From: Officer in Charge, Naval Medical Administrative Unit, Monterey
To: Chairman, Physics Department, Naval Postgraduate School, Monterey,
833 Dyer Road, Monterey CA 93943-5100

Subj: ANNUAL INDUSTRIAL HYGIENE SURVEY OF NAVAL POSTGRADUATE SCHOOL,
MONTEREY, PHYSICS DEPARTMENT

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

Encl: (1) Industrial Hygiene Survey Report ET-0304

1. As required by reference (a), an annual industrial hygiene survey of the
Naval Postgraduate School, Monterey, Physics Department was conducted on
8 and 9 September 2004 by the Naval Medical Administrative Unit, Monterey
Industrial Hygienist. The survey report ET-0304 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. Since there were no findings, a response to this report is unnecessary.
Rather, the report is forwarded for departmental information and records, and
should be shared with departmental personnel.

4. Further clarification or consultation with respect to this report 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
PHYSICS DEPARTMENT
SURVEY #ET-0304
8 and 9 September 2004

Survey Conducted By: Eric Thurston,
Industial Hygienist
TABLE OF CONTENTS

Executive Summary........................................................3
Glossary/Common Abbreviations...........................................4
Section I.  INTRODUCTION................................................6
    Report Organization...................................................6
    Survey Schedule.....................................................7
    Change of Operation Notification..................................7
Section II.  Navy Occupational Safety and Health Program Reviews.......8
Section III. Industrial Hygiene Assessment.................................11
Section IV. Industrial Hygiene Survey Data ................................18
Section V. Medical Surveillance Matrix......................................19
Section VI. Workplace Monitoring Program..................................21
Appendix A. Industrial Hygiene Assessment OPNAV 5100/14 Form..........22
Appendix B. Change of Operation Notification Form.........................29
EXECUTIVE SUMMARY

There were no findings noted during the survey and corrective actions are unnecessary. Survey details can be found in sections II and III of this report.

The noise levels of the new rail gun will need to be measured when it is operational.

The cooperation of two people from your staff, PH lab manager Kerry Yarber and George Jaksha, 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

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEL</td>
<td>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.</td>
</tr>
<tr>
<td>PPE</td>
<td>Personal Protective Equipment. Clothing or devices furnished to protect employees in performance of work in potentially hazardous areas or conditions.</td>
</tr>
<tr>
<td>ppm</td>
<td>Parts per million. A means for expressing the concentration of gases and vapors in air.</td>
</tr>
<tr>
<td>RFR</td>
<td>Radiofrequency/Microwave Radiation.</td>
</tr>
<tr>
<td>RPPM</td>
<td>Respiratory Protection Program Manager.</td>
</tr>
<tr>
<td>SCBA</td>
<td>Self Contained Breathing Apparatus.</td>
</tr>
<tr>
<td>SOP</td>
<td>Standard Operating Procedures.</td>
</tr>
<tr>
<td>STEL</td>
<td>Short term exposure limit. A 15 minute time weighted average exposure which should not be exceeded at any time during a workday.</td>
</tr>
<tr>
<td>Stressor</td>
<td>Potential Hazard (e.g. Noise, Chemicals, Dusts)</td>
</tr>
<tr>
<td>TLV</td>
<td>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.</td>
</tr>
<tr>
<td>TWA</td>
<td>Time Weighted Average. A method for averaging varying concentrations over a specified period of time (usually 8 hours).</td>
</tr>
<tr>
<td>WC</td>
<td>Work Center</td>
</tr>
<tr>
<td>WMP</td>
<td>Workplace Monitoring Program. A program to evaluate workplace health hazards through surveys and exposure measurement.</td>
</tr>
</tbody>
</table>
SECTION I
INTRODUCTION

The Naval Postgraduate School, Physics Department provides a wide variety of teaching and research services to students and faculty. Some examples of ongoing projects include underwater acoustics and laser imaging.

