From:  Officer in Charge, Naval Medical Administrative Unit, Monterey
To:    Chairman, 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 5100.23G, Chapter 8, Section 0803.a

Encl:  (1) Industrial Hygiene Survey Report ET-0361

1. As required by reference (a), an annual industrial hygiene survey of the
Naval Postgraduate School, Monterey, Electrical and Computer Engineering
Department was conducted from 7 to 21 August 2006 by the Naval Medical
Administrative Unit, Monterey Industrial Hygienist. The survey report ET-0361
is forwarded as enclosure (1).

2. This survey is a service provided under the overall Occupational Health
Program. It is not an inspection report but is designed to assist your
department'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:
Industrial Hygiene Department, NAVHOSP Lemoore
NAVAL MEDICAL ADMINISTRATIVE UNIT, MONTEREY

INDUSTRIAL HYGIENE SURVEY

of

NAVAL POSTGRADUATE SCHOOL, MONTEREY

ELECTRICAL AND COMPUTER
ENGINEERING DEPARTMENT

SURVEY #ET-0361

7 to 23 August 2006

Survey Conducted By: Eric Thurston,
Industrial Hygienist
# TABLE OF CONTENTS

Executive Summary..........................................................2
Glossary/Common Abbreviations............................................3

## Section I. INTRODUCTION................................................5
  - Report Organization..................................................5
  - Survey Schedule......................................................6
  - Change of Operation Notification.................................6

## Section II. Navy Occupational Safety and Health Program Reviews......7

## Section III. Industrial Hygiene Assessments.............................10
  - General Laboratories................................................11
  - Electronics Calibration Lab........................................14
  - Special Signals Lab..................................................16
  - RADAR/ECM Lab, RADAR Repair Lab...............................18
  - Linear Accelerator..................................................20
  - Flash X-Ray Facility................................................21

## Section IV. Industrial Hygiene Survey Data .............................22

## Section V. Medical Surveillance Matrix..................................23

## Section VI. Workplace Monitoring Program................................25

## Appendix A. Industrial Hygiene Assessment OPNAV 5100/14 Forms........26
  - General Laboratories.................................................27
  - Electronics Calibration Lab.........................................29
  - Special Signals Lab..................................................31
  - RADAR Repair Lab....................................................33
  - Flash X-Ray Facility................................................36

## Appendix B. Change of Operation Notification Form.......................38
EXECUTIVE SUMMARY

No findings or corrective actions were identified during this survey.

Paul Buczynski should be congratulated for administering an excellent hazardous materials control in the RADAR Labs.

Specific details of these findings can be found in sections II and III of this report. The cooperation of Bob McDonnell, Paul Buczynski, Todd Weatherford, and Don Snyder, 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.

RPMP  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 5100.23G, Chapter 8, Section 0803.f  
(b) OPNAVINST 5100.23G, Chapter 8, Sections 0803.b and c  
(c) OPNAVINST 5100.23G, 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

<table>
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<tr>
<th>Annual Required</th>
<th>2 Year Schedule</th>
<th>4 Year Schedule</th>
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</thead>
<tbody>
<tr>
<td>ECE Dept (2006)</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

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 5100.23G, 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 5100.23G, Chapter 22

Teaching and research projects in the ECE Department require the use of a class II 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 5100.23G, 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
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    543A, 543B, 543C, 539, 545, 612, 616
        Integration Lab               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
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, but only one is used by the ECE Department.

BULLARD HALL, BUILDING 233

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

WATKINS HALL, BUILDING 245

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

HALLIGAN HALL, BUILDING 234

106 Electronics Calibration Lab

FLASH X-RAY FACILITY, BUILDING 216

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

The linear accelerator has been disassembled, and is no longer in use. There is no bench grinder currently in Watkins Hall, Room 117.
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. Solvents and toluene during use of 3M Rubber and Vinyl 80 Spray Adhesive. Minimal usage will not result in significant exposures.

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 II laser in the Optics Lab. Significant exposure is not expected since the blink mechanism of the eye provides adequate protection.

7. Ergonomics during computer use. Repetitive stress injuries or problems have not occurred.

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.

2. Toluene, which is a developmental reproductive hazard, during use of the 3M Rubber and Vinyl 80 Spray Adhesive.

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-0361    DATE: 7 August 2006

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).

