SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK
SECTION 02065
CONTAMINATED SOILS REMOVAL, HAULING, AND STOCKPILING

- End of Section Table of Contents -

SECTION 02065
CONTAMINATED SOILS REMOVAL, HAULING, AND STOCKPILING

PART 1 GENERAL

1.1 APPLICABLE PUBLICATIONS
The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
ASTM D 2488 (1993) Description and Identification of Soils (Visual-Manual Procedure)
CORPS OF ENGINEERS (COE) PUBLICATIONS
EM 385-1-1 (1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual
ER 385-1-92 (Dec 1991) Safety and Occupational Health Document Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) Activities.
ER 1110-1-263 (April 1996) Chemical Data Quality Management for Hazardous Waste Remedial Activities, w/ Appendices
CODE OF FEDERAL REGULATIONS (CFR)
29 CFR 1910 Occupational Safety and Health Standards
29 CFR 1926 Safety and Health Regulations for Construction
40 CFR 260 thru 270 EPA's Hazardous Waste Requirements (RCRA)
ENVIRONMENTAL PROTECTION AGENCY (EPA)
EPA SW-846 (Rev O; Update III) Test Methods for Evaluating Solid Waste (Vol IA, IB, IC, and II)
EPA 540/G-89/004 (Oct 1988) Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (Interim Final)
EPA 600/4-79/020 (1983) Methods for Chemical Analysis of Water & Wastes
EPA 600/4-82/057 (July 1982) Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater
STATE OF ALASKA ADMINISTRATIVE CODES (AAC) AND STATUTES (AS)
8 AAC 61 Occupational Safety and Health Division - Occupational Health and Environmental Control, Toxic and Hazardous Substances (as amended through January 22, 1999)
18 AAC 75 Oil and Hazardous Substances Pollution Control
18 AAC 78 (as amended through January 22, 1999) Underground Storage Tanks
AS 18.60 Safety
STATE OF ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION (ADEC) PUBLICATIONS
ADEC GUIDANCE UST PROCEDURES MANUAL (December 10, 1998) Underground Storage Tanks Procedures Manual

1.2 DEFINITIONS
1.2.1 Clean Closure
Clean closure has been obtained when observations or investigations for the excavation site, as required by 18 AAC 78 for Underground Storage Tanks (UST), indicate that a release has not occurred or that further removal or investigation is not required.

1.3 DESCRIPTION OF WORK
Petroleum, oil, and lubricants (POL) contaminated soils are known to exist at the site (specifically the NOAA IRP site, as shown on the drawings) and shall be further identified and quantified by the Contractor's sampling and testing. Contaminated soils shall be removed

as necessary to perform the work, and to the extents shown on the drawings, and disposed of as specified. The Contractor shall attempt to achieve clean closure at each excavation site. No payment will be made for over-excavation or work related thereto, unless specifically directed in writing by the Contracting Officer.

1.3.1 Worker Protection
The Contractor shall provide personal protective equipment and other tools required for worker protection as appropriate for work conditions and as required by paragraph 1.8 SAFETY AND HEALTH. The Contractor shall provide personal protective equipment for the Contracting Officer, as outlined in SECTION 01351 SAFETY, HEALTH, AND EMERGENCY RESPONSE (HTRW/UST).

1.3.2 Inspection
Federal, State or local agencies may require their representative(s) to be present to inspect operations. The Contractor shall comply with all such inspection requirements.

1.3.3 Compliance
Work shall meet or exceed the minimum requirements established by the State of Alaska in applicable statutes and administrative codes. These documents are under constant revision. The Contractor shall be responsible for compliance with the most recent revisions to the regulations throughout the duration of work on the project. The Contractor shall also be responsible for compliance with all applicable Federal and local regulations. Any instances where compliance would exceed the scope of work or specific requirements of the contract, and any conflicts between various regulations or between any regulation and the contract specifications, shall be brought to the immediate attention of the Contracting Officer for resolution.

1.3.4 Available Data
Soil borings have been taken at various locations throughout the site. See the drawings for plotted locations of borings and the soil boring logs. Additional data on subsurface conditions is available for review at the Alaska District Corps of Engineers, (Soils and Geology Section, (907) 753-2681).

1.4 SUBMITTALS
Government approval is required for submittals with a "GA" designation, submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with SECTION 01330 SUBMITTAL PROCEDURES.

SD-01 Data

Sampling and Analysis Plan (SAP); GA.

The Sampling and Analysis Plan (SAP) shall include the Field Sampling Plan

(FSP) and the Quality Assurance Program Plan (QAPP). See paragraph 1.7

SAMPLING AND ANALYSIS PLAN (SAP) in this section and in SECTION 01450

CHEMICAL DATA QUALITY CONTROL.

Safety and Health Program (SHP); GA. - Include the Site Specific Safety and Health Plan (SSHP), and qualifications and training of the site supervisors and employees. See paragraph 1.8 SAFETY AND HEALTH of

this section and paragraph 1.7 Site SAFETY AND HEALTH PLAN of SECTION 01351, SAFETY, HEALTH, AND EMERGENCY REPOSNSE (HTRW/UST)

SD-08 Statements Qualifications; GA. Resume of consultant. See paragraph 1.5.1 CONTRACTOR CONSULTANT. Soil Disposal Certification; FIO. See paragraph 3.6.2 DISPOSAL OF REMEDIATED SOIL.

SD-09 Reports Site Assessment Report; GA. Draft and Final Work Plan. See paragraph 3.7 SITE ASSESSMENT REPORT. Work Plan; GA. Draft and Final Work Plan. See paragraph 1.6 WORK PLAN.

SD-18 Records Correspondence; FIO. Copies of all correspondence with other government agencies shall be furnished immediately upon issue or receipt. All Contractor correspondence with ADEC shall be through the Contracting Officer. Cover letters shall be appropriately addressed with "TO:" and "THROUGH:" headings.

1.5 QUALIFICATIONS

1.5.1 Contractor Consultant

The Contractor shall provide an experienced and qualified consultant as outlined in paragraph 3.5 of SECTION 01450 CHEMICAL DATA QUALITY CONTROL.

1.5.2 Contractor Laboratory

Except as otherwise specified, all testing shall be performed at no additional cost to the Government by a Contractor-retained, commercial testing laboratory which is currently validated by the U.S. Army Corps of Engineers. Point of contact for Corps of Engineers validation is the Alaska District, Soils and Geology Section, (907) 753-2695 or -2681. Copies of the laboratories validation letters shall be included in the work plan.

1.5.3 Support Staff

The Contractor shall identify all staff involved for the various components, including personnel collecting and shipping samples. The qualifications of these staff members shall be detailed by the Contractor.

1.6 WORK PLAN (WP)

The WP shall incorporate the elements specified in EPA 540/G-89/004. The WP shall include the Contaminated Soil Stockpile Design and Operation Plan (see paragraph 3.4 EXCAVATION AND DISPOSAL REQUIREMENTS). Include the Work Plan (WP), composed of the Remediation Plan; and the Sampling and Analysis Plan (SAP), composed of the Field Sampling Plan (FSP) and the Quality Assurance Program Plan (QAPP). See paragraphs 3.6.4 REMEDIATION PLAN (WP) AND 1.7 SAMPLING AND ANALYSIS PLAN (SAP). Submittals will be screened by the Contracting Officer prior to review or transmittal to ADEC for comment. The Contractor shall correct and resubmit items which are unacceptable for detailed review.The 30-day period will not begin until all corrected items are received by the Contracting Officer.

1.7 SAMPLING AND ANALYSIS PLAN (SAP)

The plan shall include an executive summary. The SAP shall reflect the degree of complexity of the project. The SAP shall be composed of a Field Sampling Plan (FSP) and a Quality Assurance Program Plan (QAPP). The SAP shall be in accordance with EPA 540/G-89/004; EPA SW-846, Volume II; ER 1110-1-263; 18 AAC 78; and the ADEC GUIDANCE UST PROCEDURES MANUAL. In the event of conflicts, the more stringent requirements shall be followed. The plans shall include methods to be

used for field screening, frequency of sampling, required number of samples for project work, quality control, and Government quality assurance purposes; and incorporate the Government Quality Assurance (QA) procedures identified in ER 1110-1-263 as a confirmation of the Quality Control (QC) activity, including a discussion of limits of data acceptability, resolution of inconsistencies of data, and procedures for initiating corrective action.