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

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 hazards specific to individual codes, 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 the sampling/monitoring data conducted 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

References:  (b) OPNAVINST 5100.23F, Chapter 8, Sections 0803.b and c  
(c) OPNAVINST 5100.23F, Chapter 8, Paragraph 0803.g

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 Safety Office. The year of the last survey appears after each work center listing.

WORKPLACE SURVEY SCHEDULE

<table>
<thead>
<tr>
<th>Workplace</th>
<th>Annual Required</th>
<th>2 Year Schedule</th>
<th>4 Year Schedule</th>
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<tr>
<td>Physics Dept (2004)</td>
<td>None</td>
<td>None</td>
<td>None</td>
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</tbody>
</table>

Change of Operations Notification:

Reference (b) requires an industrial hygiene re-evaluation when workplace changes occur. Please notify the industrial hygienist via your 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, Physics Department because these hazards are not present:

• Asbestos Control
• Bloodborne Pathogens Control
• Manmade Vitreous Fibers Control
• Polychlorinated Biphenyls (PCB’s) Control
• Respiratory Protection

CHEMICAL HYGIENE PROGRAM

Reference: (a) 29 CFR 1910.1450

A Chemical Hygiene Plan for use of chemicals required by reference (a) has been developed, and is available for review at www.nps.navy.mil. Detailed instructions on how to access this document was provided to the lab manager during the 2003 annual survey.

ERGONOMICS PROGRAM

On occasion, the machinist is required to lift items in excess of 40 pounds. He has received back injury prevention training.

Recommendations: None.

HAZARDOUS MATERIALS CONTROL PROGRAM

A Hazardous Materials Control Program has been established and is functioning effectively. No problem trends 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

The potential for significant noise exposures only occurs from use of the machine tools in the Building 232, Room 035 Wood Shop and the Room 038 Machine Shop. The machinist wears ear muffs during operation of this equipment. Noise hazardous equipment is properly labeled, and the machinist is enrolled in the NPS Hearing Conservation Program.

Noise levels of the new rail gun will need to be measured when it becomes operational.

Recommendations: Continue use of hearing protection during operation of the machine tools.
LEAD CONTROL PROGRAM

Reference: (a) 29 CFR 1910.1025

Personnel perform intermittent, brief duration soldering operations at stations throughout the department using temperature-controlled irons and lead-tin solder. Significant exposures are not expected based on historical monitoring data of similar soldering operations performed at other Naval activities. The machinist also very rarely performs cutting of lead plates, which involves low speed machining. Significant exposures are not expected based on monitoring data collected during performance of the same type of job performed by the Building 214, Oceanography Department machinist. As noted in section III of this report, lead is a reproductive hazard. Use of respirators and enrollment in the Lead medical surveillance program are unnecessary for these jobs. The Safety Office forwarded electronic versions of the contents of Appendices A and B from reference (b), the Federal Lead Standard, to the department lab manager and departmental machinist, and is available to personnel performing soldering. The lab manager was also provided detailed instructions on how to access this information on the NPS Safety Office website during the 2003 annual survey. Personnel must wash their hands and face after soldering, and before eating, drinking, smoking, chewing, or application of cosmetics or lip balm to avoid unintentional ingestion.

NON-IONIZING RADIATION CONTROL PROGRAM

Reference: (b) OPNAVINST 5100.23F, Chapter 22

Teaching and research projects in the Physics Department require the use of class II, III, and IV lasers; there are no military exempt lasers or other sources of non-ionizing radiation used in this department. The Code 223 Laser Systems Safety Officer (LSSO), 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. Initial training is provided to students, but they graduate before annual refresher courses would be necessary. A review of records indicates no laser-related injuries have occurred since the last survey was performed.

