Industrial Hygiene Compliance Assessment
Alaska Army National Guard Hangar 6
Anchorage, Alaska

February 2004

Submitted to:

Mr. Doc L. Miller
National Guard Bureau
Southwest Region Industrial Hygiene Office
20,000 Army Aviation Drive
Reno, Nevada 89506-1200

Report Prepared By:

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Industrial Hygienist

Report Reviewed By:

Jim Neely
Certified Industrial Hygienist

DEPARTMENT OF THE ARMY AND THE AIR FORCE
NATIONAL GUARD BUREAU

REGIONAL INDUSTRIAL HYGIENE OFFICE SOUTHWEST
20000 ARMY AVIATION DRIVE
RENO, NEVADA 89506-1200

NGB-AVS-SI **EXECUTIVE SUMMARY** **17 MAR 2004**

SUBJECT: Industrial Hygiene (IH) Health Hazard Information Module (HHIM) Survey and Baseline Employee Exposure Monitoring Survey, at the Hangar 6 in Anchorage, Alaska

1. References. See survey report.

2. General:

   a. At the request of the Industrial Hygiene Southwest (IHSW) Region-NGB, an HHIM survey was performed.

   b. Mr. Chris Coon, IH of Federal Occupational Health conducted the surveys.

3. Findings. See survey report.

4. Recommendations:

   a. **Follow all recommendations made in the attached survey report** and additional recommendations made in this Executive Summary.

   b. To execute your responsibilities in correcting all deficiencies, please coordinate with the State Safety Office (SSO) for technical guidance.

   c. **Hazardous Communications** program is required to meet OSHA standards which consists of: Documented Material Safety Data Sheets (MSDS) training and periodic inventory, identification via labeling of chemicals; educational orientation to chemicals, their use and hazards; cataloged MSDS in individual section and master binders for easy access and identification. **(NO RAC)**

d. Use this report to help in **correcting deficiencies** noted by the contractor. Place suspense as to completion of deficiencies noted.

e. A **Respiratory Protection Program** should be in place, which will provide training on care of respirator, maintenance and storage, along with annual fit testing. **RAC 3**

f. **Additional IH services** will be provided **to monitor locations that were not looked at or surveyed during the contract visit**. This will help eliminate other possible health hazards.

g. **Make sure Army Reserve and Guard supervisor's/OIC's see this report** so he/she will know what areas were surveyed and what precautions should be taken for their personnel.

h. Spray painting with **aerosol can** should be done outside or in a well-ventilated area.

i. **General housekeeping** of hangar floor was poor with real high levels of lead dust. Other heavy metals probably accompany this detected metal. I will enclose a clean-up SOP that should be utilized occasionally after the initial cleanup is completed. **RAC 3**

j. All personnel should **utilize alternate environmental and user-friendly solvents**. **MEK** is not user or environmentally safe. The personnel using solvents for cleaning of parts should utilize Personal Protective Equipment (PPE), e.g., rubber gloves, splash goggles & protective face shield, along with rubber apron. PPE shouldn't be stored in solvents or parts cleaning tanks. These parts cleaning tanks lids should be closed when not being utilized. **RAC 3**

k. The following **programs** exist in other states already and can be implemented and altered to fit your uses: Respiratory Protection, Confined Space & Hazardous Communication programs. Call around and don't reinvent the wheel, improve on it and share your wealth.

l. Provide additional **task lighting** for areas where individual do fine work; in areas where the work population is aging; or in areas where background surfaces (walls, ceilings, etc.) are darker.

m. This facility should have **Emergency Eyewash & Shower Lavage** stations. They shall be checked weekly by flushing the system and documenting this procedure on the station. All access to the eyewash should be unobstructed. (ANSI Z358.1-1998) **NO RAC**

n. All entryway doors leading into the maintenance bay should be **posted** as "Hazardous Noise Area". Hearing protection should be provided for fulltime personnel, as well as visitors. The Hangar personnel should be put on the Alaska **Hearing Conservation Program** until sound level testing can be documented to take them off. **RAC 2**

5. If additional information is needed about the contractors report, please contact CPT Michelle Worm, Occ. Health Manager @ (907) 428-6488.

CF: OHM

DOC L. MILLER, IH, NGB
Regional Industrial Hygienist

Table of Contents

Executive Summary

Industrial Hygiene Survey
Alaska Army National Guard Hangar 6
Anchorage, Alaska

I. Background and Introduction

On September 9th, 2003, a baseline industrial hygiene survey was performed at the Army National Guard Hangar 6 located in Anchorage, Alaska (photo 1). The primary point of contact for information gathered during this survey was Captain Michelle Worm (907-428-6488). The survey was conducted at the direction of Mr. Jim Neely CIH (#3034). The survey included a physical walk-through inspection of the building, inspection of battery storage areas, noise dosimetry and sound levels inspection, an illumination study, indoor air quality study, and reviews of existing programs, i.e., respiratory protection, HazCom, etc.