1.8 SAFETY AND HEALTH
See SECTION 01351 SAFETY, HEALTH, AND EMERGENCY RESPONSE (HTRW/UST).

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 GENERAL
3.1.1 Consultant Responsibilities
The Contractor Consultant shall be on site during all excavation, stockpiling, and all other operations involving contaminated soil. The Consultant shall perform all field screening and collect all on-site samples. The Consultant shall review and update the SAP, review tests results, and provide recommendations for the Contractor's testing program.

3.1.2 Work Plan Implementation
The Contractor shall continuously maintain, update, and implement the Work Plan. The Work Plan shall be continuously updated to reflect the conditions and work at the site. A copy of the Work Plan shall be kept at the Work Site at all times and be available to all workers.

3.1.3 Safety Guidelines
Personnel working inside and in the general vicinity of the site shall be trained and thoroughly familiar with the WP, SHP, SSSHP, safety precautions, procedures, and equipment required for controlling the potential hazards associated with this work. Personnel shall use proper protection and safety equipment during work in and around the site as specified in EM 385-1-1, ER 385-1-92 and the contract clauses.

3.1.4 SHP and SSHP Implementation and Documentation
Written documentation of tests shall be submitted on a daily basis to the Contracting Officer, by the morning of the next work day following the tests. Documentation shall include the equipment used (manufacturer's name, brand, and serial number), date and time of each test, reading of levels or concentrations, and printed name and signature of person performing each test. Documentation shall also include date, time, and location where the equipment was last calibrated (laboratory or field) and calibration test data (per manufacturer's recommendations).

3.1.5 Protection of Existing Structures and Utilities
The Contractor shall take all necessary precautions to avoid damage to existing structures, their appurtenances, or utilities that may be affected by work activities. Any damage resulting from the Contractor's operations shall be repaired at no expense to the Government. The Contractor shall coordinate with the installation to locate underground

utilities prior to beginning construction. Utilities encountered which were not previously shown or otherwise located shall not be disturbed without approval from the Contracting Officer.

3.1.6 Leaks, Spills, and Releases
Whenever the Contractor suspects or has knowledge of a leak, spill, or release of oil, hazardous substances, or regulated substance not previously identified in the contract documents, the Contractorshall immediately prepare an ADEC Oil and Hazardous Materials Incident Report Form in accordance with ADEC regulations. The Contractor shall hand-deliver or FAX the completed form to the Contracting Officer and the Installation Environmental Office. The Installation Environmental Office will be responsible for providing notification to ADEC. The Contractor shall reevaluate the SHP as appropriate and await direction from the Contracting Officer before proceeding.

3.2 CONTAMINATED SOIL IDENTIFICATION
Soils within the NOAA IRP site are contaminated with POL products. Contaminated soils shall be identified by commercial laboratory testing, with confirmation by Contractor quality control and Government quality assurance samples. Visual inspection and field screening shall be used as appropriate in the FSP. The Contractor shall perform a general site inspection as outlined below. Paragraph titled Number of Samples summarizes purposes and types of testing required. All contaminated soils shall be removed only to the extent and limits of the excavations necessary to complete the work under this contract.

3.2.1 General Site Inspection
The inspection shall include:

a. checking for obvious leaks and spills;

b. checking for any obvious soil or water contamination caused by a release or leakage;

c. determining from contract documents, on-site personnel, and any required sampling and testing, the general nature of the contamination, and estimated depth to groundwater;

d. classifying the soil strata according to ASTM D 2488 from visual observations of the site and any required excavation. (Note: sieve analyses are not required; excavation is not required solely for soil strata classification); and

e. recording local climatological conditions during inspection;

3.2.2 Field Screening Soils
The Contractor shall exercise a high degree of control over field screening, sampling, and testing in conjunction with construction in order to minimize the amount of excavated material requiring temporary stockpiling, prevent dilution of contaminated soils with clean soils, and insure completion of work within the limited construction season. The Contractor shall obtain timely and accurate chemical sampling and test data. All samples taken each day shall be tested with a maximum 14-day turnaround.

3.3 SOIL CLASSIFICATION, TESTING, AND ANALYSIS
3.3.1 Classification of Soil Contamination

a. Clean (also referred to as uncontaminated). No visible stains, no smell of fuels or volatiles, no analytical test results above background on the Residual Range Organics (RRO), and Diesel Range

Organics (DRO), Gasoline Range Organics (GRO), benzene, toluene, ethylbenzene, and xylenes (BTEX).

b. Contaminated.

1. Low-Level Contaminated. No hydrocarbons above 18 AAC 78, Category A, levels. Additionally, no Volatile Aromatic Hydrocarbons (VAH) above 18 AAC 75, 341 cleanup levels.

2. High-Level Contaminated. Hydrocarbons above 18 AAC 78, Category A, levels and VAHs above 18 AAC 75, 341 levels.

3.3.2 Field Screening Tests

The Contractor's Qualified Person shall use an volatile hydrocarbons test or other appropriate field test to qualitatively check for the presence or absence of soil contamination where visible stains are not apparent. The Contractor shall incorporate field screening into the SAP to insure adequate and economical selection of samples for laboratory testing. Field screening shall be utilized according to ADEC requirements and prudent, professional judgment. The type of field screening instruments to be used on site shall depend upon the type of contamination indicated. The Contractor shall include in the SAP a description of the type of instruments selected, limits, action levels, procedures for testing, to include coordination/verification with the commercial testing laboratory tests, and the Qualified Person's training to use the instruments and interpret the data. The Contractor shall prepare a table to compare field screening results with laboratory testing results. This table shall be updated as sampling and testing proceeds. A final copy, including an explanatory narrative, shall be part of the Field Report.

3.3.3 Sampling and Testing

Sampling and testing shall be in accordance with the methods identified below (Type Test/Method or Procedure):

a. Gasoline Range Organics (GRO)/State of Alaska Method AK 101.

b. Diesel Range Organics (DRO)/State of Alaska Method AK 102.

c. Residual Range Organics (RRO)/State of Alaska Method AK 103.

d. Benzene, Toluene, Ethylbenzene, Xylenes (BTEX)/EPA SW-846, "Test Methods for Evaluating Solid Wastes," Test Method 8021B.

3.3.3.1 Number of Samples

The minimum number of soil samples collected from excavations shall be as identified in 18 AAC 78 (including guidance manuals). The Contractor is responsible for preparing the proposed sampling scheme and determining the analyses to be performed on the samples, and shall include this information in the Sampling and Analysis Plan (SAP).

a. Stockpiles. Samples shall be taken each day that excavation or stockpiling operations occur. The following numbers of samples, as a minimum, shall be collected and tested in accordance with the approved SAP:

(1) Temporary Stockpiles and all Excavated Materials: Sample as required to segregate excavated materials into classification specified, i.e., clean, low-level, etc.

(2) Long-term stockpile contaminated soil: Two samples for the initial 50 cubic meters of material and 1 sample for each additional 50 cubic meters above the initial 50, or portion thereof.

b. Minimum number of samples for closure (does not include required QC and Government QA Samples). The minimum number shall be whichever requires the greatest number of samples:

(1) As required by 18 AAC 78 (including guidance manuals);
(2) Two samples for excavations of 50 square meters or less;
(3) At least 1 sample for each 250 square meters of the excavations

c. QC and Government QA samples shall be taken as specified in paragraphs: Quality Control (QC) Samples, and Government Quality Assurance (QA) Samples.

3.3.3.2 Number of Tests
The tests specified shall be performed on each sample taken. The number of tests shall be sufficient to perform the work specified as described in the SAP.

3.3.4 Quality Control (QC) Samples
In addition to the samples and tests as specified above, ten percent (10%) (minimum of one) of the samples collected for each test method shall be collected as split/duplicate samples for analysis in the Contractor's commercial testing laboratory. Samples for volatile analyses shall be collected as triplicates, others shall be splits of homogenized samples. The SAP shall include information regarding the quantities and types of these samples to be collected. QC and QA samples shall be taken simultaneously as triplicate splits. Other Contractor QC Samples (trip blanks, decontamination blanks, etc.) and other samples shall be taken as required by the ADEC GUIDANCE MANUAL, the SAP and the Internal Quality Control Reporting requirements below.