PROCESS CONTROL VENTILATION PROGRAM

References: (d) Industrial Ventilation: A Manual of Recommended Practice, 22nd Edition, Chapter 10, Figure VS-35-01, ACGIH
(e) 29 CFR 1910.1450, Appendix A, section C4(h)

Lab hoods are located in Building 232, Rooms 000 and 131 for work with chemicals. The lab hood in Room 000 has been inoperable for the past 6 months. The last ventilation measurements of the Room 000 hood found air flow rates to be acceptable per the criterion outlined in reference (d). Quarterly measurements recommended by reference (e) have been discontinued in favor of annual measurements due to infrequent use of the hoods. The department plans to remove the hood from room 131, which is currently being used as a student office.
REPRODUCTIVE HAZARDS CONTROL PROGRAM

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

Materials that contain reproductive hazards, as defined by Appendix 29-A of reference (f), are limited to lead, which is a male, female, and developmental hazard, present in solder and lead stock that is machined, and toluene, which is a developmental hazard, present in 100% toluene, Star Brite and Scotchkote electrical tape compounds, and LHB So Sure Flat Black 37038 Enamel in aerosol paint cans. Lead can present a potential male, female, and developmental hazard, while toluene can present a developmental hazard. As discussed above, significant exposures during lead work are not expected, and monitoring data collected during machining of lead plates in the Oceanography Department for the same purpose and process indicates insignificant exposures are generated.

Significant exposures to any of these toxics are unlikely as discussed in section III of this report.

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 (g), and request an evaluation by the industrial hygienist and the occupational health provider from the POM Army medical clinic.

- Follow all recommendations regarding the use of reproductive hazards in the workplace.
SECTION III

INDUSTRIAL HYGIENE ASSESSMENTS
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

000 Glasswork/Chemical Storage
002/003C Acoustics Lab
003/005 Sensor Research
003F Threshold Cathode Test Facility
004 Radar Imaging Computer Simulation
006 Applied Optics
007 Storage
008A Directed Energy Simulation (Computer)
107A/B/C/D Acoustics Lab
108B Acoustic Computer Lab
111 Advanced Electronics
011 Electromagnetic Railgun
013 Space Physics Computer Lab
015 Physical Acoustics Lab
016 Electronics Assembly Area
017/023 Advanced Acoustics Lab
018 Laser/LIDAR Development
019/021 Anechoic Chamber
020/022 Space Physics Computer Lab
024 Thermal Acoustics
025 Underwater Acoustics
026 Assembly Area
027 Optics Teaching Lab
028 Storage
035 Wood Shop
036 Thermoacoustics Lab
037 Being prepped to become the location of the new rail gun Lab
042/048 Seismo-Lab/Sonar Transducer Lab
105 Computer Lab
111 Advanced Electronics
121-124 Computer Workstations
125A,B,C/127 Physics Lab
131 Office
133 Scanning Electron Microscope
135 Optics and Sensors Teaching Lab
139A Office
139B Optics Storeroom
141 Educational Physics Lab
148 Electronics/Applied Physics Teaching Lab
210 Computer Research Lab
223 Computer Electronics Prep Room

The remainder of department spaces are classrooms, offices, or general storage areas.
FUNCTION: Laboratories are used for course demonstrations and individual student or staff research. 1st floor labs in Building 232 are primarily oriented toward teaching while basement labs primarily involve 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. Intermittent, short duration lead-tin soldering, both with and without soldering flux, is performed at many locations. Two laboratory fume hoods are located in Rooms 000 and 131, but the hood in Room 000 is inoperable and the hood in Room 131 is not being used.

Room 004, formerly the Modern Physics room, now houses the Radar Imaging Computer Simulation Lab. Room 037, formerly the Electronics Assembly Area, is being renovated to house a new rail gun. In turn, the Electronics Assembly Area has been moved into Room 016. The Educational Physics Lab formerly present in Room 016 is now located in Room 141. Room 131 has been converted into a student office, and the small gold and copper electroplating machine has been moved into the basement.

The most common chemicals stored in the laboratory spaces are acetone, methanol, and ethanol. 100% toluene, 100% trichloroethylene, and 100% benzene are stored in the Room 000 lockers, but were not present in any of the lab spaces during the survey. Star Brite protective coating, which contains both methylene chloride and toluene, is present in Underwater Acoustics Room 025. Lead-tin soldering is performed in the majority of spaces inspected. Super 77 Spray Adhesive that contains toluene is stored in Room 036 but is not currently used.