REFERENCES / NOTES:

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

FINDINGS: None.
INDUSTRIAL HYGIENE ASSESSMENT

ACTIVITY: NPS Monterey       FILE NO.: ET-0361       DATE: 7 August 2006

DEPARTMENT: ECE, Electronics Calibration Lab       POC: Bob McDonnell

LOCATION: Bldg 234, Room 106       IND. HYG: Eric Thurston

FUNCTION: Intermittent, short duration lead-tin soldering with temperature-controlled irons is performed. Chemicals used in the past include Star Brite electrical coating and 3M Scotchkote electrical coating, but no containers of the products were observed during the survey. GC Type Z9 Silicone Heat Sink Compound, Quik-Freeze MS-242, and Chemtronics Electro-washer Cleaner Degreaser were stored in the hazardous materials locker located in the Room 107.

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. 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.
2. Cleaning with Chemtronics Electro-Washer Cleaner Degreaser. Significant exposures are unlikely based on minimal usage.
3. 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 methylene chloride exposure levels during use of the Star Brite compound; similar toluene levels are expected during use of the Star Brite and Scotchkote products.
4. Chlorodifluoromethane during cooling of circuit boards with Quik-Freeze MS-242 product. Significant exposure is unlikely based on minimal usage.
5. Polysiloxane during use of GC Type Z9 Silicone Heat Sink Compound. This low toxicity product will not result in significant exposure.

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 (con’d)

ACTIVITY: NPS Monterey FILE NO.: ET-0361 DATE: 7 August 2006

DEPARTMENT: ECE, Electronics Calibration Lab POC: Bob McDonnell

LOCATION: Bldg 234, Room 106 IND. HYG: Eric Thurston

RECOMMENDATIONS:

1. 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 5100.23G, Chapter 21, paragraph 2104f(5)

FINDINGS: None.
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. 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.
2. Cleaning surfaces associated with soldering with denatured alcohol. Significant exposures are unlikely based on minimal usage.
3. 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.
4. Triethanolamine and 2-butoxyethanol during use of penetrating fluid. Significant exposures are unlikely based on minimal usage.
5. 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. Lead, which is a male, female, and developmental reproductive hazard, during soldering.
2. Toluene, which is a developmental reproductive hazard, during use of Scotchkote or Star Brite coating.

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:

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 5100.23G, Chapter 21, paragraph 2104f(5)

FINDINGS: None.
INDUSTRIAL HYGIENE ASSESSMENT

ACTIVITY: NPS Monterey  FILE NO.: ET-0361 DATE: 10 August 2006

DEPARTMENT: ECE, RADAR/ECM Lab, RADAR Repair Lab  POC: Paul Buczynski

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; however, filling of the balloons with helium has not occurred
in the past two years. Spot cleaning electrical equipment with isopropyl
alcohol has replaced use of 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. Radiofreqency 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 where 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. In
addition, toluene is present in Eco-Sure Green Primer 34082, So-Sure Grey
16307, Grey 16187, Flat Black 37038, Clear 14810, and Red 11105 Lacquers all
contain toluene. 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. 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.

