



DEPARTMENT OF THE NAVY
NAVAL MEDICAL ADMINISTRATIVE UNIT
PRESIDIO OF MONTEREY HEALTH CLINIC
MONTEREY, CALIFORNIA 93944-5012

IN REPLY REFER TO

6260

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178 Aug 04

From: Officer in Charge, Naval Medical Administrative Unit, Monterey
To: Head, Electrical and Computer Engineering, Naval Postgraduate School,
Monterey, 833 Dyer Road, Monterey CA 93943-5000

Subj: ANNUAL INDUSTRIAL HYGIENE SURVEY OF NAVAL POSTGRADUATE SCHOOL,
MONTEREY, ELECTRICAL AND COMPUTER ENGINEERING DEPARTMENT

Ref: (a) OPNAVINST 5100.23F, Chapter 8, Section 0803.a

Encl: (1) Industrial Hygiene Survey Report ET-0301

1. As required by reference (a), an annual industrial hygiene survey of the Naval Postgraduate School, Monterey, Electrical and Computer Engineering Department was conducted on 11 and 12 August 2004 by the Naval Medical Administrative Unit, Monterey Industrial Hygienist. The survey report ET-0301 is forwarded as enclosure (1).

2. Due to the size and complexity of your command, separate reports will be issued as surveys of individual areas are completed to ensure the timeliness of the information. This survey is a service provided under the overall Occupational Health Program. It is not an inspection report but is designed to assist your Command's Occupational Safety and Health Program by identifying and evaluating actual and potential occupational health hazards and the status of their controls.

3. The Navy Oversight Inspection Unit and other inspection teams rely on these surveys and the corrective actions taken as indicators of an aggressive and comprehensive Navy Occupational Safety and Health (NAVOSH) Program. Since there are no findings or corrective actions identified, a response to this survey is unnecessary.

4. Further clarification or consultation with respect to these findings and recommendations is available from Eric Thurston at commercial (831) 656-3466, e-mail sethurst@nps.navy.mil.

S.E. THURSTON
By direction

Copy to:
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NAVAL MEDICAL ADMINISTRATIVE UNIT, MONTEREY

INDUSTRIAL HYGIENE SURVEY

of

NAVAL POSTGRADUATE SCHOOL, MONTEREY

ELECTRICAL AND COMPUTER
ENGINEERING DEPARTMENT

SURVEY #ET-0301

11 and 12 August 2004

Survey Conducted By:

Eric Thurston,
Industrial Hygienist

Enclosure (1)

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EXECUTIVE SUMMARY

No findings or corrective actions were identified during this survey. The department's Lab Manager, Bob McDonnell, should be congratulated for administering an excellent departmental OSH program.

Specific details of these findings can be found in sections II and III of this report. The cooperation of your staff, especially Bob McDonnell and Steve Richards, was greatly appreciated.

COMMON ABBREVIATIONS AND GLOSSARY

(The following abbreviations may be used in this report)

ACGIH	American Conference of Governmental Industrial Hygienists
ACM	Asbestos Containing Material.
AL	Action Level. Normally ½ PEL. Exposure level at which air sampling, employee training, medical surveillance are required.
ANSI	American National Standards Institute. A national consensus standards developing organization.
Ceiling	A toxic material exposure level which cannot be exceeded for any length of time.
CFM	Cubic feet per minute. Air flow rate.
dba	A sound level reading in decibels as measured on the A-weighted network of a sound level meter.
EL	Excursion Limit. Is a concentration limit which cannot be exceeded at any time.
EPA	Environmental Protection Agency.
f/cc	Fibers per cubic centimeter. A means for expressing airborne asbestos fiber concentrations.
FPM	Feet per minute.
HAZCOM	Hazard communication. A system for training employees about job hazards through the use of chemical inventories, MSDSs, labels, and personnel training.
HCP	Hearing Conservation Program. A program to prevent hearing loss from exposure to noise through the use of hearing protection, training, and medical surveillance.
HEPA	High-efficiency particulate air filter. A filter capable of trapping and retaining 99.97% of 0.3 micron diameter, or larger, particles.
HM	Hazardous material. A material which is a physical or health hazard per 29 CFR 1910.1200.
HW	Hazardous waste. Any discarded or abandoned hazardous substance as defined in 40 CFR 261.
LEV	Local exhaust ventilation. Exhaust system at source of contamination.
mg/m3	Milligrams per cubic meter of air. A means for expressing concentrations of dust and metal fumes in air.
MMVF	Man made vitreous fibers. (Fiberglass, mineral wool, ceramics)
MSAL	Medical Surveillance Action Level. A concentration of an air contaminant at which medical surveillance examinations must be provided to exposed personnel.
MSDS	Material Safety Data Sheet. A form used by manufacturers to communicate to users the chemical and physical properties of their products.
NAVOSH	Navy Occupational Safety and Health
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health. Recommends safety and health standards for OSHA.
NPEL	Navy Permissible Exposure Limit.
OSHA	Occupational Safety and Health Administration.
OV	Organic vapors.
PCB	Polychlorinated Biphenyl

COMMON ABBREVIATIONS AND GLOSSARY

PEL	Permissible Exposure Limit. The maximum permissible allowable exposure level of a toxic chemical or harmful physical agent (normally averaged over 8 hours) to which an employee may be exposed.
PPE	Personal Protective Equipment. Clothing or devices furnished to protect employees in performance of work in potentially hazardous areas or conditions.
ppm	Parts per million. A means for expressing the concentration of gases and vapors in air.
RFR	Radiofrequency/Microwave Radiation.
RPPM	Respiratory Protection Program Manager.
SCBA	Self Contained Breathing Apparatus.
SOP	Standard Operating Procedures.
STEL	Short term exposure limit. A 15 minute time weighted average exposure which should not be exceeded at any time during a workday.
Stressor	Potential Hazard (e.g. Noise, Chemicals, Dusts)
TLV	Threshold Limit Value. Established by ACGIH as levels of airborne contaminants or physical hazards under which it is believed workers may be exposed on a day after day basis without adverse effect.
TWA	Time Weighted Average. A method for averaging varying concentrations over a specified period of time (usually 8 hours).
WC	Work Center
WMP	Workplace Monitoring Program. A program to evaluate workplace health hazards through surveys and exposure measurement.

