation (with intermittent readings).

7. Calculations.

a. If the initial and final calibration flow rates are different, a volume calculated using the highs flow rate should be reported to the laboratory. If compliance is not established using the lowest flow rate, further sampling should be considered.

b. Generally, sampling is conducted at approximately the same temperature and pressure as calibration, in which case no correction for temperature and pressure is required and the sample volume reported to the laboratory is the volume actually measured. Where sampling is conducted at a substantially different temperature or pressure than calibration, an adjustment to the measured air volume may be repaired depending on sampling pump used, in order to obtain the actual air volume sampled.

c. The actual volume of air sampled at the sampling site is reported, and used in all calculations.

1. For particulates, the laboratory reports mg/m(3) of contaminant using the actual volume of air collected at the sampling site. The value in mg/m(3) can be compared directly to OSHA Toxic and Hazardous Substances Standards (e.g., 29 CFR 1910.1000).

2. The laboratory normally does not measure concentrations of gases and vapors directly in parts per million (ppm). Rather, most analytical techniques determine the total weight of contaminant in collection medium. Using the air volume provided by the CSHO, the lab calculates concentration in mg/m(3) and converts this to ppm at 25 degrees C and 760mm Hg using Equation F-1. This result is to be compared with the PEL without adjustment for temperature and pressure at the sampling site.

ppm(NTP)=mg/m(3) (24.45)/(Mwt) Equation F-1

where: 24.45= molar volume at 25 degrees C (298 K) and 760mm Hg

Mwt=molecular weight

NTP=Normal Temperature and Pressure, 25 degrees C and 760mm Hg.

3. If an occasion arises where it is necessary to know the actual concentration in ppm at the sampling site, it can be derived from the laboratory results reported in ppm at NTP by using the following equation:

ppm(PT)=ppm(NTP) (760/P) (T/298) Equation F-2

where: P=sampling site pressure (mm of Hg)

T=sampling site temperature (Degrees K)

298=temperature in degrees Kelvin (273 degrees K+ 25 degrees)

since ppm(NTP)=mg/m(3) (24.45)/(Mwt)

ppm(PT)=mg/m(3) X 24.45/Mwt X 760/P X T/298 Equation F-3

NOTE: When a laboratory result is reported as mg/m(3) contaminant, concentrations expressed as ppm(PT) cannot be compared directly to the standards table without converting to NTP.

NOTE: Barometric pressure can be obtained by calling the local weather station or airport, request the unadjusted barometric pressure. If these sources are not available then a rule of thumb is for every 1000 feet of elevation, the barometric pressure decreases by 1 inch of Hg.

8. Calculation Method for a Full-period, Continuous Single Sample.

a. Obtain the full-period sampling result (value X), the PEL and the SAE. The SAE can be obtained from the Chemical Information Manual.

b. Divide X by the PEL to determine Y, the standardized concentration. That is:

Y=X/PEL (Equation F-5)

c. Compute the UCL (95%) as follows:

UCL (95%)=Y + SAE (Equation F-6)

d. Compute the LCL (95%) as follows:

LCL (95%)=Y-SAE (Equation F-7)

e. Classify the exposure according to the following classification system:

1. If the UCL </=1, a violation does not exist.
2. If LCL </=1 and the UCL>1, classify as possible overexposure.
3. If LCL >1, a violation exists.

9. Calculation Method for Full-period Consecutive Sampling. The use of multiple consecutive samples will result in slightly lower sampling and analytical errors than the use of one continuous sample since the inherent errors tend to partially cancel each other. The mathematical calculations, however, are somewhat more complicated. If preferred, the CSHO may first determine if compliance or noncompliance can be established using the calculation method noted for a full-period, continuous, single sample measurement. If results fall into the "possible overexposure" region using this method, a more exact calculation should be performed using equation F-4.

a. Obtain X1, X2..., Xn, the n consecutive concentrations on one workshift and their time durations, T1, T2, ..., Tn. Also obtain the SAE in Appendix A, Chemical Information Table.

b. Compute the TWA exposure.

c. Divide the TWA exposure by the PEL to find Y, the standardized average (TWA/PEL).

d. Compute the UCL (95%) as follows:

UCL (95%)=Y + SAE (Equation F-6)

e. Compute the LCL (95%) as follows:

LCL(95%)= Y- SAE (Equation F-7)

f. Classify the exposure according to the following classification system:

1. If UCL </=1, a violation does not exist.
2. If LCL </=1, and the UCL > 1, classify as possible overexposure.
3. If LCL > 1, a violation exists.

g. When the LCL </=1.0 and UCL >1.0, the results are in the "possible overexposure" region, and the CSHO must analyze the data using the more exact calculation for full-period consecutive sampling as follows:

LCL=Y - SAE / T(12) X(12) + T(22) X(22) ...T(n2) X(n2)

PEL (T(1) + T(2) +...T(n)) Equation 1F-8

10. Grab Sampling. If a series of grab samples (e.g., detector tubes) are used to determine compliance with either an 8-hour TWA limit or a ceiling limit, consult with the ARA for Technical Support regarding sampling strategy and the necessary statistical treatment of the results obtained.