3.3.5 Government Quality Assurance (QA)Samples (apply to soil samples only) Quality Assurance Samples: In addition to the blind field duplicate QC samples, ten percent (10%) (minimum of one) of the samples collected for each test method shall be collected as split/duplicate samples for shipment to the Government QA laboratory as an external check on the laboratory analysis. QC and QA samples shall be taken simultaneously as triplicate splits. Samples for volatile analyses shall be collected as triplicates, others shall be splits of homogenized samples. This QA testing is in addition to, and separate from, the Contractor's commercial testing laboratory internal QA testing. The SAP shall include information regarding the quantities and types of these samples to be collected. This confirmational quality assurance analysis will be performed at a laboratory to be designated by the Contracting Officer.

3.3.5.1 Submittals To The Government QA Laboratory
The Contractor shall submit to the Contracting Officer a list of required analyses, estimate of the number of tests, approximate sampling dates, and requested completion date for QA testing at least 20 days prior to shipping initial samples so that the work can be scheduled. The Contracting Officer shall be notified immediately of any changes. The Contractor shall provide all labor and field supplies, including sample containers and shipping coolers, for collecting and shipping samples for Government QA testing. Government QA laboratory charges will be paid by the Government. The Contractor shall, in the presence of the Contracting Officer, properly collect, label, and package the duplicate QA samples, fill out all chain-of-custody forms, and ship the samples by one-day delivery service to the designated laboratory for analysis. The Contractor shall notify the Contracting

Officer when all sampling is completed and shall clearly mark the chain-of-custody form accompanying the final shipment "FINAL" in 3 millimeter high lettering. A Summary Report shall be provided to the Contracting Officer within 7 days after the Contractor receives the project sample laboratory data. The report shall include a site plan and section showing the sample locations. The Summary Report shall also include the following:

a. Sample Key/Sample ID's: The Contractor shall prepare a tabular presentation which shall: match contract laboratory sample aids to QA laboratory sample aids; identify all Field Duplicates; identify all Field Blanks (including rinsates and trip blanks); match all rinsates with their corresponding field samples; and match each trip blank with the samples that accompanied it during shipment. The table shall include all relevant sample numbers, the date each was collected, the matrix of each, the analytical method(s) requested for each, and any other applicable information.

b. Sample Receipt: The Contractor's laboratory shall complete and report a "Cooler Receipt Form" for all shipments for purposes of noting problems in sample packaging, chain-of-custody, and samplepreservation. The form shall also document the cooler's interior temperature upon opening by the laboratory.

c. Copies of all chain-of-custody forms.

d. General Organic and Inorganic Reporting: For each analytical method run, the Contractor shall report all analytes for each sample as a detected concentration or as less than the specific limits of quantization. Generally, all samples with out-of-control spike recoveries being attributed on matrix interferences shall be designated as such. All soil/sediment and solid waste samples shall be reported on a dry-weight basis with percent moisture and percent solids reported. The Contractor shall also report dilution factors for each sample as well as the date of extraction (if applicable)and date of analysis. All appropriate data quality flags shall be reported. Report time and date each sample was received at the laboratory, time and date each sample was extracted (if applicable), time and date each sample was analyzed, and holding times, sample storage and preservation.

e. Internal Quality Control Reporting: (At a minimum, internal quality control samples shall be analyzed at rates specified in the specific methods.

(1) Laboratory Blanks (Method Blanks and Instrument Blanks): All analytes shall be reported for each laboratory blank. All non-blank sample results shall be designated as corresponding to a particular laboratory blank in terms of analytical batch processing.

(2) Surrogate Spike Samples: Surrogate Spike Recoveries shall be reported with all organic method reports where appropriate (i.e., when the method requires surrogate spikes). The report shall also specify the control limits for surrogate spike results as well as the spiking concentration. Any out-of-control recoveries (as defined in the specified method) shall result in the sample being rerun (both sets of data shall be reported) or data being flagged.

(3) Matrix Spike Samples: Matrix Spike Recoveries shall be reported for all organic and inorganic analyses. All general sample results shall be designated as corresponding to a particular matrix spike sample. The report shall indicate what field sample was spiked. The report shall also specify the

control limits for matrix spike results for each method for each matrix.

(4) Laboratory Duplicates and/or Matrix Spike Duplicate Pairs: Relative Percent Difference shall be reported for all duplicate pairs as well as analyte/matrix specific control limits.

(5) Controls: When run for internal quality control, Laboratory Control Standards results shall be reported with the corresponding field sample data. Control limits for LCSs shall also be specified.

f. Field Duplicates and Field Blanks: These samples shall be identified as such by the Contractor and reported as any other field sample. Field duplicates shall be reported alongside of the corresponding project sample result. Percent Relative Standard Deviation shall be reported for all field duplicate pairs. Field blanks shall be analyzed for the same parameters as the samples.

g. Proof of Checking: Proof that the data have been checked by the laboratory manager or QA officer.

h. Chromatograms: Chromatograms for all fuel identification and/or quantization methods, including GRO, DRO, etc.

3.3.5.2 Data Validation

The Government laboratory will perform data validation. The product of this review is the Chemical Quality Assurance Report. Review will include all Quality Control parameters such as holding times, detection limits, method blanks, surrogate recoveries, matrix spikes and duplicates, and inter-laboratory and intra-laboratory data comparisons.

3.3.5.3 Acceptance and Final Disposition

The Contractor shall allow 60 calendar days for laboratory analysis of QA samples and data review. The elapsed time shall begin when the Contractor's last sample arrives at the designated laboratory, provided that the Contractor's completed Summary Report is received within 30 calendar days thereafter. Otherwise, the Contractor shall allow 30 calendar days from the date the completed summary report is received at the laboratory. The Contractor may, at his option, continue activities based on initial sampling and QC results, prior to receipt of Government QA test results. Where Government QA results are unacceptable due to Contractor negligence (improper sample collection and/or handling by the Contractor), or where Government QA results conflict with the Contractor's QC results, further sampling and testing shall be performed as directed by the Contracting Officer. All costs for such additional sampling and testing due to Contractor negligence, including both QC and Government QA testing and analysis, and for any required remedial actions in the work, shall be borne by the Contractor. No payment will be made for laboratory sampling and testing prior to receipt and acceptance by the Government of the QA samples and the completed Contractor Summary Report, properly formulated in accordance with these specifications.

3.4 EXCAVATION AND DISPOSAL REQUIREMENTS

3.4.1 Excavation

The Contractor shall conduct field screen testing within the NOAA IRP site prior to excavation to determine the approximate boundaries of any soil contamination and throughout the duration of excavation activities to identify any contaminated soils. Excavation shall be performed in a manner that will prevent contaminated soil from becoming mixed with

previously uncontaminated soil. All excavated material shall be field screened per paragraph 3.3.2 FIELD SCREENING TESTS. Other sampling and testing shall be as specified. Contaminated and uncontaminated soil shall be segregated in separate temporary stockpiles. Open excavations and stockpile areas shall be secured while awaiting verification test results. Surface water shall be diverted to prevent direct entry into the excavation. The excavation shall not be backfilled without approval from the Contracting Officer. The Contractor shall attempt to achieve clean closure at each excavation site but shall not excavate beyond the lines specified or shown without written direction from the Contracting Officer. Any evidence that contamination extends beyond lines shown shall be reported on the same day it is discovered, to the installation's Environmental Coordinator and the Contracting Officer.

3.4.1.1 Temporary On-Site Stockpiles
Uncontaminated excavated soil shall be temporarily stockpiled and used for backfill in the excavation prior to using borrow material. Contaminated soil shall be stockpiled for sampling in accordance with paragraph 3.3.1 CLASSIFICATION OF SOIL CONTAMINATION. Uncontaminated soil shall be stockpiled separately from the contaminated soil, a safe distance away from, but adjacent to, the excavation. Contaminated soil shall be placed on an impermeable geomembrane meeting the minimum requirements in 18 AAC 78.311 for short term storage, and covered with a sheet of geomembrane meeting the minimum requirements in 18 AAC 78.311. Top covers for stockpiles shall be held in place with concrete pavers or sandbags.