Lasers were stored but not being used in several rooms. Class II lasers, which are primarily used in teaching, optics, and research labs, were present in Rooms 027 and 135. Class II lasers are reported to still be used in Room 006, but none could be located during the survey. A Class IIIa laser is present in Room 027. Class IIIb lasers are being stored but not used in Rooms 027, 125, and 135. Class IV lasers were present in rooms 007 and 018; the laser in Room 007 was being stored but not used.

The electromagnetic railgun in Room 011 has been disassembled, which shoots bursts less than a second, will be replaced by a newer model in Room 037 sometime in the next year.
INDUSTRIAL HYGIENE ASSESSMENT

The following operations potentially expose personnel to hazardous occupational stressors:

1. Laser radiation during use of class IIIb or IV lasers. Exposures are controlled by use of proper procedures, operation interlocks, and laser goggles.
2. Impact noise during operation of the new rail gun. Noise levels will need to be measured when it becomes operational.

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

3. Use of 100% methylene chloride, 100% toluene, 100% trichloroethylene, and 100% benzene. These chemicals are used by staff personnel in minimal amounts (2 ounces per time maximum). Monitoring data indicates that no detectable chemical vapors are present during use of these products.
4. Methylene chloride and toluene during use of Star Brite chemical electrical tape compound in Room 025. Monitoring data indicates that no detectable chemical vapors are present during this compound’s use.
5. Toluene during use of LHB So Sure Flat Black 37038 Enamel aerosol paint cans in Room 018. Significant exposure is unlikely based on minimal usage (approximately 2 ounces per time); this product has not been used in the past three years.
6. Chemical compounds, most commonly including acetone, methanol, and ethanol, during wet chemistry operations. Intermittent, short duration use of minimal amounts of chemicals will not pose a significant exposure.
7. Lead and zinc chloride fumes during lead-tin soldering. Historical monitoring data shows intermittent, short duration soldering using 60/40 lead/tin solder will not expose personnel to hazardous levels.
8. Electromagnetic radiation during use of the railgun in Room 037. Extremely brief exposure duration will not result in significant exposure.
9. Cold during handling liquid nitrogen in Room 037. Exposure to extreme cold is prevented by use of thermal mitts.
10. Ergonomics during computer use. No injuries or problems have occurred.

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

3,4,5. Toluene, which is a developmental reproductive hazard, during use of 100% toluene, Star Brite compound, and LHB Industries So Sure black enamel.
7. 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.
RECOMMENDATIONS:

1. Continue use of goggles, procedures in place, and other controls during use of class III or IV lasers.
2. The departmental lab manager reports that he will contact the Industrial Hygienist when the new rail gun becomes operational so that noise levels can be measured 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 (b). Directions on how to access the Federal Lead Standard, Appendices A and B were transmitted to the Department Lab Manager as part of the 2003 survey, and is therefore available to workers as required by reference (c).
9. Continue use of the thermal mitts to prevent cold “burns” from occurring to exposed skin while handling liquid nitrogen.

REFERENCES / NOTES:

(a) OPNAVINST 5100.23F, Chapter 18, paragraph 1804a
(b) OPNAVINST 5100.23F, Chapter 21, paragraph 2104f(5)
(c) OPNAVINST 5100.23F, Chapter 21, paragraph 2106

FINDINGS: None.
INDUSTRIAL HYGIENE ASSESSMENT

ACTIVITY: NPS Monterey     FILE NO.: ET-0304 DATE: 9 September 2004

DEPARTMENT: Physics Dept, Machine and Wood Shops     POC: George Jaksha

LOCATION: Bldg 232, Rooms 038 and 035     IND. HYG: Eric Thurston

FUNCTION: Manufactures items needed by students for research using metal and wood and machine tools.