Findings in this report were obtained by observations of the facility and through interviews with personnel. The purpose of this survey was to evaluate the occupational environment of the hangar and make recommendations for corrective actions or follow-up work.

The Hangar has several full time employees. There are offices for personnel, crew quarters, a kitchen, restrooms, a large hangar for blackhawk helicopters, and storage areas for tools and vehicle parts.

II. Survey Procedures and Equipment Used

Carbon dioxide (CO_2), carbon monoxide, temperature, and relative humidity were measured using a TSI Model 8554 Q-Trak IAQ Monitor. The unit was calibrated prior to use with certified zero gas, and 1,000-ppm CO_2 span gas. CO_2 measurements are often used as a screening technique to evaluate whether adequate quantities of outdoor air are being introduced and evenly distributed to interior occupied spaces. Human occupants produce CO_2, water vapor and other bioeffluents, and the American Society of Heating, Refrigerating and Air Conditioning Engineers, in their standard 62-1999, *Ventilation for Acceptable Air Quality*, recommend maintaining CO_2 below a concentration that is 700 parts per million (700 ppm) above outdoor levels. Outside CO_2 concentrations are typically about 350 ppm. Providing sufficient ventilation to maintain steady-state CO_2 concentrations at this level will assure that a substantial majority of people entering a space will be satisfied with respect to human bioeffluents (body odors). ASHRAE recommends an outside air supply rate of 20 cubic feet per minute (20 cfm) per building occupant in office spaces, and at that ventilation rate, CO_2 concentrations will not increase over time.

Illumination measurements were taken in several areas of the hangar using a General Electric, triple range 214, light meter. Measurements in the office areas were taken at typical work locations, such as the tops of desks and near computer workstations.

EQUIPMENT USED

Type	Model Number	Serial Number	Calibration Date
GE triple range light meter	QA121	0390	–
TSI Q-Trak	8554	08011039	08/23/01
SKC Airchek Sampler	224-PCXR8	633697	–
Dwyer Rotameter	VFB	02875	08/04/03
Quest Electronics Sound Level Meter	215	M6070061	03/11/97
Sound Calibrator	CA-12B	U5060045	03/11/97

III. Findings and Recommendations

A. Battery Storage and Charging

There were no battery storage facilities observed in this hangar.

Recommendations:

1. None

B. Brake Repair

This facility does not perform brake changes or repairs.

Recommendations:

1. None

C. Lead Wipe Sampling

No lead wipe sampling was performed at this hangar as there were no obvious sources of lead emissions. There are currently no OSHA standards applicable to surface lead in general work areas. However, there is an OSHA enforcement guideline for lead concentrations of 200 $\mu g/ft^2$ that is applied to break areas, washrooms, and eating/drinking areas in regulated areas. Regulated areas include any operation that exhibits high airborne lead exposures, such as lead abatement tasks and lead smelting. For purposes of this survey, it is recommended that areas with levels that exceed 200 $\mu g/ft^2$ should be thoroughly cleaned, and employees who may come into contact with those areas should be properly trained in the hazards of lead exposure.

Recommendations:

1. None

D. Lead Air Sampling

There were no operations ongoing at the time of inspection of this facility that required lead air sampling.

Recommendations:

1. None

E. Asbestos Survey

All accessible areas of the hangar were visually inspected to identify suspect asbestos-containing materials (ACM). All accessible surfaces, structures, and mechanical systems within these areas were examined. Asbestos inspections had been performed for the facility in the 1990's, therefore, materials were only examined for condition. For quantities and locations of known asbestos-containing materials refer to the asbestos inspections on file at the Health and Safety Office, located in the Anchorage National Guard Office, Room D203. Table 1 lists all materials that were identified as possible asbestos-containing materials.

Table 1
Suspect Asbestos-Containing Building Materials Inventory

Location	Material	Friability	Photo #	Condition
Hangar				
Offices	2- x 4- foot suspended ceiling tile	Yes	2	Good
Electrical room	9- inch brown vinyl floor tile and associated mastic	No	3	Good
Throughout	Gypsum wallboard and joint compound	Yes	3	Good
Offices	12- x 12- inch vinyl floor tile and mastic	No	4	Good
Throughout	4- inch black baseboard and associated mastic	No	NS	Good
Throughout	Metal clad fire doors and frames	Yes	5	Good

NS - not shown

The Environmental Protection Agency (EPA) under the authority of the Clean Air Act regulates asbestos as a hazardous air pollutant. The asbestos regulations are included in the National Emissions Standards for Hazardous Air Pollutants (NESHAPS) and are referenced as 40 CFR 61, Subpart M. Those regulations, and state and local regulations, should be carefully examined prior to renovation, demolition, cleanup, or any other activity which could disturb the ACMs, to ensure that all activities are in compliance with applicable requirements.