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

FINDINGS: None.
FUNCTION: The linear accelerator has been disassembled, and NPS is in the process of procuring another one from Stanford.
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 and acetone are 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 and acetone exposures while cleaning the vacuum changer are 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.
<table>
<thead>
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<th>NOHMS CODE</th>
<th>EXAM</th>
</tr>
</thead>
<tbody>
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<td>601</td>
<td>ACIDS/ALKALIS</td>
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<td>ASBESTOS CURRENT WORKER &gt; MSAL</td>
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<tr>
<td>168</td>
<td>METHYLENE CHLORIDE</td>
</tr>
<tr>
<td>503</td>
<td>NOISE</td>
</tr>
<tr>
<td>507</td>
<td>RADIOFREQUENCY &amp; MICROWAVE RADIATION</td>
</tr>
<tr>
<td>603</td>
<td>MIXED SOLVENTS</td>
</tr>
<tr>
<td>511</td>
<td>WHOLE BODY VIBRATION</td>
</tr>
<tr>
<td>604</td>
<td>WOOD DUST</td>
</tr>
<tr>
<td>723</td>
<td>BARBER/BEAUTY SHOP WORKER</td>
</tr>
<tr>
<td>703</td>
<td>CHILD CARE WORKER</td>
</tr>
<tr>
<td>706</td>
<td>DOT VEHICLE OPERATOR</td>
</tr>
<tr>
<td>722</td>
<td>FIREFIGHTER, ANNUAL EXAM</td>
</tr>
<tr>
<td>707</td>
<td>FIREFIGHTER, PREPLACEMENT AND PERIODIC EXAMS</td>
</tr>
<tr>
<td>709</td>
<td>FOOD SERVICE PERSONNEL</td>
</tr>
<tr>
<td>710</td>
<td>FORKLIFT OPERATOR</td>
</tr>
<tr>
<td>711</td>
<td>HAZARDOUS WASTE WORKER/SPILL RESPONSE</td>
</tr>
<tr>
<td>714</td>
<td>POLICE/SECURITY GUARD</td>
</tr>
<tr>
<td>716</td>
<td>RESPIRATOR USER CERTIFICATION EXAM</td>
</tr>
<tr>
<td>702</td>
<td>WASTEWATER/SEWAGE WORKER</td>
</tr>
<tr>
<td>OTHER:</td>
<td></td>
</tr>
<tr>
<td>OTHER:</td>
<td></td>
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<tr>
<td>OTHER:</td>
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<td>OTHER:</td>
<td></td>
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<tr>
<td>OTHER:</td>
<td></td>
</tr>
<tr>
<td>OTHER:</td>
<td></td>
</tr>
<tr>
<td>NONE REQUIRED</td>
<td></td>
</tr>
</tbody>
</table>
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

23 August 2006

<table>
<thead>
<tr>
<th>LOCATION/JOB</th>
<th>STRESSOR</th>
<th>REQUIRED</th>
<th>METHOD(^1)</th>
<th>FREQUENCY</th>
<th>MEASURING</th>
<th>MAN HRS.</th>
<th>PER YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>None required.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total


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 5100.23G, 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: 4  Male: 4  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. Bldg 245, Room 117 Power Systems contains a small drill press, but the small dual Skil 5 inch bench grinder was not observed during the site visit of this space. Heavy lifting is restricted to less than 40 pounds.

<table>
<thead>
<tr>
<th>Potential Hazard</th>
<th>Inter or Cont.</th>
<th># Workers</th>
<th>Exposure &gt; MSAL?</th>
<th>Controls in Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Lead and tin fumes, general soldering</td>
<td>Once-twice/month, less than 5 mins/time</td>
<td>5</td>
<td>No</td>
<td>Temperature controlled irons</td>
</tr>
<tr>
<td>*Lead and tin fumes, 100 and 200 Watt soldering guns</td>
<td>1-4 times/year less than 5 mins/time</td>
<td>5</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>1,1,1-trichloroethane, isopropyl alcohol, acetone, cleaning surfaces for soldering</td>
<td>1-2 pints/yr 2 ozs/month 2 ozs/month</td>
<td>5</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>* Reproductive hazard (See I. H. assessment)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential Hazard</td>
<td>Inter or Cont.</td>
<td># of Meas.</td>
<td>Exposure</td>
<td>Controls in Use</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>----------------</td>
<td>------------</td>
<td>----------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Copper, foil molding</td>
<td>Varies</td>
<td>Students</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>RF radiation, Microwave Lab</td>
<td>Varies</td>
<td>1-2</td>
<td>No</td>
<td>Dummy loads</td>
</tr>
<tr>
<td>Room 419</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RF radiation, anechoic chambers</td>
<td>Varies</td>
<td>1-2</td>
<td>No</td>
<td>Closed, lined</td>
</tr>
<tr>
<td>Room 419</td>
<td></td>
<td></td>
<td></td>
<td>chambers</td>
</tr>
<tr>
<td>Laser radiation, class IIIB laser</td>
<td>10 times/month</td>
<td>1-2</td>
<td>No</td>
<td>Enclosed beam,</td>
</tr>
<tr>
<td>laser, Optics Lab</td>
<td>2 hours total</td>
<td></td>
<td></td>
<td>laser goggles</td>
</tr>
<tr>
<td>Ergonomics, computer use</td>
<td>Daily, 7-8 hrs</td>
<td>5</td>
<td>N/A</td>
<td>None</td>
</tr>
<tr>
<td>Noise, Room 117 drill press</td>
<td>Infrequent</td>
<td>1-2</td>
<td>No</td>
<td>None</td>
</tr>
</tbody>
</table>

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-STEIs. 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.