3.4.2 Disposal of Contaminated Soil
The Contractor shall remediate all contaminated soil prior to disposal. The Contractor shall not use dilution or mixing for the reduction of contamination, but shall carefully segregate clean and contaminated soils to minimize additional soil contamination. No material shall be wasted without prior approval of the Contracting Officer. See paragraph Stockpiling Corrective Action.

3.4.2.1 Clean
Excavated soils that are "clean" as defined above may be used as a source of area fill or backfill material within the requirements of other sections of these specifications. This "clean" material may be placed in all areas. All "clean" soil not used shall be wasted in the disposal area shown on the drawings or as otherwise directed.

3.4.2.2 Contaminated (Low-level and High-level)
Excavated soils that are contaminated as defined above shall be stockpiled on-site as directed. Contaminated soils shall not be used as fill or backfill and shall be remediated as specified in paragraph 3.6 REMEDIATION OF CONTAMINATED SOIL.

3.4.3 Disposal of Contaminated Water
The Contractor shall treat and dispose of contaminated water at an off-base location. The proposed methods of treatment and disposal shall be described in the Work Plan.

3.4.4 Transportation of Wastes
Transportation shall be provided in accordance with Department of Transportation (DOT) Hazardous Material Regulations and State and local requirements, including obtaining all necessary permits, licenses, and

approvals. Evidence that a State licensed hazardous waste transporter is being used shall be included in the SUBMITTALS.

3.4.4.1 Hauling of Contaminated Soils
All truck loads of contaminated materials shall be covered during transport. If wet materials are transported, trucks shall be lined to preclude spillage of contaminated materials. The Contractor shall take precautions to prevent particulate matter from becoming airborne. Contaminated soil shall be contained during transport. Any spills during transport shall be promptly picked up and the affected area cleaned. All spills shall be reported to the ADEC through the Installation Environmental Office (see paragraph 3.1.6 LEAKS, SPILLS, AND RELEASES). The Contractor shall take all necessary precautions to prevent any cross contamination between contaminated and noncontaminated soils.

3.5 BACKFILLING
Excavations shall be backfilled only after the soil test results have been approved. The information required for Closure and other reports shall be obtained prior to beginning backfill. The excavation shall be dewatered if necessary at no expense to the Government. Backfilling shall be in accordance with SECTION 02319 EARTHWORK FOR VEHICLE TRAFFIC AREAS, SIDEWALKS, CURBS AND GUTTERS, AND AREA GRADING.
The excavation(s) shall be completely backfilled within 14 days of Contractor receipt of acceptable Government QA results. The top 150 millimeters of the excavation bottom shall be scarified and allowed to aerate a minimum of 24 hours immediately prior to backfill operations. Backfill shall be placed in accordance with other sections of these specifications, as appropriate. Excavated materials conforming to specification requirements for materials to be used for fills, backfilling, grading or topsoiling, may be utilized within the limitations specified in paragraph 3.3.1 CONTAMINATED SOIL IDENTIFICATION. Only "Clean" soil shall be used for backfilling.

3.5.1 Physical Marking of Test Samples Locations
Where clean closure is not obtained, the Contractor shall provide a physical marker at the location of each sample where the level of contamination is greater than that required for clean closure. The physical markers shall be comprised of a #4 (minimum) reinforcing steel bar, 25 millimeters diameter standard aluminum survey cap, and steel fence post 2.5 meters in length. The steel bar shall be driven 450 millimeters below the excavation line and be of sufficient, continuous length to extend 300 millimeters above finish grade. Aluminum cap shall be securely driven on the top of the bar and marked with the sample number, tank group, and/or other notation to identify and reference the location. The steel post shall protect the bar and cap, be an approved color, be positioned within 150 millimeters of the bar, and be driven to an approved depth.

3.6 REMEDIATION OF CONTAMINATED SOIL
3.6.1 Method and Type
The Contractor shall thermally remediate contaminated soils as defined above, at a facility licensed and approved by the State of Alaska, Department of Conservation for this type of remediation. Qualifications of the facility shall be submitted for approval. The Contractor shall coordinate with the facility prior to excavation at the UST Site to confirm the procedures, i.e. segregation by soil type, level of

contamination, etc., required by the facility to successfully thermally remediate the soil. The Contractor shall be responsible for ensuring that thermal remediation reduces the contaminations to levels below the concentrations listed for 18 AAC 78.315, Table D, Level A.

3.6.2 Disposal of Remediated Soil
The Contractor is responsible for disposal of thermally remediated soil following treatment and for obtaining certification proving soils have been properly disposed of. The Contractor shall provide certification indicating that there is no further Government liability for the soils after disposal. Certification shall include the name and address of the facility at which disposal occurred and describe the disposal location. Disposal of contaminated material shall be in accordance with guidelines outlined in 18 AAC 78.274 and the disposal shall be approved by ADEC.

3.6.3 Sampling and Testing
It is the Contractor's responsibility to ensure adequate sampling and testing is performed prior to beginning remediation, during the remediation, and for proper disposal of remediated soil. The Contractor shall provide the results of all tests to the Government (see paragraph Field Report). Sampling and testing, required for remediation of the contaminated soil stockpiles, beyond that specified in paragraph 3.4 EXCAVATION AND DISPOSAL REQUIREMENTS and for disposal of the thermally remediated soil shall be considered incidental to the cost of remediation. Confirmational sampling and testing to determine levels of contamination following thermal remediation shall be conducted by the firm performing the remediation unless where other procedures are approved by the Contracting Officer.

3.6.4 Remediation Plan
The Contractor shall prepare a Remediation Plan as an addendum to the specified Work Plan. The Plan shall contain the methods and procedures the Contractor shall use to remediate the soil stockpile(s). The plan shall be comprehensive from initial building of the stockpile through remediation and final clean-up of the site. The plan shall include the requirements of the remediation and disposal facilities, proposed sampling and testing, transport of materials, remediation, method of disposal, site restoration, and other procedures and actions which the Contractor proposes for remediation of the contaminated soil.

3.7 SITE ASSESSMENT (SA) REPORT
The Contractor shall prepare and submit a draft and final SA report for each excavation or site. All copies, except one final SA report, shall be bound, including all photographs/slides. The Contractor shall make an assessment of the site based on the field work and analysis required by this contract. As-built drawings shall accompany the SA Report and be listed in the Report's Table of Contents. As a minimum, each SA report shall include the following:

a. The Owner's Name and Address.
b. The Operator's Name and Address (if different from the owner).
c. Location of the Excavation, including:
(1) the legal description by subdivision lot, block, or tract information; or by section lot, tax lot, or government lot number; or (2) the meridian, township, range, section, and nearest quarter section locations within the section.

d. Any historical information regarding a previous release, repair, spill or cleanup which becomes known during the project
e. Data report required by ADEC GUIDANCE MANUAL

f. Name and business address of each person who supervised the SA
g. A narrative description of activities conducted at the site and dates the activities occurred
h. A Site Sketch that shows
(1) the location and configuration of any tanks, piping, containers, and contamination found (if applicable);
(2) the locations of any samples taken, including depth; (3) the proximity to building and residences;
(3) any release sites (if applicable);
(4) any free product sites (if applicable);
(5) any debris sites;
(6) the facility and property boundaries;
(7) a bar scale and north arrow; (9) any other pertinent information;
i. A Photographic History. A photographic history and description of the contract work to include pre- and post-construction photographs. Each print shall show the following information in typewritten format.
(1) Location;
(2) Contract No.;
(3) Contractor/Photographer;
(4) Date/Time;
(5) Photograph No.;
(6) Description;
(7) Direction of View;
j. Local Climatological Conditions During the Site Work.
k. Documentation of Materials Handling to include:
(1) information on all "regulated" and "hazardous" materials;
(2) quantities removed;
(3) procedures utilized;
(4) disposition;
SECTION 02065 Page 18