Asbestos-containing materials (ACM) is defined by the EPA, as any material containing greater than one percent (1%) of asbestos. ACMs are categorized as being either friable or non-friable.

Friable ACMs are those materials that can be easily crumbled, pulverized, or otherwise broken up using hand or finger pressure when dry, and are materials considered more likely to produce airborne asbestos fibers. Non-friable ACMs are materials that do not meet the above test, and are considered less likely to produce airborne asbestos fibers. Non-friable ACMs are further categorized into Category I non-friable ACM (packings, gaskets, resilient floor coverings, and asphalt roofing products) and Category II non-friable ACM (materials not included in Category I).

Not all ACMs are regulated under NESHAPS. Regulated ACM (RACM) refers to a (a) Friable asbestos material, (b) Category I non-friable ACM that has become friable, (c) Category I non-friable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading, or (d) Category II non-friable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of regulated demolition or renovation operations. Regulated demolition and renovation operations are those where the quantity of ACM affected is 260 linear feet or more on pipes, 160 square feet or more on other components, or 35 cubic feet or more in volume. There are certain notification requirements for demolition projects involving less than the above quantities.

Briefly, the EPA requires that RACM be removed from facilities scheduled for demolition or renovation before any activity begins that would break up, dislodge, or similarly disturb the materials or preclude access to the materials for subsequent removal. Category I non-friable ACM that is not in poor condition and is not friable does not have to be removed prior to demolition of a facility. However, these materials are exempt from mandatory removal only during demolition, not renovation. Removal is mandated when renovation activities are expected to disturb these ACMs and render them friable. Category II non-friable ACM also does not have to be removed prior to demolition if the probability is low that the material will become crumbled, pulverized, or reduced to powder (made friable) during demolition. However, state regulations may require the removal of these materials. Additionally, Category I non-friable ACM that has not become crumbled, pulverized, or reduced to powder during demolition activities may be disposed of as ordinary construction waste.

Recommendations:

1. Perform comprehensive asbestos inspections or re-inspections to update records. **(RAC 2)**

2. If materials that are identified in Table 1 are determined to be asbestos-containing and the materials are to be removed, a certified asbestos abatement contractor should be utilized. If these materials are to be managed in place, an asbestos Operations and Maintenance Plan (O&M) should be written. Custodial personnel and others doing maintenance and repair work in the facility should acquaint themselves with the contents of this survey and any future surveys performed. **(RAC 2)**

F. Indoor Air Quality and HVAC Systems

1. Hangar

The hangar is heated through ceiling mounted blower units and wall mounted radiators. The ducts appeared to be in good condition. The HVAC system is maintained by the state Facilities Management Department.

The average outdoor carbon dioxide concentration at the time of the survey was 469 parts per million (ppm); therefore, the maximum indoor CO_2 level recommended by the ASHRAE standard would be 1,169 ppm. In general, CO_2 concentrations throughout the building were lower than 1,169 ppm, and the highest CO_2 concentration measured on this date was 625 ppm.

Building air temperature ranged from about 67.0 to 71.8° F and relative humidity was between about 31.8 and 33.8 percent during the testing period. Air temperatures were slightly below the recommended comfort range of 68-75° F, and the relative humidity was within the recommended comfort zone of between 30 and 60 percent. The low temperature readings were measured in the hangar bay. Humidity levels above 60 percent can result in proliferation of bacteria and fungi, while levels below 30 percent can cause dry eyes, skin, and mucous membranes.

Carbon monoxide levels ranged from 1.1 to 1.4 ppm at all inside measurement locations. The Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) for CO is 50 ppm as an 8-hr TWA concentration, and the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) for CO is 25 ppm, also as an 8-hr TWA.

Recommendations:

1. Observe and maintain temperature comfort levels throughout the year, particularly in the winter months. **(RAC 3)**

G. Shop Ventilation Systems

Maintenance Shop Tailpipe Exhaust Ventilation Systems

The hangar does not use tailpipe exhaust systems.

Recommendations:

1. None

H. Respiratory Protection and Air Sampling

No respirator use was reported in this building.

Recommendations:

1. None

I. Hazardous Materials Storage and Use

A Material Safety and Data Sheet (MSDS) book listed by product name with a chemical inventory list is on file for this building. The MSDS book appeared to be well maintained and regularly updated. An eye wash station and fire extinguishers were present and appeared to be maintained regularly.

The hangar uses metal storage cabinets to store hazardous materials. These cabinets were well marked and the materials stored within in good condition.

Hangar operations include maintenance and minor repair of helicopter aircraft. Aqueous detergents are used primarily for aircraft washes. Solvents used in wipe applications include MEK, and toluene. Employees wear mainly disposable vinyl gloves. Solvent wiping was not occurring at the time of the survey. These operations reportedly take 30 minutes maximum, with most tasks less than 10 minutes.