11. SAEs for Exposure to Chemical Mixtures. Often an employee simultaneously exposed to a variety of chemical substances in the workplace. Synergistic toxic effects on target organ is common for such exposures in many construction and manufacturing processes. This type of exposure can also occur when impurities are present in single chemical operations. New permissible exposure limits for mixtures, such as the recent welding fume standard (5 mg/m(3)), address the complex problem of synergistic exposures and their health effects. In addition, 29 CFR 1910.1000 contains a computational approach to assess exposure to a mixture. This calculation should be used when components in the mixture poses synergistic threat to worker health.

Whether using a single standard or the mixture calculation, the sampling and analytical error (SAE) of the individual constituents must be considered before arriving at a final compliance decision. These SAEs can be pooled and weighed to give a control limit for the synergistic mixture. To illustrate this control limit, the following example using the mixture calculation is shown:

The mixture calculation is expressed as:

E(m)=(C(1)/L(1) + C(2)/L(2)) +...C(n)/L(n) Equation F-9

Where: Em=equivalent exposure for a mixture
(E(m) should be </= 1 for compliance)
C=concentration of a particular substance
L=PEL

As an example, an exposure to three different but synergistic substances:

Material	8-hr Exposure (ppm)		8-hr TWA PEL (ppm)	SAE
Substance	1	500	1000	0.089
Substance	2	80	200	0.11
Substance	3	70	200	0.18

Using Equation F9: E(m)=500/1000 + 80/200 + 70/200= 1.25

Since E(m) >1, an overexposure appears to have occurred; however, the SAE for each substance also needs to be considered:

Exposure ratio (for each substance) Y(n) = C(n)/L(n)
Ratio to total exposure R(1)= Y(1)/E(m),...R(n) =Y(n)/E(m)

The SAEs (95% confidence) of the substance comprising the mixture can be pooled by:

RS(t) = [((R(1))(2) X (SAE(1))(2)) + (R(2))(2) X (SAE(2))(2)) + ...
(R(n))(2) X (SAE(n))(20))](1/2)

The mixture Control Limit (CL) is equivalent to: 1 + RS(t)

If E(m)</=CL, then an overexposure has not been established at the 95% confidence level; further sampling may be necessary.

If E(m) >1 and E(m) >CL, then an overexposure has occurred (95% confidence).

Using the mixture data above:

Y(1)= 500/1000 Y(2)= 80/200 Y(3)= 70/200

Y(1)=.5 Y(2)= .4 Y(3)= .35
R(1)= Y(1)/E(m)=0.4 R(2)=0.32 R(3)=0.28

RS(t2)=(0.4)(2)(0.089)(2) + (0.32)(2)(0.11)(2) + (0.28)(2)(0.18)(2)

RS9t)=(RS(t2))1/2=0.071
CL=1+RS(t)=1.071

E(m)=1.25

Therefore E(m) >CL and an overexposure has occurred within 95% confidence limits.

This calculation is also used when considering a standard such as the one for total welding fumes. A computer program is available for personal computers which will calculate a control limit for any synergistic mixture.

Sample Calculation for Full-period, Continuous Single Sample

A single fiberglass filter and personal pump were used to sample for carbaryl for a 7-hour period. The CSHO was able to document that the exposure during the remaining unsampled one-half hour of the 8-hour shift would equal the exposure measured during the 7-hour period. The laboratory reported 6.07
mg/m . The SAE for this method is 0.23. The PEL is 5.0 mg/m .

Step 1. Calculate the standardized concentration.

Y=6.07/5.0=1.21

Step 2. Calculate confidence limits.
LCL=1.21 - 0.23=0.98
Since the LCL does not exceed 1.0 noncompliance is not established.
The UCL is calculated:
UCL=1.21 + 0.23 = 1.44

Step 3. Classify the exposure.

Since the LCL </=1.0 and the UCL >1.0, classify as possible overexposure.

Sample Calculation for Full-period Consecutive Sampling '

If two consecutive samples had been taken for carbaryl instead of one continuous sample and the following results were obtained:

Sample	A	B
Sampling Rate (1pm)	2.0	2.0
Time (Min)	240	210
Volume (L)	480	420
Weight (mg)	3.005	2.457
Concentration (mg/m(3))	6.26	5.85

The SAE for carbaryl is 0.23.