(5) copies of "Complete Manifest Packages";
(6) copies of all "Transportation and Disposal Tracking Forms";
1. Data Presentation. All test results shall be submitted. Results shall be presented as the reports were received from the laboratories and cross referenced to summary sheets showing the date, time, location of the sample collected, and the name of person who collected the samples. The summary sheets shall include all project sample results, QC sample results, and QA sample results in a side-by-side format. (This is in addition to the Summary Report and test results. See paragraph 1.4 SUBMITTALS to the Government QA Laboratory.) A summary of the sampling results and findings shall be included.
m. The Government Quality Assurance Report. The Government QA report shall be attached as an appendix; the SA Report will not be accepted without the QA Report. Payment will be withheld until the SA Report, including QA Report, is submitted. The Contractor shall attach a cover letter report to the QA report addressing comments on incomplete data, incorrect procedures, incorrect QA and QC procedures, poor holding times, etc.
n. Field Notes: The Contractor shall maintain field notes in a bound book. Field notes shall be written in ink. Erasures will not be allowed. The Contractor shall document all field activities and any visibly contaminated soil. The Contractor shall include a copy of the field notes as part of the SA Report.
o. ADEC Forms.
p. Remediation Report.
3.7.1 SA Report Schedule
The Contractor shall submit the draft SA report within 21 calendar days of completion of excavation. The Contracting Officer will provide comments on the draft report to the Contractor within 30 calendar days after the draft report has been submitted. The Contractor shall incorporate all Government comments in the final report. The Contractor shall submit the final report within 14 calendar days of receipt of comments.
-- End of Section --
SECTION 02065 Page 19

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK
SECTION 02065
CONTAMINATED SOILS REMOVAL, HAULING, AND STOCKPILING

- End of Section Table of Contents -

SECTION TABLE OF CONTENTS
DIVISION 02 - SITE WORK
SECTION 02111
EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL

End of Section Table of Contents -

SECTION 02111
EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 5434 (1993) Guide for Field Logging of Subsurface Explorations of Soil and Rock

CODE OF FEDERAL REGULATIONS (CFR)

40 CFR 302 Designation, Reportable Quantities, and Notification

1.2 SURVEYS

Surveys shall be performed immediately prior to and after excavation of contaminated material to determine the volume of contaminated material removed. The Contractor shall provide cross-sections on 10.0 meter intervals and at obvious break points for all excavated areas. Locations of confirmation samples shall also be surveyed.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation, submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with SECTION 01330 SUBMITTAL PROCEDURES: SD-01 Data Excavation and Handling Work Plan; GA. An Excavation and Handling Work Plan shall be submitted no more than 30 calendar days after notice to proceed. No work at the NOAA IRP site, with the exception of site inspections and surveys, shall be performed until the Work Plan is approved. The Contractor shall allow 45 calendar days in the schedule for the Government's review. No adjustment for time or money will be made if resubmittals of the Work Plan are required due to deficiencies in the plan. At a minimum, the Work Plan shall include:

a. Schedule of activities.
b. Method of excavation and equipment to be used.
c. Shoring or side-wall slopes proposed.
d. Dewatering plan.
e. Storage methods and locations for liquid and solid contaminated material.
f. Borrow sources and haul routes.
g. Decontamination procedures.
h. Spill contingency plan.
i. Excavation sampling and stockpile sampling frequency and chemical analysis.
j. Storage treatment and disposal plans for contaminated soils.

SD-09 Reports. Surveys; FIO. Cross-sections and areas of excavation. Confirmation Sampling and Analysis; FIO. Sampling of Stored Material; FIO. Chemical Testing; FIO. Closure Report; FIO. See paragraph, 3.10 CLOSURE REPORT.

1.4 DEFINITIONS

Contaminated and uncontaminated soils shall be as defined in paragraph 3.3.1 of SECTION 02065 CONTAMINATED SOILS REMOVAL, HAULING, AND STOCKPILING.

1.5 REGULATORY REQUIREMENTS

1.5.1 Permits and Licenses
The Contractor shall obtain required federal, state, and local permits for excavation and storage of contaminated material. Permits shall be obtained at no additional cost to the Government.

1.6 DESCRIPTION OF WORK
The work shall consist of excavation, temporary storage, and disposal/treatment of approximately 2,400 cubic meters of contaminated material. Approximate locations of contaminated material are shown on the drawings and labeled "NOAA IRP Site". Chemical analysis of contaminated material has been performed by the Government and is available for review by contacting the Corps of Engineers, Alaska District, Soils and Geology Section at (907) 753-2681. Subsurface conditions are shown on the drawings. The Contractor shall perform an independent evaluation of the site characterization data. The Contracting Officer shall be notified immediately if contaminated material is discovered which has not been previously identified or if other discrepancies between data provided and actual field conditions are discovered.

1.7 CHEMICAL TESTING
Required sampling and chemical analysis shall be conducted in accordance with SECTION 01450 CHEMICAL DATA QUALITY CONTROL and SECTION 02065 CONTAMINATED SOILS REMOVAL, HAULING, AND STOCKPILING.

1.8 SCHEDULING
The Contractor shall notify the Contracting Officer 7 calendar days prior to the start of excavation of contaminated material. The Contractor shall be responsible for contacting regulatory agencies in accordance with the applicable reporting requirements.

PART 2 PRODUCTS
2.1 BACKFILL MATERIAL
Backfill material may be obtained from areas of excavation within the project limits and from the on base borrow source noted on the drawings. Backfill shall meet the requirements of SECTION 02319 EARTHWORK FOR VEHICLE TRAFFIC AREAS, SIDEWALKS, CURBS AND GUTTERS, AND AREA GRADING. If backfill material from the NOAA IRP site is reused, a minimum of one set of classification tests shall be performed per borrow source and 1 backfill sample shall be collected and tested for the following list of contaminants: Chemical Parameter DRO, GRO, RRO Benzene Toluene Ethylbenzene Xylenes Backfill orignating from the NOAA IRP site shall not be used until borrow source chemical and physical test results have been submitted and approved.

2.2 SPILL RESPONSE MATERIALS
The Contractor shall provide spill response materials including, but not limited to the following: containers, adsorbents, shovels, and personal protective equipment. Spill response materials shall be available at all times in which hazardous materials/wastes are being handled or transported. Spill response materials shall be compatible with the type of materials and contaminants being handled.

PART 3 EXECUTION

3.1 EXISTING STRUCTURES AND UTILITIES See SECTION 02319 EARTHWORK FOR VEHICLE TRAFFIC AREAS, SIDEWALKS, CURBS AND GUTTERS, AND AREA GRADING.

3.2 CLEARING AND GRUBBING See SECTION 02230 CLEARING AND GRUBBING.

3.3 CONTAMINATED MATERIAL REMOVAL

3.3.1 Excavation

Areas of contamination shall be excavated to within 50 mm of the depth and extent shown on the drawings. Excavation shall be performed in a manner that will limit the potential for contaminated material to be mixed with uncontaminated material. The Contractor shall maintain an excavation of sufficient size to allow workers ample room to complete the work. A log of the materials and any visible signs of contamination encountered during excavation shall be maintained for each area of excavation. Excavation logs shall be prepared in accordance with ASTM D 5434. Ground water is approximately 7.5 meters below pre-excavation ground surface and is not expected to be encountered during excavation activities.

3.3.2 Shoring

Sheeting, bracing, or shoring shall be installed in the absence of adequate side slopes if there is a need for workers to enter the excavated area.

3.3.3 Dewatering

Surface water shall be diverted to prevent entry into the excavation using ADEC Best Management Practices. Dewatering shall be limited to that necessary to assure adequate access, a safe excavation, and to ensure that compaction requirements can be met.

3.4 CONFIRMATION SAMPLING AND ANALYSIS

The Contracting Officer shall be present to inspect the removal of contaminated material from each site. After all material suspected of being contaminated has been removed, the excavation shall be examined for evidence of contamination and, if appropriate, field analysis used to determine the presence of volatile and organic or other petroleum contamination using a real time vapor monitoring instrument or immunoassay field kits. Excavation of additional material shall be as directed by the Contracting Officer. After all contaminated material is removed to the limits shown on the drawings, confirmation samples shall be collected and analyzed for the following contaminants:
Chemical Parameter DRO, GRO, RRO, Benzene Toluene Ethylbenzene Xylenes
Samples shall be collected at a frequency of one per 100 square meters from the bottom and each of the side walls. A minimum of one sample shall be collected from the bottom and each side wall of the excavation. Based on test results, the Contractor shall propose any additional excavation which may be required to remove material which is contaminated above action levels. Additional excavation shall be subject to approval by the Contracting Officer. Locations of samples shall be marked in the field and documented on the as-built drawings. All sampling should be conducted following guidelines in the ADEC Underground Storage Tanks Procedures Manual. QA sampling shall be conducted as outlined in SECTION 01450 CHEMICAL DATA QUALITY CONTROL.