The hangar also reportedly uses a gas path cleaner every 100 flight hours. The product MSDS (Tritech BBR 3100) reports the major ingredient as solvent naphtha (petroleum) heavy aroma but does not list specific types of hydrocarbons. The process occurs with the tail of the aircraft sticking outside of the hangar. An employee interviewed stated that the operation involves burning the solvent through the engine, with a resulting strong solvent odor.

Touch up spray painting is reportedly done, using aerosol cans only. Operations are conducted after hours, outside in summer or with the doors cracked open in winter. The primary paint is PWC 3403 Green (Pacific West Chemical). The paint contains butyl acetate, xylene, and Stoddard solvent. The operation was not occurring at the time of this survey.

Recommendations:

1. Conduct air sampling and a personal protective equipment (PPE) survey of the solvent wiping (particularly MEK and toluene). If possible, select a solvent wiping task in a semi-confined area of the aircraft, for worst-case analysis.

2. Conduct air sampling and a personal protective equipment (PPE) survey of the gas path cleaner operation. Contact the manufacturer to obtain the names of the solvent ingredients. The OSHA Hazard Communication standard requires that the ingredients be released to an occupational health professional, although a confidentiality agreement may be required for proprietary ingredients.

3. Evaluate painting operations for the need for air monitoring and PPE. This survey should also include evaluating sanding and scraping tasks.

4. Continue to maintain and update MSDS sheets for all hazardous materials [29 CFR 1910.1200(g)(1)]. **(RAC 2)**

J. Physical Safety and Condition of Facility

A physical walk-through of the hangar was conducted. Overall, housekeeping was found to be in excellent condition.

The following is a list of discrepancies found in the building:

- None

K. Noise Dosimetry and Sound Level Survey

Noise dosimetry was performed on two mechanics as they performed typical daily work routines. This information can be found in Table 2. DoD Instruction 6055.12, Hearing Conservation Program, requires that areas be posted and hearing protection worn when noise levels exceed 85 dBA. In addition, employees who are exposed to an 8-hour time weighted average (TWA) noise exposure in excess of 85 dBA need to be enrolled in a hearing conservation program which includes annual audiograms.

The monitoring results indicate that employee exposures were below applicable standards during the day of the survey. Some of the tools used by technicians during normal work routines include impact wrenches and other high noise equipment. Inspectors observed that mechanics were wearing ear protection when working around high noise sources. During the day of the survey there were no activities requiring operation of the helicopter engines.

Table 2
Noise Dosimetry Data – Baseline Survey

Name	Jacob Nag	**Name**	Kevin Clark
SSN	528-19-9695	**SSN**	394-86-5192
Location	Hangar 6 bay	**Location**	Hangar 6 bay
Occupation	Mechanic	**Occupation**	Mechanic
Run Time	5:40 hours	**Run Time**	5:38 hours
TWA_1	76.0	**TWA_1**	80.0
Dose	12.78	**Dose**	50.56
Max	111.1	**Max**	111.0
Peak	87.1	**Peak**	93.6

Recommendations:

1. Continue to monitor noise hazards in the hangar bay work area, particularly during engine operations. **(RAC 3)**

L. Illumination Survey

Illumination levels that were measured throughout the hangar general areas can be found on the floor plan in Appendix D. The numbers represent the illumination level in foot-candles (FC). In general, the measurements were taken at task surface level, such as on desks. Measurements not taken on a desk were taken at waist level.

Illumination measurements were compared with recommendations made by the Industrial Engineering Society (IES)/American National Standards Institute (ANSI) RP7-1991. In general, IES recommends a range of 50 to 100 foot-candles as the minimum lighting requirements for performance of visual tasks of medium contrast or small size, such as would typically occur in an office area.

Based on these criteria, the general lighting locker room, machine shop, engine storage room, and hangar bay appears to be inadequate. Supplemental lighting should be utilized in areas where current lighting is inadequate. Inadequate light levels may place strain on the eyes and cause headaches or vision problems.

Recommendations:

1. Upgrade current lighting in the hangar or use supplemental lighting in areas that measured below 50 foot-candles. **(RAC 2)**

M. Inspection of Typical Facility Operations

Listed below is a table with typical operations that might be found in a facility of this type. During the survey it was determined if the operation took place in the given facility and whether that operation was observable during the survey time frame or not. Operations that vary from the standard list provided by the National Guard Bureau are listed at the end of the table and marked with an asterisk. Some operations may only take place once or twice a year. Their applicability was determined by information provided by the shop supervisor when available.