Signature/Title: ___________________________ Date: _______ 7 August 2006
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. |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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#:** 234, Room 106  **Shop:** ECE Dept, Electronics Calibration Lab

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

# of students varies

**Shop Operation:** Intermittent, short duration lead-tin soldering with temperature-controlled irons is performed. Chemicals used in the past include Star Brite electrical coating and 3M Scotchkote electrical coating, but they were not observed during the site survey of this space. GC Type Z9 Silicone Heat Sink Compound, Quik-Freeze MS-242, and Chemtronics PR Electro-washer Cleaner Degreaser, were located inside the hazardous materials locker during the site visit.

<table>
<thead>
<tr>
<th>Potential Hazard</th>
<th>Inter or Cont.</th>
<th># Workers Exposed</th>
<th>Exposure &gt; MSAL?</th>
<th>Controls in Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Lead and tin fumes, general soldering</em></td>
<td>Once-twice/month, less than 5 mins/time</td>
<td>2</td>
<td>No</td>
<td>Temperature controlled irons</td>
</tr>
<tr>
<td>Acetone, n-hexane, cleaner-degreaser</td>
<td>1-2 10-ounce aerosol cans/year</td>
<td>2</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>acetone, cleaning surfaces for soldering</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Toluene, methylene chloride, Star Brite compound</em></td>
<td>½ pint/year</td>
<td>2</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td><em>Toluene, other solvents, 3M Scotchkote Electrical Coating</em></td>
<td>½ pint/year</td>
<td>2</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Chlorodifluoromethane, Quik-Freeze MS-242, cooling circuit boards</td>
<td>1 12-ounce can/year</td>
<td>2</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Polysiloxane, GC Type Z9 Silicone Heat Sink Compound</td>
<td>1 1-oz tube/year</td>
<td>2</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Solvents, Chemtronics PR Electro-Wash Cleaner/Degreaser</td>
<td>1 10-ounce aerosol can/year</td>
<td>2</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>* Reproductive hazard (See I. H. assessment)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
If no exposure > MSAL, provide rationale: Lead and tin fumes created during lead-tin soldering are unlikely to exceed the MSALs based on monitoring data of similar operations and brief duration, intermittent operations. Minimal usage of low toxicity cleaner-degreaser during soldering cleaning will not result in exposures above the MSALs and PEL-STELs. Monitoring data, traceable to Industrial Hygiene Survey ET-0162, indicate methylene chloride levels during use of the Star Brite coating are below the PEL, AL, and STEL; similar levels are expected for toluene present in the Star Brite and Scotchkote products. Minimal usage of the Quik-Freeze product will not result in Freon exposures above the MSAL and PEL-Ceiling. Significant exposure to polysiloxane during use of the low toxicity heat sink compound will not occur based on minimal usage. Minimal usage of the Cleaner/Degreaser will not result in significant exposures above the MSAL.

Signature/Title: S.E. Thurston, Industrial Hygienist

Date: 7 August 2006

MONITORING PLAN

<table>
<thead>
<tr>
<th>Stressor to be Sampled</th>
<th># of Meas.</th>
<th>* Measure.</th>
<th>**Measure.</th>
<th>Frequency per Yr.</th>
<th>Man Hrs. per Yr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** 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:** Minor modifications to transmitters are made using denatured alcohol, Scotchkote and Star Brite coatings, LHB Pentrating Fluid, and lead/tin solder. Personnel also conduct field testing using 2 high frequency, 100 Watt transceivers mounted on a trailer.