3.5 CONTAMINATED MATERIAL STORAGE

Excavated material shall be stockpiled as specified in Section 02065 CONTAMINATED SOILS REMOVAL, HAULING, AND STOCKPILING.

3.6 SAMPLING

3.6.1 Sampling of Stored Material

Samples of stored material shall be collected at a frequency as outlined in Section 02065 CONTAMINATED SOILS REMOVAL, HAULING, AND STOCKPILING. Chemical analyses for contaminated material to be taken to an offsite treatment facility shall also conform to the requirements of the treatment facility. Documentation of all analyses performed shall be furnished to the Contracting Officer. Additional sampling and analyses to the extent required by the approved offsite treatment, storage or disposal (TSD) facility shall be the responsibility of the Contractor and shall be subject to approval by the Contracting Officer.

3.7 SPILLS

In the event of a spill or release of a hazardous substance (as designated in 40 CFR 302), pollutant, contaminant, or oil (as governed by the Oil Pollution Act (OPA), 33 U.S.C. 2701 et seq.), the Contractor shall notify the Contracting Officer and the On-Base Fire Department immediately. If the spill exceeds the reporting threshold, the Contractor shall follow the pre-established procedures as described in the RCRA Contingency Plan for immediate reporting and containment. Immediate containment actions shall be taken to minimize the effect of any spill or leak. Cleanup shall be in accordance with applicable federal, state, and local regulations. As directed by the Contracting Officer, additional sampling and testing shall be performed to verify spills have been cleaned up. Spill cleanup and testing shall be done at no additional cost to the Government.

3.8 BACKFILL

Excavations shall be backfilled in accordance with Section 02065 CONTAMINATED SOILS REMOVAL, HAULING, AND STOCKPILING.

3.8.1 Compaction

Backfill shall be compacted in accordance with SECTION 02319 EARTHWORK FOR VEHICLE TRAFFIC AREAS, SIDEWALKS,CURBS AND GUTTERS, AND AREA GRADING.

3.9 DISPOSAL REQUIREMENTS

Offsite disposal of contaminated material shall be in accordance with Section 02065 CONTAMINATED SOILS REMOVAL, HAULING, AND STOCKPILING.

3.10 CLOSURE REPORT

Five copies of a Closure Report shall be prepared and submitted within 21 calendar days of completing work at the site. The report shall be labeled with the contract number, project name, location, date, name of General Contractor, and the Corps of Engineers District contracting for the work. The Closure Report shall include the following information as a minimum:

a. A cover letter signed by a responsible company official certifying that all services involved have been performed in accordance with the terms and conditions of the contract documents.

b. A narrative report including, but not limited to, the following:

(1) site conditions, ground water elevation, and cleanup criteria;

(2) excavation logs;

(3) field screening readings;
(4) quantity of materials removed from each area of contamination;
(5) quantities of water/product removed during dewatering;
(6) sampling locations and sampling methods;
(7) collection data such as time of collection and method of preservation;
(8) sample chain-of-custody forms; and
(9) source of backfill.

c. Copies of all chemical and physical test results.

d. Copies of all manifests and land disposal restriction notifications.

e. Copies of all certifications of final disposal signed by the responsible disposal facility official.

f. Waste profile sheets.

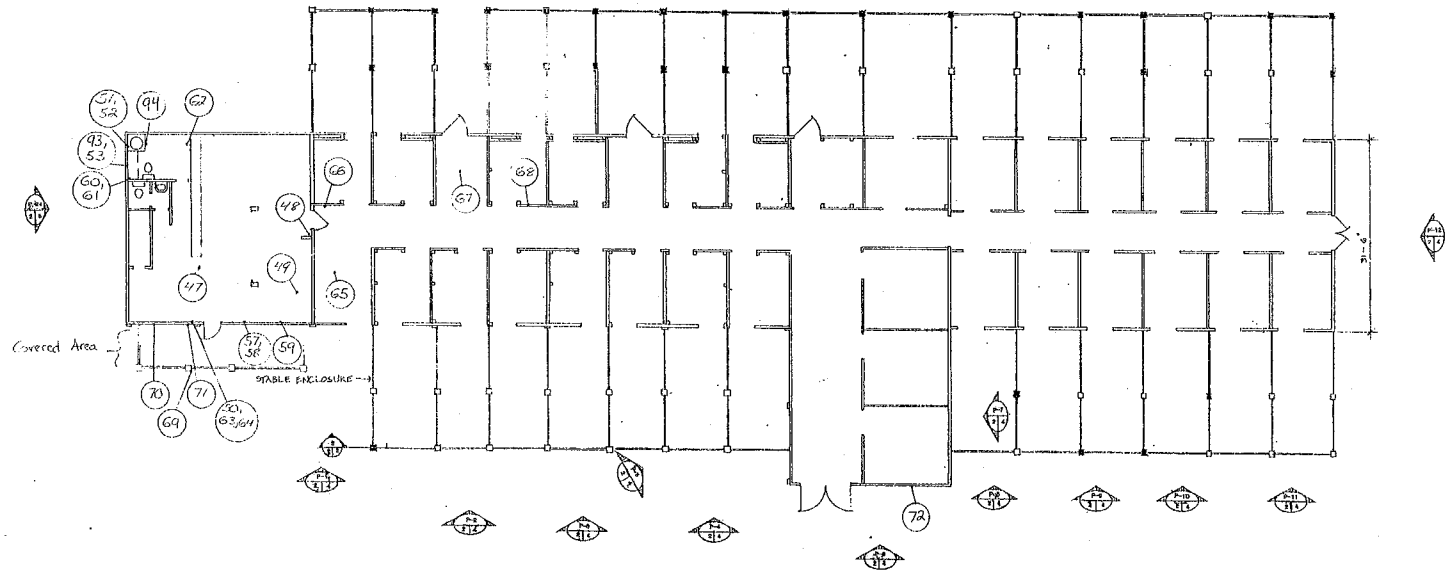
g. Scaled drawings showing limits of each excavation, limits of contamination, known underground utilities within 15 m of excavation, sample locations, and sample identification numbers.

h. Progress Photographs. Color photographs shall be used to document progress of the work. A minimum of four views of the site showing the location of the area of contamination, entrance/exit road, and any other notable site conditions shall be
taken before work begins. After work has been started, activities at each work location shall be photographically recorded daily. Photographs shall be a minimum of 76.2 x 127.0 mm and shall include:

(1) Soil removal, handling, and sampling.
(2) Unanticipated events such as discovery of additional contaminated material.
(3) Contaminated material storage.
(4) Site or task-specific employee respiratory and personal protection.
(5) Fill placement and grading.
(6) Post-construction photographs. After completion of work at each site, the Contractor shall take a minimum of four views of each excavation site. Photographs shall be mounted back-to-back in double face plastic sleeves punched to fit standard three ring binders. Each print shall have an information box attached. The box shall be typewritten and arranged as follows:

Project Name:
Direction of View:
Location:
Date/Time:
Photograph No.:
Description of View:

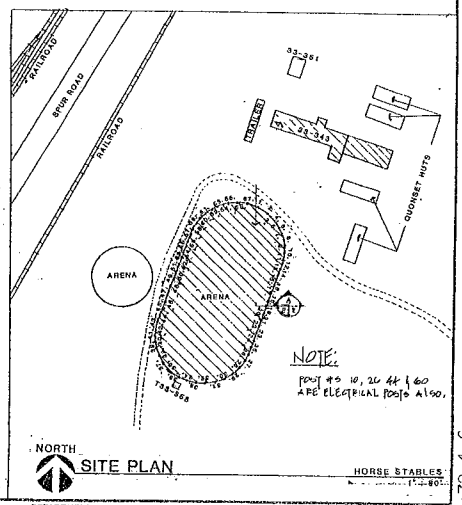
-- End of Section --



N

EXISTING FLOOR PLAN

BLDG. 33-343
1/8" : 1'-0"