Table 3
Industrial Hygiene Baseline Survey – Operational Data

Operation	HHIM Code	Applicable to Facility
Administrative operations	ADO	No
Cleaning/sweeping janitorial	CLE	Yes
Hazardous wastes operations	HAW	No
Load/unload misc. items	IOA	Yes
Maintenance of vehicles brake/clutch repair and other	MAI	No
Office area/data processing	OFF	No
Aerosol can painting	ACP	Yes
ARC welding	ARC	Yes
Brazing- copper, aluminum, etc	BRZ	No

Operation	HHIM Code	Applicable to Facility
Compressed air cleaning	CAC	Yes
Dip tank cleaning – chemical	DTC	No
Electrical parts repair	EPR	No
Gas metal ARC welding	GMA	No
Grinding, buffing, polishing	GRD	Yes
Inert gas welding/cutting	ING	No
Manual wiping or cleaning equipment or metal parts	MAN	Yes
Metal Sanding	MSD	No
Oxyacetylene gas welding	OXA	No
Pneumatic tool operations	PTO	Yes

Operation	HHIM Code	Applicable to Facility
Welding on painted surfaces	PTS	No
Soldering	SOL	No
Spray cleaning	SPC	No

Operation	HHIM Code	Applicable to Facility
Storing/cleaning batteries	STG	Yes
Steam cleaning	STM	No
Stencil painting	STM	No

N. Safety Policies, Training, and Record Keeping

Safety policies and procedures were reviewed at the base safety office. The following programs were available for review:

- Hazard Communication: The hazard communication program appeared to contain all of the major required elements. The need for contractors to have written MSDSs while working on-site should be added to the requirements.
- Respiratory Protection Program: The plan that was available for review needs to be updated to comply with the revised OSHA Respiratory Protection Standard (29CFR1910.134). The program does not contain a list of tasks requiring respiratory protection and procedures for determining chemical cartridge change-out frequency. Demonstration of competency is also not covered. According to safety department personnel, a revised program has been developed but was not yet available.
- Hearing Conservation Plan: The plan covers most requirements of the Army and OSHA standards. However, noise dissymmetry is not adequately detailed.
- Confined Space Program: The confined space program covers most of the requirements of the OSHA Standard (29 CFR 1910.146). The program needs to better describe the criteria for "Low Hazard Permit Spaces", such as atmospheric testing and continuous ventilation. The emergency rescue team also needs to be better defined, including phone numbers and the need for rehearsals. Finally, the use of extraction devices is not fully discussed.
- Personal Protective Equipment (PPE): The PPE program complies with the updated OSHA Standard (29CFR1910.132). Each workplace is to have a completed assessment. However, the assessment document could not be located this facility.

Recommendations:

Update program deficiencies as discussed above. Confirm training records for employees in this facility. (RAC 2)

Technical Assistance: For technical assistance regarding information found in this report or the performed survey, please contact Mr. Chris Coon or Mr. Jim Neely, representatives of Federal Occupational Health at 253-351-0677 or Mr. Doc Miller of the Southwest Regional Industrial Hygiene Office, 800-766-5588. Contact the State Safety and Occupational Health Office and/or the Regional Industrial Hygienist should any of the operations change, or should the personnel become incapable of following the previous recommendations and subsequent recommendations are needed.

Appendix A: References

American Conference of Governmental Industrial Hygienists (ACGIH), Industrial Ventilation, A Manual of Recommended Practice, 23 Edition, 1998.

American Conference of Governmental Industrial Hygienists (ACGIH), Threshold Limit Values for Chemical Substances and Physical Agents and Biological Indices for 1998.

American National Standards Institute (ANSI)/Illuminating Engineering Society (IES), Industrial Lighting 1991.

American National Standards Institute, Z358. 1-1998. Emergency Eyewash and Shower Equipment 1998.

AR 40-5, Preventative Medicine, 15 October 1990.

AR 385-10, The Army Safety Program, 23 May 1988.

Corps of Engineers Guide Specification, CEGS-1585 1, Overhead vehicle tailpipe (and welding fume) Exhaust Systems, May 1984.

DA PAM 40-ERG, Ergonomics.

DA PAM 40-501, Hearing Conservation, 27 August 1991.

National Safety Council, Fundamentals of Industrial Hygiene, 4~ edition, 1996.

NOR 385-10, Army National Guard Safety and Occupational Health Program, 29 December 1989.

TB MED 503, The Army Industrial Hygiene Program, February 1985.

TG022, US Army Environmental Hygiene Agency (USAEHA), Industrial Hygiene Evaluation Guide, October 1975.

TG 141, US Army for Health Promotion and Preventive Medicine (USACHPPM) Industrial Hygiene Air Sampling Guide, November 1997.

Title 29, Code of Federal Regulations (CFR), 1998, revision Part 1910, Occupational Safety and Health Standards.

Title 29, Code of Federal Regulations (CFR), 1998, revision Part 1926, Construction Standards.

Appendix B: Assessment Criteria

A. Ventilation Standards

Ventilation rates were compared to recommendations made in the ACGIH Industrial Ventilation Manual and Corps of Engineers specifications. See Appendix A for reference information.

B. Illumination Standards

Illumination measurements were compared with recommendations made by the Industrial Engineering Society (IES)/American National Standards Institute (ANSI) RP7-1991 Standard and MIL-STD1472E.