SECTION I

INTRODUCTION

The Naval Postgraduate School Electrical and Computer Engineering (ECE) Department has a wide variety of teaching, research, and support facilities. The potential health hazards in the department and the processes carried out in individual laboratories vary with the type of research being conducted by both staff and students.

If an operation has been overlooked or significant changes made which are believed to put personnel at serious risk, the Industrial Hygienist should be contacted, and an evaluation requested.

REPORT ORGANIZATION

Reference: (a) OPNAVINST 5100.23F, Chapter 8, Section 0803.f
(b) OPNAVINST 5100.23F, Chapter 8, Sections 0803.b and c
(c) OPNAVINST 5100.23F, Chapter 8, Paragraph 0803.g

Section I - contains the background information associated with this report and the schedule for follow-up surveys.

Section II - addresses the status of the command's occupational health programs and contains a short overview of each program's status.

Section III - Contains industrial hygiene assessments of specific work areas. These assessments address the status of workplace hazards and required control procedures.

Section IV - contains the results of all noise survey data collected in support of this survey.

Section V - identifies the occupational health medical surveillance requirements for each work area based on survey findings.

Section VI - details the sampling required to be conducted for OSHA or NAVOSH regulated stressors or stressors which have been found to result in personnel exposures equal to or in excess of the MSAL.

Appendix A - contains the OPNAV 5100/14 forms which are required by reference (a). These forms detail the occupational exposures of employees by work center or functional group.

Appendix B - is a copy of the Change In Operation Notification form, which should be filled out whenever a major operational change occurs. By returning the completed forms to the Industrial Hygienist, all new operations can be evaluated as required by reference (a). This form can be copied as needed for your use.

SURVEY SCHEDULE

In accordance with reference (b), each workplace must be thoroughly evaluated to identify and quantify potential occupational hazards. To document these evaluations, an initial comprehensive (baseline) survey is needed, followed by periodic updated surveys. Reference (c) requires workplaces with recognized potential health hazards to be evaluated annually, and other workplaces to be evaluated periodically. Medical surveillance recommendations and a workplace monitoring plan are developed from the findings of these surveys. Any comments or suggestions regarding these survey schedules should be forwarded to the Industrial Hygienist in the NPS Safety Office. The year of the last survey appears after each work center listing.

WORKPLACE SURVEY SCHEDULE

<u>Annual Required</u>	<u>2 Year Schedule</u>	<u>4 Year Schedule</u>
ECE Dept (2004)	None	None

Change of Operations Notification:

Reference (c) requires an industrial hygiene re-evaluation when workplace changes occur. Please notify the industrial hygienist in the Safety Office whenever major changes occur in a workplace. Examples of major changes include:

- Exposure times have changed.
- New types of equipment are used.
- New chemical/chemical product usage.
- New operations are performed.
- Increase in major chemical usage.
- Changes in exhaust ventilation.

A "CHANGE OF OPERATIONS NOTIFICATION" form is provided in Appendix B and can be used for this purpose. Copy the form as needed for your use.

SECTION II

NAVY OCCUPATIONAL SAFETY AND HEALTH

PROGRAM REVIEWS

The following programs are not required to be maintained by the Naval Postgraduate School, Monterey, Electrical and Computer Engineering Department because these hazards are not present:

- Asbestos Control
- Bloodborne Pathogens Control
- Manmade Vitreous Fibers Control
- Polychlorinated Biphenyls (PCB's) Control
- Process Control Ventilation
- Respiratory Protection

ERGONOMICS PROGRAM

Repetitive tasks are not performed in this department. Personnel are not required to lift items in excess of 40 pounds except at the Linear Accelerator and Flash X-Ray Facility involving moving of lead bricks. Personnel there have attended back injury prevention training. No problems or injuries have occurred from use of computers or heavy lifting.

HAZARDOUS MATERIALS CONTROL PROGRAM

An excellent Hazardous Materials Control Program has been established and is functioning effectively. No problems were noted with this program. A Department Authorized Use List (DAUL), as well as inventory lists for each area, has been developed. MSDSs have been obtained for hazardous materials, and are cross-referenced to both lists. Basic hazardous materials training has been provided to workers, with detailed information on product hazards provided by a review of the MSDS.

HEARING CONSERVATION PROGRAM

Although the potential for significant noise exposures does not occur from use of the electric drills and operation of equipment in the Room 616 RADAR/ECM Lab, personnel must continue to wear appropriate hearing protection during use of the equipment.

LEAD CONTROL PROGRAM

References: (a) 29 CFR 1910.1025
(b) OPNAVINST 5100.23F, Chapter 21, paragraph 2106

Personnel perform intermittent, brief duration soldering operations at stations throughout the department using temperature-controlled irons and lead-tin solder. Personnel at the Linear Accelerator and Flash X-Ray Facility handle lead bricks as radiation shielding, and also perform minimal lead-tin soldering. Significant exposures are not expected based on historical monitoring data of similar soldering operations performed at other Naval activities, and because lead bricks are not heated or mechanically acted upon. As noted in section III of this report, lead is a reproductive hazard. Personnel have access to the Federal Lead Standard, reference (a), information required by reference (b) from the NPS OSH Office computer web site. Use of respirators and enrollment in the Lead medical surveillance program are unnecessary. Follow the guidance discussed in the reproductive hazard control program in this, as well as the third, section of the report.

NON-IONIZING RADIATION CONTROL PROGRAM

Reference: (c) OPNAVINST 5100.23F, Chapter 22

Teaching and research projects in the ECE Department require the use of a class IIIb laser located in Bullard Hall, Room 221, and two class II lasers were observed in use in Bullard Hall, Room 224. The activity's Laser Systems Safety Officer, Steve Richards, has cognizance over this control program, which complies with the requirements outlined in reference (c). Laser goggles are being worn and proper procedural controls are being followed to prevent injury. A review of records indicates no laser-related injuries have occurred since the last survey was performed.