The following operations 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. Metal dusts during use of machine tools in the Machine Shop. Significant exposures are unlikely based on the nature of mostly intermittent, small scale jobs.
2. Methylene chloride during gluing acrylic parts together using TAP Plastics Free-Flowing Acrylic Cement. Monitoring data of this operation indicates significant exposure concentrations are not generated.
3. Lead during rare cutting of lead plates with the Machine Shop band saw. Low speed, brief duration operation will not generate significant lead exposures.
4. Noise and wood dust during operation of machine tools in the Wood Shop. Significant exposures are unlikely based on brief exposure duration.
5. Metal fumes during silver soldering. Significant exposures will not result from brief duration jobs.
7. Various alcohols during use of Dykem blue layout and staining fluids, and Dykem remover and thinner.
8. Toluene during waterproofing of electrical connections of machined parts using Skotchkote Electrical Coating. Monitoring data collected during use of the same product for the same purpose and duration resulted in insignificant toluene exposure levels being measured.
9. Various solvents during use of OSH Spray Enamel Flat Black # 604C in aerosol cans. This particular paint does not contain toluene in its formulation.

Significant exposure to mildly toxic chemicals present in products used during jobs # 6 through 9 above will not occur from usage of minimal amounts.
The following operation potentially exposes personnel to stressors identified by OPNAVINST 5100.23F, Chapter 29, Appendix 29-A as reproductive hazards:

3. Lead, which is a male, female, and developmental reproductive hazard, during cutting of lead plates with a band saw.
8. Toluene, which is a developmental reproductive hazard, during use of Skotchktote Electrical 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:

1,3. Continue use of hearing protection during use of power and machine tools in the Wood and Machine Shops as required by reference (a).

REFERENCES:

(a) OPNAVINST 5100.23F, Chapter 18, paragraph 1807a

FINDINGS: None.
SECTION VI
INDUSTRIAL HYGIENE SURVEY DATA

This Section contains the noise measurement 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.

The measurements performed in support of this survey follow methods approved and validated by Federal OSHA and appropriate Naval instructions. In all cases, accepted professional industrial hygiene practices are followed. Documentation concerning the types of instruments used and their calibration records are held by the Naval Medical Admin Unit, Monterey Bay 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.
## MEDICAL SURVEILLANCE PLACEMENT MATRIX

**COMMAND/SHOP:** NPS Monterey, Physics Department  
**DATE:** 9 September 2004  
**PAGE:** 1 OF 1

### WORKER GROUP

<table>
<thead>
<tr>
<th>NOHIMS CODE</th>
<th>EXAM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Class IIIb or IV Laser</td>
</tr>
</tbody>
</table>

- **601** ACIDS/ALKALIS
- **114** ASBESTOS CURRENT WORKER > MSAL
- **178** BLOOD AND/OR BODY FLUIDS
- **124** CADMIUM
- **133** CHROMIC ACID/CHROMIUM VI
- **508** HAND-ARM VIBRATION
- **505** IONIZING RADIATION
- **506** LASER RADIATION-CLASS IIIb or IV
- **161** LEAD (INORGANIC)
- **162** METAL WORKING FLUIDS
- **212** MANMADE MINERAL FIBERS/FIBERGLASS
- **602** METAL FUMES
- **168** METHYLENE CHLORIDE
- **503** NOISE
- **507** RADIOFREQUENCY & MICROWAVE RADIATION
- **603** MIXED SOLVENTS
- **511** WHOLE BODY VIBRATION
- **604** WOOD DUST
- **723** BARBER/BEAUTY SHOP WORKER
- **703** CHILD CARE WORKER
- **706** DOT VEHICLE OPERATOR
- **722** FIREFIGHTER, ANNUAL EXAM
- **707** FIREFIGHTER, PREPLACEMENT AND PERIODIC EXAMS
- **709** FOOD SERVICE PERSONNEL
- **710** FORKLIFT OPERATOR
- **711** HAZARDOUS WASTE WORKER/SPILL RESPONSE
- **714** POLICE/SECURITY GUARD
- **716** RESPIRATOR USER CERTIFICATION EXAM
- **702** WASTEWATER/SEWAGE WORKER
- **OTHER:**
- **OTHER:**
- **OTHER:**
- **OTHER:**
- **OTHER:**
- **OTHER:**
- **OTHER:**
- **NONE REQUIRED**
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