C. Noise

Noise measurements were taken and compared with OSHA Standard 29 CFR 1910.95 and Department of the Army Pamphlet 40-501.

D. Air Sampling

Personal air sampling was conducted in compliance with applicable NIOSH Analytical Methods. Sampling results were compared to relevant Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PEL), American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV), or National Institute of Occupational Safety and Health (NIOSH) Recommended Exposure Limits (REL).

E. Risk Assessment Codes

Risk Assessment Codes (RACs) are included in this report to quantify the risk of particular operations to employees and to establish funding priorities for corrective actions. RACs are assigned with regard to hazard severity and mishap probability. The type, length, and route of exposure are taken into consideration, as are the medical effects that would occur with such exposures.

Appendix C

Photograph Log

Photo 1. Hangar 6 in Anchorage, Alaska.

Photo 2. Hangar 6, 2- x 4- foot suspended ceiling tile.

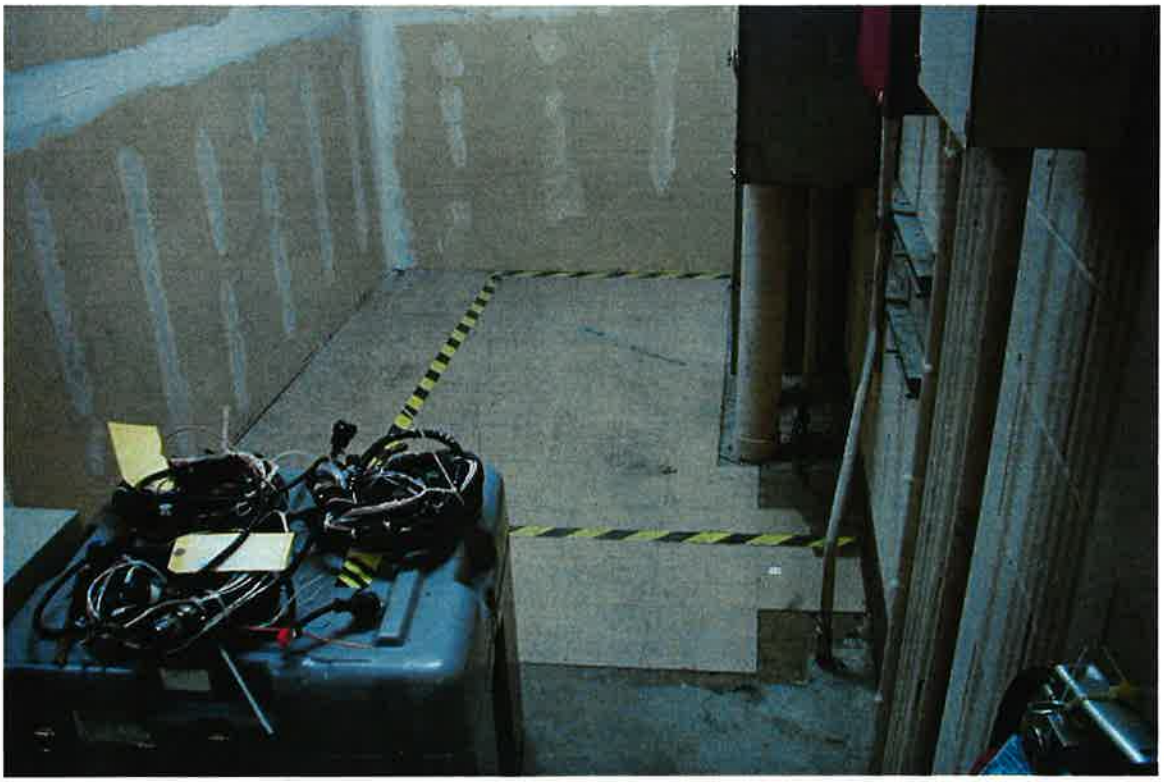


Photo 3. Hangar 6, 9- inch brown vinyl floor tile and gypsum wallboard.

Photo 4. Hangar 6, 12- inch white vinyl floor tile and associated mastic.