Radiofrequency radiation (RFR) levels during use of RADAR equipment located at Spanagel Hall were last measured by the NPS Radiation Safety Office from February to April 2003, and all systems were determined to not present a hazard.

REPRODUCTIVE HAZARDS CONTROL PROGRAM

References: (d) OPNAVINST 5100.23F, Chapter 29
(e) Navy Environmental Health Center Technical Manual NEHC-TM92-2

Materials that contain reproductive hazards, as defined by Appendix 29-A of reference (d), include toluene-containing aerosol paint cans, lead-tin solder, toluene present in Star Brite and Scotchkote protective coatings, and use of lead bricks at the Linear Accelerator. Negative exposure assessments were made for lead products as discussed above, and monitoring data collected during use of the aerosol paint cans and protective coatings indicate insignificant levels of toluene are present.

Recommendations:

In order to properly control reproductive hazards in the workplace, employees are encouraged to:

- Inform the supervisor as soon as possible that they are pregnant, completely fill out the questionnaire provided by reference (e), and request an evaluation by the Industrial Hygienist and the occupational health provider from the Presidio of Monterey, Army medical clinic.
- Follow all recommendations from the industrial hygienist and occupational health provider regarding the use of reproductive hazards in the workplace.

SECTION III

INDUSTRIAL HYGIENE ASSESSMENTS

INDUSTRIAL HYGIENE ASSESSMENT

ACTIVITY: NPS Monterey FILE NO.: ET-0301 DATE: 11 August 2004

DEPARTMENT: ECE, General Laboratories POC: Bob McDonnell

LOCATION: Bldgs 232, 233 and 245 IND. HYG: Eric Thurston

FUNCTION: Laboratories are used for course demonstrations and individual student or staff research. The types of stressors and number and gender of personnel potentially exposed varies with the class size and the type of research being conducted.

Currently departmental spaces are used as follows:

SPANAGEL HALL, BUILDING 232, by room number

219 Signals Enhancement Lab	427 Cryptographic Research Lab
307 Advanced Microelectronics/VLS Integration Lab	543A, 543B, 543C, 539, 545, 612, 616 RADAR/EW
309 Advanced Networking Lab #1	548 Secure Computer Lab
311 Advanced Networking Lab #2	611 RADAR Maintenance
313 Advanced Networking Lab #3	703 Antenna Lab
315, 319, 321, 321A Center for Signal Processing	704 MK-25 RADAR
419 Microwave Lab	

In addition, there are several microwave antennas on the roof of Spanagel Hall. Anechoic chambers are located in Rooms 535 and 604.

BULLARD HALL, BUILDING 233

201 Digital/Circuits Lab	208 Servo Control Lab
	221-224 Optics

BUILDING 245

117, 119 Power Systems (117 has a small machine shop)

HALLIGAN HALL, BUILDING 234

106 Electronics Calibration Lab
Linear Accelerator

FLASH X-RAY FACILITY, BUILDING 216

The remainder of department spaces are classrooms, offices, or general storage areas.

The only noted change is that cutting of copper/beryllium sheets is no longer performed.

INDUSTRIAL HYGIENE ASSESSMENT (con'd)

ACTIVITY: NPS Monterey FILE NO.: ET-0301 DATE: 11 August 2004

DEPARTMENT: ECE, General Laboratories POC: Bob McDonnell

LOCATION: Bldgs 232, 233 and 245 IND. HYG: Eric Thurston

INDUSTRIAL HYGIENE ASSESSMENT

There are no operations that potentially expose personnel to hazardous occupational stressors.

The following operations will not expose personnel to hazardous occupational stressors in excess of established health standards:

1. Lead and tin fumes during soldering with both temperature-controlled soldering irons and 100 and 200 Watt soldering guns. Significant exposures are unlikely based on the nature of mostly intermittent, extremely brief duration jobs. Accidental ingestion is prevented by washing of the worker's hands after use. Personnel have access to electronic versions of Appendices A and B from the Federal Lead Standard.
2. 1,1,1-trichloroethane, acetone, and isopropyl alcohol during cleaning of surfaces in preparation for soldering. Significant exposures are unlikely based on minimal usage.
3. Copper during use of copper foil on models. Manual forming of the foil will not generate airborne dust or fumes.
4. Radiofrequency radiation (RFR) during operation of microwave antennas in the Microwave Lab. Significant exposure is not expected based on use of very low power units being shot into dummy loads.
5. RFR during operation of antennas in the anechoic chambers in Rooms 535 and 604. Exposure is prevented by isolation of the antennas inside the closed door chambers.
6. Laser radiation during operation of a class IIIb laser in the Optics Lab. Significant exposure is not expected based on the enclosure of the laser beam and the use of laser goggles.
7. Ergonomics during computer use. Repetitive stress injuries or problems have not occurred.
8. Noise during use of the bench grinder in Room 100B. The measured noise level is below the Navy noise criterion level.

The following operations potentially expose personnel to stressors identified by OPNAVINST 5100.23F, Chapter 29, Appendix 29-A as reproductive hazards:

1. Lead, which is a male, female, and developmental reproductive hazard, during lead-tin soldering. Exposures are expected to be minimal as discussed above. Personnel who wish reproductive hazards counseling should contact the occupational health department of the Presidio of Monterey Army Clinic.

INDUSTRIAL HYGIENE ASSESSMENT (con'd)

ACTIVITY: NPS Monterey FILE NO.: ET-0301 DATE: 11 August 2004

DEPARTMENT: ECE, General Laboratories POC: Bob McDonnell

LOCATION: Bldgs 232, 233 and 245 IND. HYG: Eric Thurston

RECOMMENDATIONS:

1,2. Continue to follow proper personal hygiene procedures before eating, drinking, smoking, or chewing after soldering as required by reference (a).
6. Continue use of goggles, procedures in place, and other controls during use of the class IIIb laser.

REFERENCES / NOTES:

(a) OPNAVINST 5100.23F, Chapter 21, paragraph 2104f(5)

FINDINGS: None.