Physics Department

WORKPLACE MONITORING PLAN

September 2004

<table>
<thead>
<tr>
<th>LOCATION/JOB</th>
<th>STRESSOR</th>
<th># MEAS.</th>
<th>MEAS. REQUIRED</th>
<th>METHOD¹</th>
<th>FREQUENCY</th>
<th>MEASURING</th>
<th>MAN HRS. PER YEAR</th>
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<td>DR</td>
<td>Annual</td>
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Total = 1

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 5100.23E, 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: Kerry Yarber  Phone: (831)656-3886
Bldg#: 232  Shop: Physics, Laboratories

Total Personnel: 36 (4 Tech staff, Male: 33  Female: 4 (2 Admin, 30 Faculty, 2 faculty)
   2 Admin)

# of students varies

Shop Operation: Laboratories are used for course demonstrations and individual student or staff research. 1st floor labs in Building 232 are primarily oriented toward teaching while basement labs primarily involve 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.

Intermittent, short duration lead-tin soldering, both with and without soldering flux, is performed at many locations. Two laboratory fume hoods are located in Rooms 000 and 131, but the hood in Room 000 is inoperative and the hood in Room 131 is not being used.

Room 004, formerly the Modern Physics room, now houses the Radar Imaging Computer Simulation Lab. Room 037, formerly the Electronics Assembly Area, is being renovated to house a new rail gun. In turn, the Electronics Assembly Area has been moved into Room 016. The Educational Physics Lab formerly present in Room 016 is now located in Room 141. Room 131 has been converted into a student office, and the small gold and copper electroplating machine has been moved into the basement.

The most common chemicals stored in the laboratory spaces are acetone, methanol, and ethanol. 100% toluene, 100% trichloroethylene, and 100% benzene are stored in the Room 000 lockers, but were not present in any of the lab spaces during the survey. Star Brite protective coating, which contains both methylene chloride and toluene, is present in Underwater Acoustics Room 025. Lead-tin soldering is performed in the majority of spaces inspected. Super 77 Spray Adhesive that contains toluene is stored in Room 036 but is not currently used.

Lasers were stored but not being used in several rooms. Class II lasers, which are primarily used in teaching, optics, and research labs, were present in Rooms 027 and 135. Class II lasers are reported to still be used in Room 006, but none could be located during the survey. A Class IIIa laser is present in Room 027. Class IIIb lasers are being stored but not used in Rooms 027, 125, and 135. Class IV lasers were present in rooms 007 and 018; the laser in Room 007 was being stored but not used.