Step 1. Calculate the UCL and the LCL from the sampling and analytical results:

TWA= (6.26 mg/m(3)) 240 min + (5.85 mg/m(3)) 210 min
450 min=6.07 mg/m(3)
Y=6.07 mg/m(3)/PEL=6.07/5.0=1.21
Assuming a continuous sample:

LCL=1.21 - 0.23=0.98
UCL=1.21 + 0.23=1.44

Step 2. Since the LCL<1.0 and UCL>1.0, the results are in the possible overexposure region, and the CSHO must analyze the data using the more exact calculation for full-period consecutive sampling as follows:

LCL=1.21 - 0.23/(240 min)(2)(6.26mg/m(3))(210min)(2)(5.85mg/m(3))(2)

5.0 mg/m(3) (240 + 210 min)=1.21 - 0.20=1.01
Since the LCL > 1.0, a violation is established.

APPENDIX G
Quality Assurance

1. Chemical sampling and analysis is used by occupational health and safety professionals to assess workplace contaminants and associated worker exposures. The validity of an assessment is based, in part, on the procedures used for sample collection and analysis, and data interpretation. In many instances these procedures use approaches that have been refined over many years and are accepted by the professionals as good practice. However, the multitude of variables within a specific workplace require the professional to exercise judgment in the design of a particular assessment.

2. Analysis. Published analytical methods address several hundred possible workplace contaminants. However, these methods do not address all chemical hazards. The following references to resources that provide analysis information on many chemical hazards.

a. **Analytical Methods**

1) Sampling and Analytical Methods. OSHA. Provides links to information developed by OSHA including validated methods for use by the Salt Lake Technical Center (SLTC) Laboratory.

2) NIOSH Manual of Analytical Methods (NMAM). US Department of Health and Human Services (DHHS), National Institute for Occupational Safety and Health (NIOSH) Publication 94-113, (1994, August). Provides individual analytical methods, listed by chemical name or method number.

3) Environmental Protection Agency (EPA). The EPA has published numerous methods relating to environmental monitoring, stack testing, and indoor air quality. Many of these can find application in evaluating occupational exposure. Others can be used to supplement information during specific evaluations. The following methods were developed to monitor environmental air for volatile organic analytes by drawing a sample onto a solid sorbent then analyzing the sample by thermal desorption/GC/MS. They provide sensitive analyses for specific compounds.

Method TO-1. (1984, April), 110 KB PDF, 34 pages.
Method TO-2. (1984, April), 110 KB PDF, 32 pages.
Method TO-3. (1984, April), 80 KB PDF, 20 pages.
Method TO-17. (1997, January), 312 KB PDF, 53 pages.
Method TO-14A. (1997, January), 1.1 MB PDF, 97 pages. This document describes a procedure for sampling and analysis of volatile organic compounds (VOCs) in ambient air.
Air Monitoring Database. 1.2 MB ZIP*. Provides a computer program (PC compatible) which can be downloaded, unzipped onto a floppy disk, and installed. This database provides references to EPA, National Institute for Occupational Safety and Health (NIOSH), and OSHA

methods that can be searched by compound or method number.
Individual Standards Search Page. American Society for Testing and Materials (ASTM). ASTM has developed about 100 standards which address analysis of workplace air samples. Search specific standards of interest from this page.

b. Method Modification and Development

1) Published analytical methods address several hundred possible workplace contaminants. However, these methods do not address all chemical hazards. Some chemicals are so specialized that they are rarely encountered. New chemicals are constantly being developed. Other chemicals are not stable on existing sampling media. In these instances it becomes necessary to modify an existing method to accommodate the contaminant or a new method must be developed.

2) The procedures for method modification and development vary depending on the properties of the chemical, possible interferences, the desired sampling medium, the desired analytical technique, sensitivity required, and similar factors. Therefore, method modification and development should only be undertaken by an experienced analyst or researcher. However, the following are items which should be considered and answered by any method modification or development.

3) Questions to be answered:
Can the analyte be collected by and removed from the sampling media?
What are the collection and recovery factors and are they acceptable?
Is the detection limit sufficiently low to provide meaningful data, especially when adjusted for collection and recovery factors?
Will expected interferences produce false positive, false negative, or biased results?
If possible, can the results be verified by comparison with an accepted procedure?

4) NIOSH Manual of Analytical Methods (NMAM). US Department of Health and Human Services (DHHS), National Institute for Occupational Safety and Health (NIOSH) Publication 94-113, (1994, August). Provides individual analytical methods, listed by chemical name or method number.