INDUSTRIAL HYGIENE ASSESSMENT

ACTIVITY: NPS Monterey FILE NO.: ET-0301 DATE: 11 August 2004

DEPARTMENT: ECE, Special Signals Lab POC: Bob McDonnell

LOCATION: Bldg 232, Room 219 IND. HYG: Eric Thurston

FUNCTION: Cleaning circuit boards for subsequent soldering using isopropyl alcohol and 1,1,1-trichloroethane. Applies protective Star Brite or Scotchkote coating to circuit boards. Performs lead-tin soldering using temperature-controlled soldering irons. Conducts field testing using two high frequency, 100 Watt transceivers mounted on a trailer.

INDUSTRIAL HYGIENE ASSESSMENT

There are no operations that expose personnel to hazardous occupational stressors.

The following operations will not expose personnel to hazardous occupational stressors in excess of established health standards:

1. Methylene chloride and toluene during use of Star Brite protective coating or Scotchkote electrical coating. Monitoring data, traceable to Industrial Hygiene Survey ET-0162, indicates insignificant exposure levels during use of the Star Brite compound; similar levels are expected during use of the Scotchkote product. Skin contact is protected against by use of rubber gloves.
2. Lead and tin fumes during lead-tin soldering. Significant exposures are unlikely based on monitoring data of similar operations performed elsewhere and on use of temperature-controlled soldering irons.
3. Cleaning with isopropyl alcohol, acetone or 1,1,1-trichloroethane. Significant exposures are unlikely based on minimal usage.
4. Radiofrequency radiation (RFR) during field testing using 100 Watt transceivers. Significant exposure is not expected based on use of approved SOPs and procedural controls.

The following operations potentially expose personnel to stressors identified by OPNAVINST 5100.23F, Chapter 29, Appendix 29-A as reproductive hazards:

1. Toluene, which is a developmental reproductive hazard, during use of Scotchkote or Star Brite coating.
2. Lead, which is a male, female, and developmental reproductive hazard, during soldering.

Exposures are expected to be minimal as discussed above. Personnel who wish reproductive hazards counseling should contact the occupational health department of the Presidio of Monterey Army Clinic.

INDUSTRIAL HYGIENE ASSESSMENT

ACTIVITY: NPS Monterey FILE NO.: ET-0301 DATE: 11 August 2004

DEPARTMENT: ECE, Special Signals Lab POC: Bob McDonnell

LOCATION: Bldg 232, Room 219 IND. HYG: Eric Thurston

RECOMMENDATIONS:

1. Continue use of rubber gloves when working with the Scotchkote and Star Brite coatings to minimize skin contact with toluene and methylene chloride.
2. Continue to follow proper personal hygiene procedures before eating, drinking, smoking, or chewing after soldering operations as required by reference (a).

REFERENCES / NOTES:

(a) OPNAVINST 5100.23F, Chapter 21, paragraph 2104f(5)

FINDINGS: None.

INDUSTRIAL HYGIENE ASSESSMENT

ACTIVITY: NPS Monterey FILE NO.: ET-0301 DATE: 11 August 2004

DEPARTMENT: ECE, RADAR/ECM Lab, RADAR Repair Lab POC: Bob McDonnell

LOCATION: Bldg 232, Rooms 543,545,611,612,616,704 IND. HYG: Eric Thurston
Marina Airport

FUNCTION: Filling weather balloons with helium and wave guides and gauges with nitrogen. Spot cleaning electrical equipment with 1,1,1-trichloroethane. Performing minor mechanical repairs on RADAR and communications antennas using grease, oil, 1,1,1-trichloroethane, lead-tin solder, aerosol spray paint, power tools, and hand tools. A compressor is located in Room 611. Performs RADAR equipment testing. Personnel operate AN/MPQ 64 and AN/TPQ 37 RADAR systems in support of CIRPAS jobs located at the Marina Airport.

INDUSTRIAL HYGIENE ASSESSMENT

The following operations potentially expose personnel to hazardous occupational stressors:

1. Radiofrequency radiation (RFR) during RADAR equipment testing. Exposure is controlled by restricting access to the antenna areas and following procedural controls outlined in work SOPs.

The following operations will not expose personnel to hazardous occupational stressors in excess of established health standards:

2. Noise during operation of electric drills. Calculated exposure is insignificant, and personnel wear either ear muffs or plugs during their operation.
3. Methylene chloride and toluene during use of Growco Blue 15102 and LHB So Sure Blue 15102 lacquer aerosol paint cans in Spanagel Hall, Room 611. Monitoring data, traceable to Industrial Hygiene Survey ET-0162, indicates insignificant levels are present.
4. Noise during use of the air compressor in Room 611. The measured noise level is below the Navy noise criterion level.
5. Helium and nitrogen while filling weather balloons, wave guides, and gauges. Use of small quantities in well-ventilated areas will not cause significant exposures.
6. 1,1,1-trichloroethane, isopropyl alcohol, grease, and oil used in minimal amounts will not result in significant exposures.
7. Lead and tin fumes during soldering. Monitoring data of similar operations performed elsewhere and use of temperature-controlled irons indicate significant exposures will not occur.
8. Noise during operation of the DLQ-3CM system. Calculated noise exposure levels are at safe levels. Personnel wear ear muffs during system operation.

The following operations potentially expose personnel to stressors identified by OPNAVINST 5100.23F, Chapter 29, Appendix 29-A as reproductive hazards:

3. Toluene, which is a developmental reproductive hazard, during minimal use of aerosol spray paints.
 7. Lead, which is a male, female, and developmental reproductive hazard, during soldering operations.
- Exposures are expected to be minimal as discussed above. Personnel who wish reproductive hazards counseling should contact the occupational health department of the Presidio of Monterey Army Clinic.

INDUSTRIAL HYGIENE ASSESSMENT

ACTIVITY: NPS Monterey FILE NO.: ET-0301 DATE: 11 August 2004

DEPARTMENT: ECE, RADAR/ECM Lab, RADAR Repair Lab POC: Bob McDonnell

LOCATION: Bldg 232, Rooms 543,545,611,612,616,704 IND. HYG: Eric Thurston
Marina Airport

RECOMMENDATIONS:

1. Continue use of hearing protection during use of electric drills as required by reference (a).
7. Continue to follow proper personal hygiene procedures before eating, drinking, smoking, or chewing after soldering operations as required by reference (a).