The electromagnetic railgun in Room 011 has been disassembled, which shoots bursts less than a second, will be replaced by a newer model in Room 037 sometime in the next year.
<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>Chemical compounds, most commonly acetone, methanol and ethanol</td>
<td>30 mins/month</td>
<td>16</td>
<td>No</td>
<td>2 fume hoods in Rooms 000 and 131</td>
</tr>
<tr>
<td>100% methylene chloride use</td>
<td>Varies</td>
<td>Varies</td>
<td>No</td>
<td>Sometimes fume hoods</td>
</tr>
<tr>
<td>100% *toluene use</td>
<td>Varies</td>
<td>Varies</td>
<td>No</td>
<td>&quot; &quot;</td>
</tr>
<tr>
<td>100% trichloroethylene use</td>
<td>Varies</td>
<td>Varies</td>
<td>No</td>
<td>&quot; &quot;</td>
</tr>
<tr>
<td>100% Benzene use</td>
<td>Varies</td>
<td>Varies</td>
<td>No</td>
<td>&quot; &quot;</td>
</tr>
<tr>
<td>*Toluene, methylene chloride Varies</td>
<td>Varies</td>
<td>No</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Star Brite liquid electrical tape, Room 025</td>
<td>Varies</td>
<td>Varies</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>*Toluene, LHB So Sure Flat Black 37038 Enamel, aerosol paint can in Room 018</td>
<td>Not used in last year</td>
<td>Varies</td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>*Lead and zinc chloride fumes, soldering</td>
<td>Once/month, 5-10 mins</td>
<td>16</td>
<td>No</td>
<td>Temperature controlled irons</td>
</tr>
<tr>
<td>Class IIIb and IV lasers</td>
<td>Infrequent</td>
<td>Varies</td>
<td>Yes</td>
<td>Interlocks, locked rooms, and flashing lights for class IV work; Laser goggles for both class III and IV</td>
</tr>
<tr>
<td>Plastic, copper, and wood dust, noise, machine tools, Rooms 035 and 037</td>
<td>Varies, typically no more than 5 mins/time</td>
<td>Varies</td>
<td>No</td>
<td>Ear plugs, milling machine has plastic enclosure and attached to HEPA-filtered vacuum</td>
</tr>
<tr>
<td>New rail gun, Room 037</td>
<td>&lt; 1 second burst</td>
<td>Varies</td>
<td>Yes</td>
<td>Ear plugs or muffs</td>
</tr>
<tr>
<td>-impact noise</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-EMF fields</td>
<td></td>
<td></td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Cold, handling liquid nitrogen, Room 037</td>
<td>Minimal</td>
<td>Varies</td>
<td>No</td>
<td>Thermal mitts</td>
</tr>
<tr>
<td>Ergonomics, computer use</td>
<td>Daily, up to 8 hours</td>
<td>3</td>
<td>N/A</td>
<td>None</td>
</tr>
<tr>
<td>Ergonomics, computer use</td>
<td>Daily, 2-3 hrs</td>
<td>32</td>
<td>N/A</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: Chemical compounds, including acetone, methanol, and ethanol, are unlikely to exceed the MSALs and PELs based on intermittent, brief duration, and minimal usage. Monitoring data, traceable to Industrial Hygiene Survey ET-0165, indicate no detectable levels of toluene, methylene chloride, benzene, or trichloroethylene are generated during use of 100% methylene chloride, toluene, trichloroethylene, or benzene, or during use of Star Brite Liquid Electrical Tape. The one aerosol can of black enamel has not been used in the past 2 years, and is unlikely to be used in the near future; significant exposures are unlikely based on minimal usage (maximum of 2 ounces per time). Lead and zinc chloride fumes created during lead-tin soldering are unlikely to exceed the MSALs and PEL-STEL based on monitoring data of similar operations and brief duration, intermittent operations. Significant laser exposure is unlikely based on use of proper procedures, controls, and personal protective equipment (laser goggles). EMF exposure above the TLVs is unlikely based on extremely brief exposure. Exposure to cold is protected against by use of thermal mitts. Ergonomics: no injuries or problems have occurred from computer use. The lab hood located in Room 131 has not been used in the past year, and there are no plans to use it again; the department intends to remove it in the near future.

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

Date: 8 September 2004

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>Engineering Controls in Use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Lab Hoods</td>
<td>1</td>
<td>DR Hood face</td>
<td>Annual</td>
<td>1</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: Kerry Yarber  Phone: (831)656-2304

Bldg#: 232, Spanagel Hall  Shop: Rooms 038, Machine Shop and 035, Wood Shop

Total Personnel: 1  Male: 1  Female: 0

Shop Operation: Manufactures items needed by students for research using metal and wood and machine tools.