<table>
<thead>
<tr>
<th>Potential Hazard</th>
<th>Inter or Cont.</th>
<th># Workers Exposed</th>
<th>Exposure &gt; MSAL?</th>
<th>Controls in Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Lead, tin fumes, soldering</em></td>
<td>As required, &lt; 1 hr/month</td>
<td>2</td>
<td>No</td>
<td>Temperature-controlled irons</td>
</tr>
<tr>
<td>Isopropanol, methanol, soldering cleaning with denatured alcohol</td>
<td>2 ozs/month</td>
<td>2</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td><em>Toluene, methylene chloride, Star Brite coating</em></td>
<td>½ pint/yr</td>
<td>2</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td><em>Toluene, 3M Scotchkote Electrical Coating</em></td>
<td>½ pint/yr</td>
<td>2</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Triethanolamine, 2-butoxy-ethanol, penetrating fluid</td>
<td>½ pint/year</td>
<td>2</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>RF radiation, field testing</td>
<td>Up to 20 hrs/week (varies with project)</td>
<td>2</td>
<td>No</td>
<td>SOPs and procedural controls</td>
</tr>
<tr>
<td>* Reproductive hazard (See I. H. assessment)*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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 and penetrating fluid will not result in exposures above the MSALs and PEL-STEls. 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 STELs; similar levels are expected during use of the Skotchkote 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: 7 August 2006

S.E. Thurston,
Industrial Hygienist

MONITORING PLAN

<table>
<thead>
<tr>
<th>Stressor to be Sampled</th>
<th># of Meas. Required</th>
<th>* Measure. Method</th>
<th>**Measure. Location</th>
<th>Frequency per Yr.</th>
<th>Man Hrs. per Yr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Engineering Controls in Use

| None |

* Use the following Codes:  ** Use the following Codes:  
DR-direct reading instrument  GA-general area  
DT-detector tube  BZ-breathing zone  
AT-adsorption tube  HZ-hearing zone  
IM-impinger/bubbler  SZ-source zone  
FI-filter  OT-other (specify)  
PD-personal dosimeter  
ND-noise dosimeter  
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 isopropyl alcohol, which has largely replaced 1,1,1-trichloroethane for this process. Filling of weather balloons with helium has not occurred in the past two years. 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.

<table>
<thead>
<tr>
<th>Potential Hazard</th>
<th>Inter or Cont.</th>
<th># Workers Exposed</th>
<th>Exposure &gt; MSAL?</th>
<th>Controls in Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helium</td>
<td>500 lbs/year when used</td>
<td>1</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>5000 lb tank/5+ years</td>
<td>1</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Isopropyl alcohol</td>
<td>1 pint/year</td>
<td>1</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Grease</td>
<td>1 pound/year</td>
<td>1</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Oil</td>
<td>5 quarts/year</td>
<td>1</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>*Lead, tin fumes, soldering</td>
<td>Once/2-3 months less than 5 mins</td>
<td>1</td>
<td>No</td>
<td>Temperature-controlled irons</td>
</tr>
<tr>
<td>*Toluene, other solvents (methylene chloride present in blue paint), aerosol paint cans, Room 611</td>
<td>2 12-ounce aerosol cans/yr</td>
<td>1</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Noise, air compressor, Room 611</td>
<td>1-2 hrs/week</td>
<td>1</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Noise, electric drills, Room 543A</td>
<td>5 times/year, 5 mins maximum</td>
<td>1</td>
<td>Yes</td>
<td>Ear plugs or muffs</td>
</tr>
<tr>
<td>Noise, DLQ-3CM system operation, Room 616</td>
<td>Twice/year, 2 students/time, 2 hrs/time max</td>
<td>Varies</td>
<td>No</td>
<td>Ear muffs</td>
</tr>
<tr>
<td>* Reproductive hazard (See I. H. assessment)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential Hazard</td>
<td>Inter or Cont.</td>
<td># Workers Exposed</td>
<td>Exposure &gt; MSAL?</td>
<td>Controls in Use</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------</td>
<td>-------------------</td>
<td>------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Noise, Mastercraft Vacuum, Room 543A</td>
<td>15 to 20 mins/month</td>
<td>1</td>
<td>No</td>
<td>Ear muffs</td>
</tr>
<tr>
<td>*Toluene, other solvents, CSD Dope and Lacquer Thinner, excess paint cleanup or thin gallon can of black paint</td>
<td>1 quart/year</td>
<td>1</td>
<td>No</td>
<td>Faceshield, chemical safety goggles, rubber gloves</td>
</tr>
<tr>
<td>RF radiation, RADAR systems operation</td>
<td>40-50 hours/quarter</td>
<td>Varies</td>
<td>No</td>
<td>Restricted areas, SOPs</td>
</tr>
<tr>
<td>* Reproductive hazard (See I. H. assessment)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*If no exposure > MSAL, provide rationale:* Use of helium and nitrogen is 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. Toluene and other solvents during minimal usage of paint thinner 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:**