REFERENCES / NOTES:

- (a) OPNAVINST 5100.23F, Chapter 18, paragraph 1807a
- (b) OPNAVINST 5100.23F, Chapter 21, paragraph 2104f(5)

FINDINGS: None.

INDUSTRIAL HYGIENE ASSESSMENT

ACTIVITY: NPS Monterey FILE NO.: ET-0301 DATE: 12 August 2004

DEPARTMENT: ECE, Linear Accelerator POC: Steve Richards

LOCATION: Bldg 234, Halligan Hall IND. HYG: Eric Thurston

FUNCTION: Personnel conduct particle physics research. The frequency of use varies with the type of research being performed, but 4 full days of activity per month are average. Lead bricks are used to shield personnel from ionizing radiation produced by the linear accelerator, with controls under the auspice of the NPS Radiation Safety Officer (RSO). Air compressors in this location produce hazardous noise levels throughout the staging area when they are operational. An air compressor located on the other side of the partition from the control area generates noise levels exceeding the Navy noise criterion level when standing at the open corner of the partitions surrounding this compressor. One 22-ounce aerosol can of Chemtronics Flux Off 2000 and a 1 gallon can of gasoline are currently stored in the flammable storage locker but are not currently used.

The following operations potentially expose personnel to hazardous occupational stressors:

1. Ionizing radiation during operation of the linear accelerator. Significant exposure is unlikely based on use of lead brick shielding and procedural controls, which are under the auspice of the NSA Monterey, Code N22G Radiation Safety Officer (RSO).

The following operations will not expose personnel to hazardous occupational stressors in excess of established health standards:

2. Lead exposure from handling lead bricks. Lead exposure will not be a significant hazard to personnel as long as personal hygiene practices are performed and because the bricks are not heated or mechanically acted upon, precluding generation of airborne dust and fumes.
3. Noise from compressors located in the staging areas. Personnel are intermittently exposed to hazardous noise levels for short periods when the compressors are running. Personnel working in this area do not have control over the operation of the compressors, and cannot shut them down when staging equipment for the linear accelerator operation.
4. Minimal lead-tin soldering will not pose a significant airborne lead exposure based on monitoring data of similar operations.
5. Minimal use of low toxicity acetone and isopropyl alcohol to clean vacuum surfaces will not generate significant airborne levels.
6. Noise during automatic operation of the compressor adjacent to the control area. Personnel do not stand in the area where noise levels exceed the Navy noise criterion level. Measured noise levels in the control area do not exceed this criterion.
7. Oil from filling the vacuum ions with vacuum pump oil. Use of low toxicity oil will not generate significant exposures.

INDUSTRIAL HYGIENE ASSESSMENT (con'd)

ACTIVITY: NPS Monterey FILE NO.: ET-0301 DATE: 12 August 2004

DEPARTMENT: ECE, Linear Accelerator POC: Steve Richards

LOCATION: Bldg 234, Halligan Hall IND. HYG: Eric Thurston

The following operations potentially expose personnel to lead, which is identified by OPNAVINST 5100.23F, Chapter 29, Appendix 29-A as a male, female, and developmental reproductive hazard:

- 2. Handling lead bricks.
- 4. Lead-tin soldering.

Exposures are expected to be minimal as discussed above. Personnel who wish reproductive hazards counseling should contact the occupational health department of the Presidio of Monterey Army Clinic.

RECOMMENDATIONS:

2,4. Continue to follow proper personal hygiene procedures before eating, drinking, smoking, or chewing after handling lead bricks, or after soldering, as required by reference (a).

REFERENCES / NOTES:

(a) OPNAVINST 5100.23F, Chapter 21, paragraph 2104f(5)

FINDINGS: None.

INDUSTRIAL HYGIENE ASSESSMENT

ACTIVITY: NPS Monterey FILE NO.: ET-0301 DATE: 12 August 2004

DEPARTMENT: Physics, Flash X-Ray Facility POC: Steve Richards

LOCATION: Bldg 216, Golf Course Annex IND. HYG: Eric Thurston

FUNCTION: Tests radiation damage effects on circuit boards, transistors, diodes, and other equipment using an x-ray source. 12 capacitors immersed in dielectric oil are charged in parallel and then discharged into a vacuum chamber containing sulfur hexafluoride gas in bursts of less than one second bursts. Machine tools, including 2 lathes, 3 drill presses, a band saw, and a power hack saw, are present, but are not currently used. Ethyl alcohol is used for cleaning the vacuum chamber. Diffusion pump oil is used for the oil diffusion vacuum pump, and vacuum pump oil is used to lubricate the mechanical pump. An electrical soldering gun is present, but is only used by contractor personnel.

INDUSTRIAL HYGIENE ASSESSMENT

There are no operations that potentially expose personnel to hazardous occupational stressors.

The following operations will not expose personnel to hazardous occupational stressors in excess of established health standards.

1. Ionizing radiation exposures are kept at safe levels through use of written SOPs and control procedures, and use of interlocks. Hazard radius boundaries have been established through measurements by the NPS Code 223 Radiation Safety Officer. Exposures are documented through use of pocket dosimeters.
2. Lead from handling of a handful of lead bricks used as shielding. Significant exposures will not occur because their use does not generate airborne dust or fumes. Both operators have been provided a copy of the Federal Lead Standard, Appendices A and B.
3. Significant ethyl alcohol exposure while cleaning the vacuum changer is unlikely based on minimal usage.
4. Oils used with the oil diffusion vacuum pump and mechanical pump are unlikely to pose significant exposure based on minimal usage and low toxicity.

The following operations potentially expose personnel to stressors identified by OPNAVINST 5100.23F, Chapter 29, Appendix 29-A as reproductive hazards:

2. Lead, which is a male, female, and developmental hazard, from the presence of lead bricks in the facility. Lead exposures are expected to be minimal as discussed above. Personnel who wish reproductive hazards counseling should contact the occupational health department of the Presidio of Monterey Army Clinic.