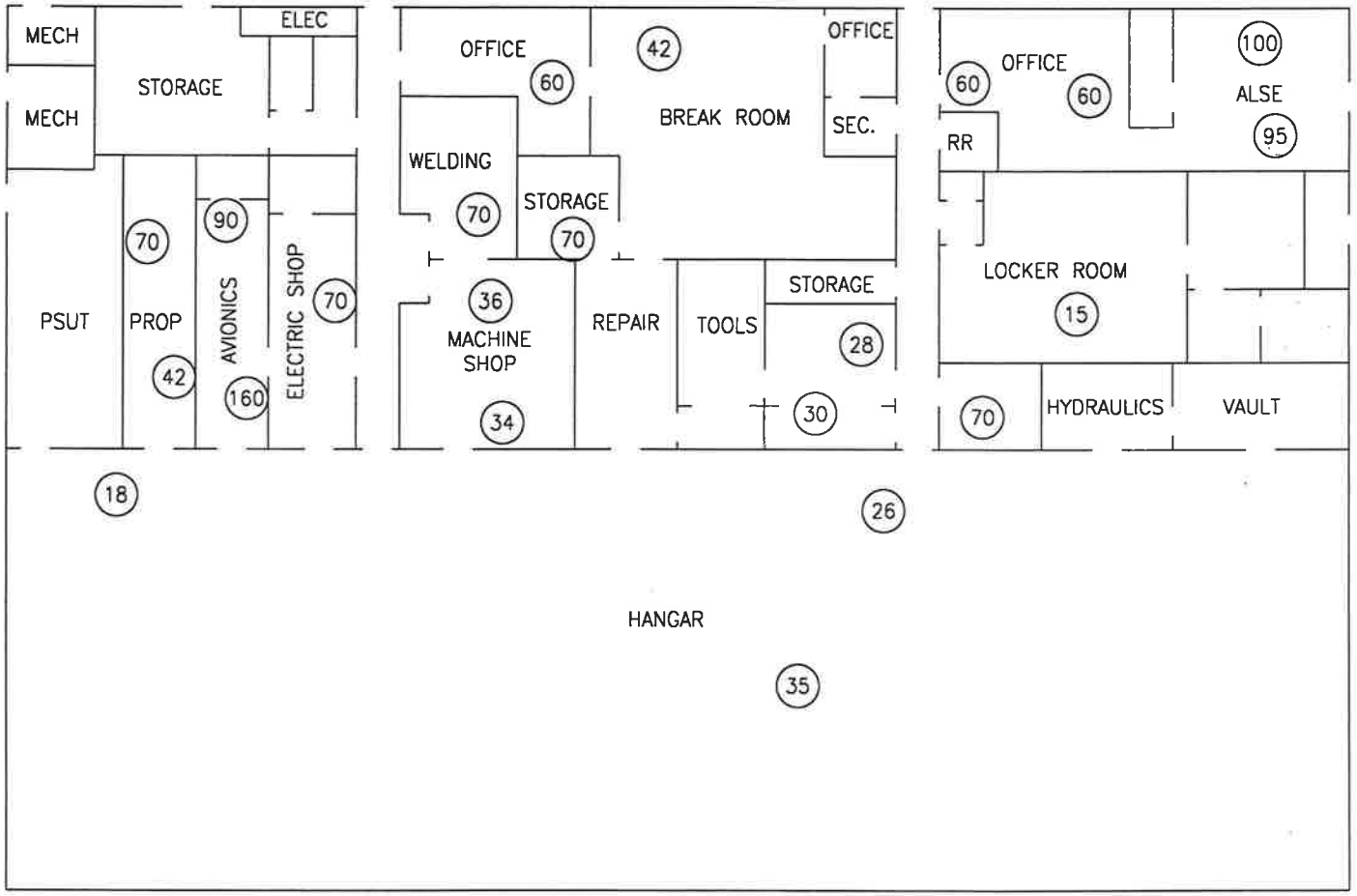
Photo 5. Hangar 6, Metal clad fire doors and frames.

Appendix D

Floor Plans

LEGEND

(XX) = ILLUMINATION (FOOT CANDLES)



ANCHORAGE HANGAR 6

SCALE: N.T.S.

PROJECT NUMBER: I 4429.318

ANCHORAGE HANGAR 6
ILLUMINATION
SAMPLE LOCATIONS

Sheet reference number

Sheet 1 OF 1

Appendix E

Inspector Certification

The

American Board of Industrial Hygiene

ABIH

AMERICAN BOARD OF INDUSTRIAL HYGIENE

organized to improve the practice of Industrial Hygiene
proclaims that

James M. Leeby

having met all requirements through education, experience, and examination, is hereby certified in the

COMPREHENSIVE PRACTICE
of
INDUSTRIAL HYGIENE

and has the right to use the title and designations

CERTIFIED INDUSTRIAL HYGIENIST

CIH

July 15, 1985
date

Chairman ABIH
Vernon E. Rose, Dr. P.H., CIH

3034
certificate number

Secretary ABIH
David M. Trayer, CIH

Appendix F

Calibration Certificate

Certificate of Calibration and Testing

Q-TRAK PLUS Indoor Air Quality Meter

New Instrument

TSI Model	8554	Test Date	8/23/01
TSI Serial Number	8554-08011039	Test Time	10:51
Firmware Version	1.40		