S.E. Thurston, 
Industrial Hygienist

**Date:** 10 August 2006
### MONITORING PLAN

<table>
<thead>
<tr>
<th>Stressor to be Sampled</th>
<th># of Meas.</th>
<th>* Measure.</th>
<th>**Measure.</th>
<th>Frequency per Yr.</th>
<th>Man Hrs. per Yr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
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</tbody>
</table>

**Engineering Controls in Use**

|                        |            |            |            |                  |                 |
|                        |            |            |            |                  |                 |

None

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

**Activity:** NPS Monterey  
**Supervisor:** Todd Weatherford  
**Phone:** (831)656-2697  

**Bldg#:** Golf Course Annex, Bldg 216  
**Shop:** ECE Dept, Flash X-Ray Facility  

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

# of students varies

**Shop Operation:** 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 duration. Machine tools, including 2 lathes, 3 drill presses, a band saw, and a power hack saw, are present but not currently in use; noise levels of this equipment were measured on 20 October 2002 (when the facility was part of the Physics Department). Ethyl alcohol and acetone are 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.

<table>
<thead>
<tr>
<th>Potential Hazard</th>
<th>Inter or Cont.</th>
<th># Workers Exposed</th>
<th>Exposure &gt; MSAL?</th>
<th>Controls in Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ionizing radiation, EMF radiation</td>
<td>5 days/2 months 8 hrs/day,</td>
<td>2</td>
<td>No</td>
<td>Written SOPs, control procedures, safe radius boundaries, interlocks on door and on operation keys</td>
</tr>
<tr>
<td>*Lead, presence of lead bricks as shielding</td>
<td>Constant</td>
<td>2</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Noise, aluminum and phenolic dusts</td>
<td>Not performed presently or in the recent past</td>
<td>1</td>
<td>No</td>
<td>Ear plugs</td>
</tr>
<tr>
<td>Ethyl alcohol, Acetone</td>
<td>½ gallon/year 1 pint/year</td>
<td>1</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Diffusion pump oil</td>
<td>500 ml/year</td>
<td>1</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Vacuum pump oil</td>
<td>2 liters/year</td>
<td>1</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>*Reproductive hazard (See I. H. assessment)</td>
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</tr>
</tbody>
</table>

36
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 and acetone 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: S.E. Thurston, Industrial Hygienist  
Date: 23 August 2006

MONITORING PLAN

<table>
<thead>
<tr>
<th>Stressor to be Sampled</th>
<th># of Meas.</th>
<th>* Measure. Method</th>
<th>**Measure. Location</th>
<th>Frequency per Yr.</th>
<th>Man Hrs. per. Yr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
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<tr>
<td>Engineering Controls in Use</td>
<td></td>
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<tr>
<td>Interlocks,</td>
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<td></td>
</tr>
<tr>
<td>Lead bricks</td>
<td></td>
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** Use the following Codes:  
GA-general area  
BZ-breathing zone  
HZ-hearing zone  
SZ-source zone  
OT-other (specify)
APPENDIX B

CHANGE OF OPERATION NOTIFICATION

Please use this form to notify the industrial hygienist of any changes to operations conducted by your department. The notification form may be copied as needed. The completed forms can be returned to:

NAVAL SUPPORT DETACHMENT, MONTEREY
CODE N22G, SAFETY OFFICE (ATTN: INDUSTRIAL HYGIENIST)
1870 MORSE DRIVE
MONTEREY CA 93943

CHANGE-OF-OPERATION NOTIFICATION

FOREMAN/SUPERVISOR:                                            EXT:

BLDG:          COMMAND/SHOP: NPS Monterey,           WORK AREA:
                ECE Department

SURVEY REPORT:  ET-0361

INSTRUCTIONS TO FOREMAN/SUPERVISOR:

The industrial hygiene survey evaluated the potential hazards to your employees based on the operations existing at the time. When your operations change, the potential hazards can also change, and these new conditions must be evaluated. Please contact the industrial hygienist if any of the following occur:

a. Exposure times have changed.
b. New operations are performed.
c. New types of equipment are used.
d. An increase in major chemical usage.
e. New chemicals or chemical products are used.
f. A change in existing exhaust ventilation.

List any changes below.

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

Date Forwarded: _____________

38