FINDINGS: None.

SECTION VI
INDUSTRIAL HYGIENE SURVEY DATA

This Section contains the noise survey data collected in support of this survey. It should be noted that the measured levels are compared to the standards without regard to any personal protective equipment that may be worn or the protection afforded by it. The goal of the NAVOSH Program is to reduce workplace hazard levels by other means so that personal protective equipment is not required. Documentation concerning the types of instruments used and their calibration records are held by the Naval Medical Admin Unit, Monterey Industrial Hygienist.

No new data was collected in support of this survey.

SECTION V

MEDICAL SURVEILLANCE MATRIX

The Medical Surveillance Matrix is provided to assist commands in assigning personnel to required medical surveillance. Medical surveillance for a work group must be based on exposure levels at or above the MSAL and exposure frequency of ten days per quarter or thirty days per year or as required by regulations or instruction.

This matrix does not identify noise medical surveillance necessary because of irregular previous audiograms or for personnel at exceptional risk due to pre-existing hearing loss.

SECTION VI

WORKPLACE MONITORING PROGRAM

The attached Workplace Monitoring Plan presents stressors and/or systems which need to be evaluated periodically during the coming year. Items included on the plan are based on regulations, professional knowledge and information obtained from supervisors. The plan should be reviewed to ensure operational information is correct. The Industrial Hygienist will have to be contacted when operations are scheduled so your Command's sampling can be completed. Changes or deletions of operations should also be communicated to the Industrial Hygienist so that the Workplace Monitoring Plan can be amended.

Naval Postgraduate School, Monterey

Electrical and Computer Engineering Department

WORKPLACE MONITORING PLAN

12 August 2004

<u>LOCATION/JOB</u>	<u>STRESSOR</u>	<u># MEAS. REQUIRED</u>	<u>MEAS. METHOD¹</u>	<u>MEASURING FREQUENCY</u>	<u>MAN HRS. PER YEAR</u>
None required.					
					Total

Air samples for each chemical stressor will be collected using sampling methods listed in the Industrial Hygiene Sampling Guide for Consolidated Industrial Hygiene Laboratories, Navy Environmental Health Center Technical Manual NEHC-TM6290.91-2, Revision B, March 1999.

1: Use the following codes to indicate sampler and sampling location:

SAMPLER:
DR-direct reading instrument
DT-detector tube
AT-adsorption tube
IM-impinger/bubbler
FI-filter
ND-noise dosimeter
PD-personal dosimeter
OT-other (specify)

SAMPLING LOCATION:
GA-general area
BZ-breathing zone
HZ-hearing zone
SZ-source zone
OT-other (specify)

APPENDIX A

OPNAV 5100/14 Forms

Reference: (a) OPNAVINST 5100.23F, Chapter 8, paragraph 0803.f

This appendix contains the OPNAV 5100/14 forms which are required by reference (a). These forms detail the occupational exposures of employees by work center or functional group. These forms are used to develop the workplace monitoring program in Section VI. They also describe the type of work done in each area and can be used to verify that all work areas were included in the survey.

WORKPLACE INFORMATION

Activity: NPS Monterey **Supervisor:** Bob McDonnell **Phone:** (831)656-2421

Bldg#: 232, 233, 245 **Shop:** ECE Department, General Laboratories

Total Personnel: 7 **Male:** 7 **Female:** 0
of students varies

Shop Operation: Laboratories are used for course demonstrations and individual student or staff research. The number and gender of students potentially exposed varies with the class size and the type of research being conducted.

Intermittent, short duration lead-tin soldering, both with temperature-controlled irons and 100 or 200 Watt guns is performed at many locations. Very low power microwave antennas are operated by shooting into dummy loads or in two anechoic chambers located in Rooms 535 and 604. A class IIIb laser is used in the Optics Lab in Rooms 221 and 224. The great majority of chemicals used are 1,1,1-trichloroethane, acetone, and isopropyl alcohol in association with soldering operations. Copper foil is molded into place onto models present in the Room 535 Transient Electromagnetic Scattering Lab. Bldg 245, Room 117 Power Systems contains a small drill press and a small dual Skill 5 inch bench grinder. Heavy lifting is restricted to less than 40 pounds.

Cutting of beryllium-copper alloy sheet is no longer performed.

Potential Hazard	Inter or Cont.	# Workers Exposed	Exposure > MSAL?	Controls in Use
*Lead and tin fumes, general soldering	Once-twice/month, less than 5 mins/time	5	No	Temperature controlled irons
*Lead and tin fumes, 100 and 200 Watt soldering guns	1-4 times/year less than 5 mins/time	5	No	None
1,1,1-trichloroethane, isopropyl alcohol, acetone, cleaning surfaces for soldering	1-2 pints/yr 2 ozs/month 2 ozs/month	5	No	None
* Reproductive hazard (See I. H. assessment)				

Potential Hazard	Inter or Cont.	# Workers Exposed	Exposure > MSAL?	Controls in Use
Copper, foil molding	Varies	Students	No	None
RF radiation, Microwave Lab Room 419	Varies	1-2	No	Dummy loads
RF radiation, anechoic chambers	Varies	1-2	No	Closed, lined chambers
Laser radiation, class IIIb laser, Optics Lab	10 times/month 2 hours total	1-2	No	Enclosed beam, laser goggles
Ergonomics, computer use	Daily, 7-8 hrs	5	N/A	None
Noise, Room 117 drill press and small dual bench grinder	Infrequent 1-5 mins/time	1-2	No	

If no exposure > MSAL, provide rationale: Lead and tin fumes created during lead-tin soldering with both temperature-controlled and 100 and 200 Watt soldering guns are unlikely to exceed the MSALs based on monitoring data of similar operations and brief duration, intermittent operations. Minimal usage of low toxicity solvents during soldering cleaning will not result in exposures above the MSALs and PEL-STEELS. Molding of copper foil does not involve heating (which would generate fumes) or generation of dust. RF radiation levels are not expected to exceed the TLVs based on use of low power transmitters fired into dummy loads or in closed, lined anechoic chambers. Laser radiation levels above the TLVs are unlikely because of enclosure of the beam and use of laser goggles. Ergonomics: no injuries or problems have occurred. The measured noise level of the grinder is below the Navy noise criterion level of 84 dBA.