5) Analytical Method Evaluation Software. Provides information on calculation of method bias, precision, and accuracy. A computer based training program is also available.

c. Laboratory Selection

1) The selection of a laboratory is influenced by many factors. Among these are:
Does the laboratory perform the required analysis? What are my requirements for quality assurance and does the laboratory quality assurance program meet these requirements?
Does the laboratory analyze samples and report results within my required turnaround time?

Does the analytical report contain the information I need? Are detection limits reported and are they sufficiently low? Are analytical costs acceptable? Does the laboratory provide the client services I desire? Am I confident in the results provided?
Rose M. "Communications with your Industrial Hygiene (IH) Laboratory: Before you sample, when you submit your samples for analysis, after you get your results." (1997). Presents a list of example questions which may be used to evaluate and compare laboratories. Though specifically addressing laboratories performing silica analysis, the approach is applicable to other analyses.
Laboratory Accreditation and Certification

2) Participation in accreditation and certification programs allow laboratories to compare themselves against other laboratories and against accepted standards. Most programs require participation in a performance evaluation testing program where samples of unknown concentration are analyzed and reported to an independent body. Many programs require an on-site assessment by a trained quality assessor. Successful participation in an accreditation or certification program is an indicator that a laboratory operates under a functioning quality assurance program. It does not guarantee that the results produced by the laboratory are beyond question.

Blood Lead Laboratories. OSHA. OSHA administers a program for approval of laboratories submitting data as required by the Lead Standards for General Industry [29 CFR 1910.1025] and Construction [29 CFR 1926.62].

Laboratory Accreditation Programs. American Industrial Hygiene Association (AIHA). AIHA offers performance evaluation and accreditation programs for industrial hygiene and environmental lead laboratories.

National Voluntary Laboratory Accreditation Program. National Institute for Standards and Technology (NIST). NIST accredits laboratories for the analysis of asbestos samples. Listings of laboratories by state are available.

3. Laboratory (External)

a) Laboratories performing industrial hygiene analyses should participate in external performance evaluation programs, and be subject to audit by external assessors. The appropriate accreditation and certification programs discussed above should be part of a laboratory's quality assurance program.

b) When submitting samples to a laboratory, there are several methods which can be easily used to assess the accuracy and precision of the laboratory's results. In all cases, if a problem is detected, it would be wise to assume that the error is in the external sample, unless other information indicates otherwise. Once a problem has been identified, the laboratory quality assurance manager should be contacted and the problem resolved to the satisfaction of all parties.

c) Collect two samples under the same conditions. Remember, when evaluating these samples, that the two samples are not identical. For instance, a droplet of solvent could be splashed onto one sample but not the second giving a false reading for the first sampler.
If the sample is a bulk material, divide it into two portions after thoroughly homogenizing. If the sample is not homogenized, the two portions could contain differing amounts of analyte.
Prepare "spiked" samples of known concentration to be submitted blind with field samples. These *must* be prepared by a skilled individual. Additional spikes should be prepared at the same time so that the spiking can be verified by a second laboratory if questionable results are reported.

d) *Validate data.* Laboratory data should be reviewed thoroughly before use to ensure there are no gross errors in values or units.

e) *Submit single- or double-blind performance evaluation (PE) samples.* The PE samples are quality assurance (QA) samples that look like routine samples but are samples spiked with a known concentration of a target contaminant. Results of the PE samples should be compared to the known spiked value to determine acceptability of other data reported by the laboratory. The results of the PE samples are an indication of the ability of the laboratory to produce accurate results.

d. Data Validation and Interpretation

1) When an employee is sampled and the results analyzed, the measured exposure will rarely be the same as the true exposure. This variation is due to sampling and analytical errors (SAE's). The total error depends on the combined effects of the contributing errors inherent in sampling, analysis, and pump flow.

OSHA Technical Manual (OTM). OSHA Directive TED 01-00-015 [TED 1-0.15A], (1999, January 20).

Sampling and Analytical Errors (SAE's). Describes the process of determining errors with a given degree of confidence by using statistical methods.

2) Consider the following questions when analyzing results:
Do the results make sense?
Bascd on knowledge of the sampling site, are the laboratory results consistent with what you expect? And are they consistent between samples?
Are the results consistent with previous sampling results?
If an error in analytical procedures or results is suspected, contact the laboratory quality assurance section for assistance and resolution.
Were the samples collected using the correct sampling method and were the method specifications followed?

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Was the correct sampling media used?
Were the sample flow rates and total volumes within specifications?
Were samples properly preserved and shipped?
Was there a possibility of contamination? Were blanks submitted for analysis?
Were there any unusual circumstances surrounding the sample collection which may influence the validity?

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