Machine Shop: Aluminum is the primary metal worked on, with minimal work on stainless steel, brass, and copper; 1 milling machine and 1 CNC milling machine, 2 lathes, 2 double grinding wheels, a band saw, a drill press, and a cutoff saw (power hacksaw) are used for machining metal. A thin sheet of beryllium can be snipped using hand shears; this has only occurred once in the past 14 years. Glues acrylic parts together using TAP Plastics Free-Flowing Acrylic Cement applied with a small syringe. Performs low rpm cutting of lead plates using the Machine Shop band saw. Performs minimal, brief duration silver soldering. Uses small amounts of ethyl alcohol, acetone, and infrequently kerosene to remove machine oil from machined parts. Uses Dykem blue layout and staining fluids, and Dykem remover and thinner to remove these fluids once parts are machined. Waterproof electrical connections of machined parts using Skotchkote Electrical Coating applied with a brush that is a part of the can lid. Use of OSH Spray Enamel Flat Black #604C in aerosol cans to paint metal parts occurs.

Wood Shop: This room contains 2 drill presses, a table saw, a rotary drum sander, a combination 6 inch horizontal belt sander/9 inch vertical disc sander (although the disc sander portion is not used), and a jointer, which are primarily used for work on plywood and pine.

<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>Machine shop,</td>
<td>Daily, up to 8 hours</td>
<td>1</td>
<td>No</td>
<td>Machining oil</td>
</tr>
<tr>
<td>-aluminum, chromium, iron oxide, copper, and zinc oxide dusts and fumes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-noise</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Ear muffs</td>
</tr>
<tr>
<td>-*lead</td>
<td>Not performed in past 3 yrs</td>
<td></td>
<td>No</td>
<td>None</td>
</tr>
<tr>
<td>Wood dust, noise, Wood Shop</td>
<td>30 mins/month, 2 mins/time</td>
<td>1</td>
<td>No</td>
<td>Ear muffs</td>
</tr>
<tr>
<td>Methylene chloride, acrylic cement</td>
<td>Very rarely, 10 mins/time</td>
<td>1</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>
### Potential Hazard | Inter or Cont. | # Workers Exposed | Exposure > MSAL? | Controls in Use
--- | --- | --- | --- | ---
Metal fumes, silver soldering | Once/year, 5 mins | 1 | No | None
Ethanol, acetone, kerosene, cleaning parts | No more than 6 ounces/yr, some reused, kerosene not used in past 2 years | 1 | No | None
Various alcohols, Dykem products | Same as above | 1 | No | None
*Toluene, other solvents, Scotchkote Electrical Coating | 2 ounces/year (not used in the past 2 years) | 1 | No | None
Solvents, aerosol paint can | 2 ounces/year | 1 | No | None

* Reproductive hazard (See I. H. assessment)

**If no exposure > MSAL, provide rationale:** Metal dust exposures during Machine Shop operations are unlikely to exceed the MSALs and PELs based on the nature of mostly intermittent, small scale jobs. Lead exposure above the AL will not result from low rpm, brief duration cutting operations. Manual cutting of thin beryllium sheets using hand shears will not generate airborne dust or fumes; the main hazard is possible imbedding of beryllium in the skin or being cut by sharp edges of the metal sheet. Noise and wood dust exposures during use of machine tools in the Wood Shop is unlikely to exceed the NOEL and wood dust MSAL based on brief exposure duration. Monitoring data collected during use of acrylic cement indicates exposures are far below the PEL-TWA, PEL-STEL, and MSAL. Rare, brief duration usage of cadmium-free silver solder will not result in metal fume exposures above the MSALs. Chemical exposures will not exceed the MSALs during use of ethyl alcohol, acetone, kerosene, Dykem products, or aerosol paint cans based on minimal usage. Toluene exposure above the MSAL or PEL-STEL will not result based on minimal usage of and method of application for Scotchkote Electrical Coating.

**Signature/Title:**

**S.E. Thurston,**

*Industrial Hygienist*

**Date:** 9 November 2004
<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>
<td></td>
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<td></td>
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<tr>
<td>Engineering Controls in Use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td></td>
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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)
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 POSTGRADUATE SCHOOL, MONTEREY
CODE 223, 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:
                Physics Department
SURVEY REPORT:  ET-0304

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: ________________