Signature/Title: _____ **Date:** 11 August 2003
S.E. Thurston,
Industrial Hygienist

MONITORING PLAN

Stressor to be Sampled	# of Meas. Required	* Measure. Method	**Measure. Location	Frequency per Yr.	Man Hrs. per. Yr.
None					
Engineering Controls in Use					
None					

* Use the following Codes:
DR-direct reading instrument
DT-detector tube
AT-adsorption tube
IM-impinger/bubbler
FI-filter
PD-personal dosimeter
ND-noise dosimeter
OT-other (specify)

** Use the following Codes:
GA-general area
BZ-breathing zone
HZ-hearing zone
SZ-source zone
OT-other (specify)

WORKPLACE INFORMATION

Activity: NPS Monterey **Supervisor:** Bob McDonnell **Phone:** (831)656-2421

Bldg#: 232, Spanagel Hall, Room 219 **Shop:** ECE Dept, Special Signals Lab

Total Personnel: 2 **Male:** 2 **Female:** 0
of students varies

Shop Operation: Laboratories are used for course demonstrations and individual student or staff research. The number and gender of students potentially exposed varies with the class size and the type of research being conducted. Minor modifications to transmitters are made using isopropyl alcohol, 1,1,1-trichloroethane, Scotchkote and Star Brite coatings, and lead/tin solder. Personnel also conduct field testing using 2 high frequency, 100 Watt transceivers mounted on a trailer.

Potential Hazard	Inter or Cont.	# Workers Exposed	Exposure > MSAL?	Controls in Use
*Lead, tin fumes, soldering	As required, < 1 hr/month	2	No	Temperature-controlled irons
Isopropyl alcohol, 1,1,1-TCA, soldering cleaning	2 ozs/month, 1-2 pints/yr	2	No	None
*Toluene, methylene chloride, Star Brite coating	½ pint/yr	2	No	None
*Toluene, 3M Scotchkote Electrical Coating	½ pint/yr	2	No	None
RF radiation, field testing	Up to 20 hrs/week (varies with project)	2	No	SOPs and procedural controls
* Reproductive hazard (See I. H. assessment)				

If no exposure > MSAL, provide rationale: Lead and tin fumes created during lead-tin soldering with temperature-controlled soldering irons are unlikely to exceed the MSALs based on monitoring data of similar operations and brief duration, intermittent operations. Minimal usage of low toxicity solvents during soldering cleaning will not result in exposures above the MSALs and PEL-STEELs. Monitoring data, traceable to Industrial Hygiene Survey ET-0162, indicate methylene chloride levels during use of the Star Brite coating are below the PELs, ALs, and STEELs; similar levels are expected during use of the Scotchkote product. RF radiation levels are not expected to exceed the TLVs based on use of procedural controls and adherence to control procedures in the SOP during testing.

Signature/Title: _____ **Date:** 11 August 2004
S.E. Thurston,
Industrial Hygienist

MONITORING PLAN

Stressor to be Sampled	# of Meas. Required	* Measure. Method	**Measure. Location	Frequency per Yr.	Man Hrs. per. Yr.
None					
Engineering Controls in Use					
None					

* Use the following Codes:
DR-direct reading instrument
DT-detector tube
AT-adsorption tube
IM-impinger/bubbler
FI-filter
PD-personal dosimeter
ND-noise dosimeter
OT-other (specify)

** Use the following Codes:
GA-general area
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SZ-source zone
OT-other (specify)

WORKPLACE INFORMATION

Activity: NPS Monterey **Supervisor:** Bob McDonnell **Phone:** (831)656-2421

Bldg#: 232, Spanagel Hall, Shop: ECE Dept, RADAR/ECM Lab, RADAR Repair Lab
Rooms 543,545,612,616 RADAR/EW
Room 611 RADAR Maintenance,
Marina Airport

Total Personnel: 1 staff **Male:** 1 **Female:** 0

Shop Operation: Operations include filling weather balloons with helium, filling wave guides and gauges with nitrogen, and spot cleaning electrical equipment with 1,1,1-trichloroethane. Performs minor mechanical repairs on RADAR and communication antennas using grease, oil, 1,1,1-trichloroethane, lead-tin solder, aerosol spray paint, power tools, and hand tools. A compressor is located in Room 611. Welding equipment is present in the space, but is not used by personnel in this department. Radiofrequency radiation equipment testing is performed. Operates AN/MPQ 64 and AN/TPQ 37 RADAR systems at the Marina airport as part of CIRPAS functions.

Potential Hazard	Inter or Cont.	# Workers Exposed	Exposure > MSAL?	Controls in Use
Helium	500 lbs/year	1	No	None
Nitrogen	5000 lb tank/ 5+ years	1	No	None
1,1,1-Trichloroethane	1 pint/year	1	No	None
Grease	1 pound/year	1	No	None
Oil	5 quarts/year	1	No	None
*Lead, tin fumes, soldering	Once/2-3 months less than 5 mins	1	No	Temperature- controlled irons
*Toluene, other solvents (methylene chloride present in blue paint), aerosol paint cans, Room 611	6 12-ounce aerosol cans/yr	1	No	None
Noise, air compressor	1-2 hrs/week	1	No	None
Noise, electric drills	5 times/year, 5 mins maximum	1	Yes	Ear plugs or muffs
Noise, DLQ-3CM system operation, Room 616	Twice/year, 2 students/time 2 hrs/time max	Varies	No	Ear muffs
RF radiation	40-50 hours/ quarter	Varies	No	Restricted areas, SOPs
* Reproductive hazard (See I. H. assessment)				