CALIBRATION VERIFICATION RESULTS

Calibration Standard	*Instrument Output*	*Actual Difference*	*Tolerance*
1000 ppm CO2	990 ppm CO2	-10 ppm	± (3% + 50 ppm)
2500 ppm CO2	2469 ppm CO2	-31 ppm	± (3% + 50 ppm)
100.0 ppm CO	99.6 ppm CO	-0.4 ppm	± 3% or 3 ppm
40.0 °C	40.0 °C	0.0 °C	± 0.6 °C (1.0 °F)
30.0 % rh	30.9 % rh	0.9 % rh	± 3% rh
60.0 % rh	60.6 % rh	0.6 % rh	± 3% rh

TSI Incorporated does hereby certify that all materials, components, and workmanship used in the manufacture of this equipment are in strict accordance with the applicable specifications agreed upon by TSI and the customer and with all published specifications. All performance and acceptance tests were successfully conducted according to required specifications. All test and calibration data supplied by TSI has been obtained using standards whose accuracies are traceable to the National Institute of Standards and Technology (NIST) or has been verified with respect to instrumentation whose accuracy is traceable to NIST, or derived from accepted values of physical constants. Calibration procedures for this instrument comply with MIL-STD-45662A, with the exception of the humidity calibration standard, which has an accuracy ratio of 2:1, with respect to the accuracy specifications of the instrument.

Calibration Environment		Applicable Test Reports	Date Last Verified
Ambient Temperature	24.2 °C	Dewpoint	06/15/2000
Barometric Pressure	738.90 mmHg	Barometric Pressure	10/24/2000

Calibrated By

TSI Incorporated

Mailing Address P.O. Box 64394 St. Paul, MN 55164 USA
Shipping Address 500 Cardigan Road St. Paul, MN 55126 US
Phone (800) 926-8378 or (651) 490-2760 Fax (651) 490-2704

Anchorage Hangar 6 Data Sheets

BREAKROOM
556 -
1.3
71.8
32.3

OFFICE 520
565
1.4
71.1
32.3

ALSE
625
1.1
71.3
32.7

HYDRAULICS
525
1.4
70.0
33.5

TOE / TOA
556
1.3
71.2
33.8

HANGAR
550 536
1.3 1.2
70.1 67.0
31.8 33.5

OUTSIDE
469
1.0
59.1
46.5

CMU INTERI
12" FLOOR
AREAS
4" BLACK
GWB BUI
~~STUDS ON~~
P.P.N.G =
ELBOWS =
CARPET
2x4 LAY
HVAC U
3 LOCK

BRN 9

ROOF.N

HANGAR

HANGAR

TOE	TDA	HANGAR	
556		550	536
1.3		1.3	1.2
71.2		70.1	67.0
33.8		31.8	33.5

CMU INTERIOR WALLS
12" FLOOR TILE IN COMMON AREAS
4" BLACK BASEBOARD
GWB BUILD OUTS
~~SHOP UNDERCOAT 2EA~~
PIPING = FIBERGLASS
ELBOWS = FIBERGLASS
CARPET MASTIC
2x4 LAY IN CT 20x14 / PREP/PAINT 40X60
HVAC UNINSULATED THROUGHOUT
3 LOCKED POL'S IN HANGAR WITH MSDS'S
BRN 9" VFT IN ELEC. 100SF
ROOFING EXT CMU PAINT

Clark

Run Time! ~~4:43~~ 5:38 hrs.

Avg.

TWA, 80.0

TWA8, 81.6

LAV8 81.6

Dose 50.56

Peak 93.6

Max 111.0 dBA

Jacob May Shop

Time 5:40 hrs

~~LA~~

TWA, 76.0

TWA8, 77.5

LAV, 77.8

Peak 87.1

Max 111.1

Dose, 12.78

GENERAL EXHAUST VENTILATION SURVEY

BATTERY ROOM

Dimensions:____ ____Ht x _____L x_____W = _____Cu. Ft.

Temperature:____ _____(degrees) F. Humidity:____ _____%

Vent #1: 4"x10"(size) Reading____,____,____,____=_____(Av. fpm)

Vent #2: __NA__(size) Reading_____,_____,_____,_____=_____(Av. fpm)

Question #1. Condition of the battery storage facility? **NA**

Q #2. PPE, clothing, eyewear, etc., in the battery room? **NA**

Q #3 Safety/Emergency equipment in the battery room? **NA**

Q #4 Availability of fire extinguishers, caution signs, spark free switches, MSDS, etc.? **Yes**

Q #5 Eye wash/shower in battery room? **NA**

WELDING ROOM:- NA

Dimensions:_____H x_____L x_____W = _____(Cu. Ft.)

Vent #1 _____(size)Reading _____,_____,_____,_____=_____(Av. fpm)

Vent #2 _____(size)Reading _____,_____,_____,_____=_____(Av. fpm)

FLAMMABBLE STORAGE ROOM – Not applicable

Dimensions:_____H x_____L x_____W= _____(Cu. Ft.)

Vent #1 _____(size)Reading_____,_____,_____,_____=_____(Av. fpm)

SHOP: Anchorage Hangar 6

LOCATION: Anchorage Alaska