If no exposure > MSAL, provide rationale: Use of helium and nitrogen in small quantities in well ventilated areas will not constitute an asphyxiation hazard. 1,1,1-trichloroethane, grease, and oil exposures from use of low toxicity chemicals in minimal amounts will not exceed the MSALs and PELs. Monitoring data of similar lead-tin soldering operations using temperature-controlled irons indicates exposures will not exceed the MSALs. Monitoring data, traceable to Industrial Hygiene Survey ET-0162, indicates methylene chloride and toluene levels are below the PELs, ALs, and STELs. The measured noise level of the air compressor equals the Navy noise criterion level of 84 dBA, and personnel stand several feet away from it during operation. Calculated noise exposures for operation of the DLQ-3CM system based on measured noise level and duration of exposure indicate 8-hour TWA exposures will be below the Navy NOEL of 84 dBA. The calculated noise exposure based on duration of electrical drill use and measured noise levels is below the Navy NOEL of 84 dBA. RF radiation: access to roof top antennas is restricted to maintenance personnel and students only. Procedures are in place which require all transmissions to be secured prior to personnel going aloft, and access points are labeled with hazard warnings. The locations of antennas preclude unauthorized personnel from being accidentally exposed. Personnel remain behind posted hazard boundaries established for the RADAR systems at the Marina airport.

Signature/Title: _____ **Date:** 11 August 2004
S.E. Thurston,
Industrial Hygienist

MONITORING PLAN

Stressor to be Sampled	# of Meas. Required	* Measure. Method	**Measure. Location	Frequency per Yr.	Man Hrs. per. Yr.
None					
Engineering Controls in Use					
None					

* Use the following Codes:
DR-direct reading instrument
DT-detector tube
AT-adsorption tube
IM-impinger/bubbler
FI-filter
PD-personal dosimeter
ND-noise dosimeter
OT-other (specify)

** Use the following Codes:
GA-general area
BZ-breathing zone
HZ-hearing zone
SZ-source zone
OT-other (specify)

WORKPLACE INFORMATION

Activity: NPS Monterey **Supervisor:** Don Snyder **Phone:** (831)656-3886

Bldg#: 234 **Shop:** ECE, Linear Accelerator

Total Personnel: 2 **Male:** 2 **Female:** 0

Shop Operation: Personnel conduct particle physics research. The frequency of use varies with the type of research being performed, but 4 full days of activity per month are average. Lead bricks, copper mesh screens, and borated poly blocks are used to shield personnel from ionizing radiation produced by the linear accelerator, with controls under the auspice of the NPS Ionizing Radiation Safety Officer (IRSO). Minimal lead-tin soldering is performed along with use of acetone and isopropyl alcohol to perform vacuum cleaning. Air compressors in this location produce hazardous noise levels throughout the staging area when they are operational. An air compressor located on the other side of the partition from the control area generates noise levels exceeding the Navy noise criterion level when standing at the open corner of the partitions surrounding this compressor. One 22-ounce aerosol can of Chemtronics Fluxoff 2000 and gasoline present in a 1-gallon can are stored but not currently used. Vacuum pump oil is added to vacuum ion pumps as necessary.

Potential Hazard	Inter or Cont.	# Workers Exposed	Exposure > MSAL?	Controls in Use
*Lead oxide, handling bricks	16 hrs/year, 100 bricks handled per year	2	No	None
Ionizing radiation, linear Accelerator operation	Varies	2	No	Lead bricks, copper mesh screens, borated poly blocks as shielding
*Lead, tin, soldering	Twice/month, 15 mins/time	1	No	Temperature-controlled soldering iron
Acetone, isopropyl alcohol, vacuum cleaning	½ gallon/year for each	1	No	None
Noise, compressor runup	estimated 2 minutes/ 20 minute periods	2	No	None
Vacuum pump oil	As needed, less than 1 gallon per year	1	No	None
* Reproductive hazard (See I. H. assessment)				

If no exposure > MSAL, provide rationale: Lead bricks are not heated or mechanically acted upon, precluding exposure to dusts or fumes. Ionizing radiation exposure is controlled by use of shielding and procedural controls. Minimal usage of low toxicity solvents will not expose personnel to levels above the MSALs and STELs. Noise from compressor use is not expected to exceed the NPEL based on measured noise levels and administrative controls (do not stand in area where the Navy noise criterion level of 84 dBA is exceeded). Use of low toxicity pump oil will not result in significant exposures.

Signature/Title: _____ **Date:** 12 August 2004
 S.E. Thurston,
 Industrial Hygienist

MONITORING PLAN

Stressor to be Sampled	# of Meas. Required	* Measure. Method	**Measure. Location	Frequency per Yr.	Man Hrs. per. Yr.
None required					
Engineering Controls in Use					
Lead bricks, copper mesh screens, borated poly blocks as radiation shielding					

* Use the following Codes:
DR-direct reading instrument
DT-detector tube
AT-adsorption tube
IM-impinger/bubbler
FI-filter
PD-personal dosimeter
ND-noise dosimeter
OT-other (specify)

** Use the following Codes:
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SZ-source zone
OT-other (specify)

If no exposure > MSAL, provide rationale: Exposures are kept at safe levels through use of written SOPs and control procedures, and use of interlocks. Safe radius boundaries have been established through measurements by the NPS Code 223 Radiation Safety Officer. Ionizing radiation exposures are documented through use of pocket dosimeters. Airborne lead is not generated since the lead bricks are not mechanically acted upon or heated that would release airborne dust or fumes. Ethyl alcohol exposures are unlikely to exceed the MSAL and PEL-STEL based on minimal usage. Oil exposures are unlikely to exceed the MSAL based on minimal usage and low toxicity.

Signature/Title: _____ **Date:** 12 August 2004
S.E. Thurston,
Industrial Hygienist

MONITORING PLAN

Stressor to be Sampled	# of Meas. Required	* Measure. Method	**Measure. Location	Frequency per Yr.	Man Hrs. per. Yr.
None					
Engineering Controls in Use					
Interlocks, Lead bricks					

*** Use the following Codes:**
DR-direct reading instrument
DT-detector tube
AT-adsorption tube
IM-impinger/bubbler
FI-filter
PD-personal dosimeter
ND-noise dosimeter
OT-other (specify)

**** Use the following Codes:**
GA-general area
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