Legend:

◯ - Sample Points

Figure 3

REVISIONS							
NO.	DATE	DESCRIPTION	BY	NO.	DATE	DESCRIPTION	BY

GRAPHIC SCALE

Not to Scale

J. IONITA (DESIGNER)	D. ECKERT (DRAWER)
D. VANDEVENTER (DRAWN)	R. BUENZOW (DAYTON SUPERVISOR)

DEPARTMENT OF THE AIR FORCE
21ST CIVIL ENGINEERING SQUADRON (AACI)
ELMENDORF AFB ALASKA 99506

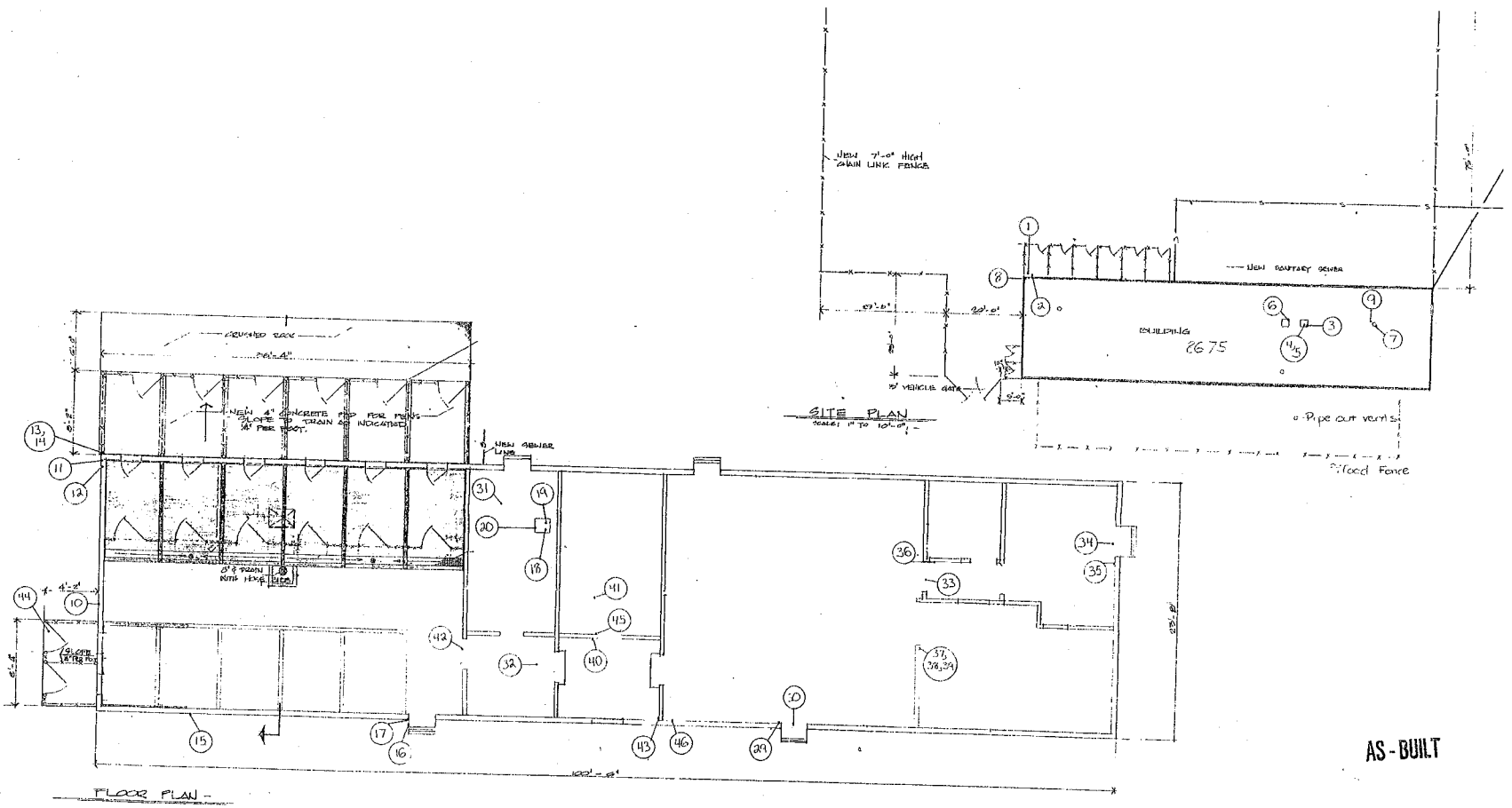
REPAIR HORSE STABLES

FLOOR PLAN, SITE PLAN AND DETAILS — 33-343

DATE: MAY 86 | PROJECT NO: ELM 86-1108 | DRAWING NO: 86E022

A-1

SHEET 2 OF 6



Not to Scale

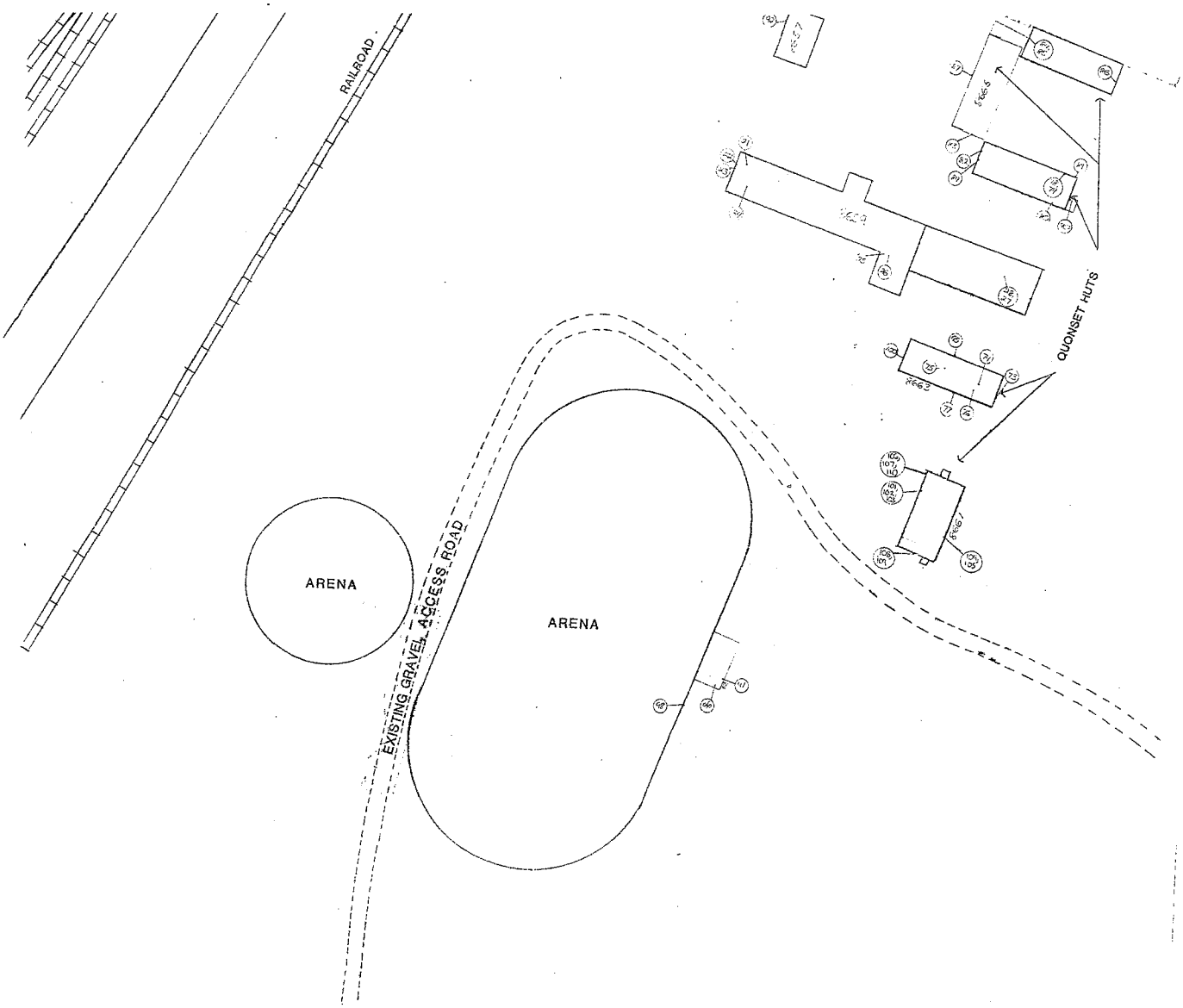
Figure 2

Legend:

◯ - Sample Points

DESIGNED Gentry	CONVERT BUILDING 2675 TO CANINE KENNELS	PROJECT NO. ELM76-0008	SHEET
DRAWN Gentry	ELMENDORF AFB, ALASKA	DATE 15 JUL 75	
CHECKED RM		DRAWING NO. 750776	

DEPARTMENT OF THE AIR FORCE
OFFICE OF THE
BASE CIVIL ENGINEER
ELMENDORF A.F.B., ALASKA 99506



SITE PLAN

NORTH

Not to Scale

Figure 4

Legend:

- Sample Points

General Services Administration
Office of Design and Construction

Metric Design Guide

DRAFT

Second Edition

April 1992

otto Schick
215-656-5822

Index

Design Information

Index (continued)

Product Information

Index (continued)

Sample Drawings

General Information

Introduction

Public Law 100-418 designated the metric system as the preferred system of weights and measures for United States trade and commerce.

All countries of the world are now officially metric.

This law also directed all federal procurements, grants, and other business related activities to be in metric by September, 1992, unless this was impractical or likely to cause loss of markets to U.S. firms.

In July 1991, Presidential Executive Order 12770 designated the Secretary of Commerce to direct and coordinate metric conversion efforts by all federal departments and agencies, and authorized the development of specific dates for metric conversion in industries where September 1992 was impractical.

A revised deadline was set for federal construction:

After January, 1994, all federal designs for renovation and new construction will be done in the metric system.

Even though this date is many months away, most federal agencies involved with construction have already committed significant projects to be designed and built in metric.

The total construction value of all federal projects in design or committed to design in metric now exceeds $650 million.

This total may exceed $1 billion in 1992, and will grow continually until 1994 when all federal design will be completed in the metric system.

This document provides guidance on how to perform metric building design, although much of the material is applicable to civil works projects.

Many private firms and governmental agencies involved with international construction have provided input and feedback to the material presented here.

Significant effort was expended coordinating this document with available private sector and professional society metric design guidance.

Whenever possible, existing guidance has simply been adopted.

Where private guidance has not existed, the most feasible direction has been developed and presented.

2

Introduction (continued)

There are several "metric" systems in use in the world.

The U.S. Government has adopted the International System of Units, abbreviated SI, from the French, "Systeme Internationale".

SI is used by major professional and code organizations.

Basic information on the SI system can be found in the first few pages of the ASHRAE Guide, which is included in this publication.

This document is in one sided and three ring format for ease of duplication.

It may be freely copied and distributed.

An objective during the development of this document has been to minimize the impact on design firms, contractors, and product manufacturers, while still complying with the national directive of complete metric conversion.

Comments on how to do this more efficiently, or questions regarding technical content of this manual, are very welcome.

Please address them to:

GSA Regional Headquarters
Wanamaker Building, Room 610
100 Penn Square East
Philadelphia PA 19107
Attn: Otto F. Schick

Tel 215 656 5822 / Fax 215 656 5839

Due to the developmental nature of metric design in the United States, it is probable that this document will be updated every six months over the next two years to incorporate new metric design information and metric product manufacturers.

3

Benefits Of Metric

International Acceptance

We have all experienced the newcomer to this country who does not yet posess english language fundamentals, and is unable to engage in even moderately sophisticated discussion.

This situation is analagous to American goods and services presented to other countries in non-metric measurements.

Other cultures are not always familiar with our system, and are increasingly unwilling to overcome this hurdle to utilize our products.

Metric is the world measurement language.

US industrial firms have sometimes been excluded from dealing in international markets because they are unable to deliver goods measured in metric terms.

Our firms will enjoy enhanced acceptance and export potential by conducting business in the international language of measurement. Many astute companies have taken initiative to understand foreign markets and become fluent in metric, and are doing well overseas as a result.

Simplicity

Metric is decimal based and therefore simpler and more efficient. The requirement to multiply 27' 8-5/8" and 32' 6-7/16" to obtain area demonstrates the complexity of our current system.

The Canadian Construction Association reports that metric produced direct benefits in terms of reductions in design costs and time, increased efficiencies in construction operations, and improved material and component dimensioning techniques, when commercial construction in Canada switched to the metric system years ago.

Public Law 100-418 states that the metric system can provide substantial advantages to the U.S. Federal Government in its own operations.

4

Benefits of Metric (continued)

Product Variations

Many countries have viewed metric conversion as an opportunity, and simultaneously selected fewer standard product sizes, reducing inventories and required manufacturing equipment. This opportunity exists with us as well.

One Unit For Each Property

The metric system simplifies building engineering by using only one unit for each physical property. Examples:

1. Pressure. While our current system has psi, psf, tons/SF, inches of water, inches of mercury, and kips/SF, the SI metric system has only one pressure unit, the Pascal (Pa). If more than 1000 Pa are present, the kPa (kilopascal) is used. If more than one million Pa, the MPa (megapascal).

2. Power

Our current system has Watts, btus, hp, tons, boiler hp, and others.

SI uses only Watts, kW, or MW, dependent on how large the number.

A demonstration of the simplicity of metric:

If we have a light fixture producing 600 W (watts) of heat, exactly how many btus of airconditioning are needed to counteract that heat? Exactly how many tons will this add to our required chiller capacity? These must be calculated.

In SI, all thermal power units are measured in Watts.

The fixture produces 600 W, so we need exactly 600 W of airconditioning to counteract it. Our chiller capacity will need to be increased by exactly 600 Watts.

Summary

The American construction community is able to meet the metric conversion challenge in federal construction, and it is in our long term strategic interest to do so.

There will be initial effort involved.

Firm resolve, close cooperation between the public and private sectors, and creative application of our extensive talent and expertise will allow the challenge to be successfully met.

5

Metric Project Definition

A project is "metric" when:

- Specifications show SI units only
- Drawings show SI units only
- Construction takes place in SI units only
- Inspection occurs in SI units only
- Cost estimating is based on SI units only

This does not imply that building products must change.

The 95 % Rule. Over 95 % of the products used in building construction today will undergo no physical change at all during the metric transition.

All that will occur is that the dimensions of the product will be identified in drawings, specifications, and on product literature in metric units, a process called soft conversion.

There are a handful of products that must undergo a physical change now in order to be efficiently used in metric construction. This process is called hard conversion.

As international standards are developed for more products, American products will then be hard converted to those sizes, to enhance their export potential.

Dual Dimensions

Dual Dimensions shall not be used on metric projects.

Dual Dimension Example: 102 mm (4 inch)

Dual dimensioning is a wasted effort. It has no effect in construction documents.

When english measurements are present, readers will use them and will ignore the metric measurement.

An exact analogy is appliance directions given in english and french. Most english speaking people will ignore the french instructions, and vice versa.

Summary

It is most important that drawings and specifications be metric exclusively. It is of secondary importance if measurements are hard or soft metric.

When documents contain SI measurement only, the reader will learn metric in order to execute the work.

6

Soft Metric

Soft Metric means "No Physical Change".

This implies the product in question will not be physically modified to be used in a metric project.

Over 95 % of currently used building products will not be physically modified to be utilized in metric construction.

All that is required is that the product literature and engineering data on these products be available with metric dimensions.

It is acceptable if product literature contains both metric and english dimensions.

Since product literature costs can be substantial, firms without metric product literature need only develop a supplement to their existing literature. Supplements will be accepted as submittals for an interim period.

There is no problem with competitive availability of soft converted products on a metric project, since these same products are competitively available today.

In the future, as standard international metric product sizes are developed by ISO (International Standards Organization) or another standards organization, these products may undergo modification to be compatible in the world market.

Listed below are examples of standard products that require no physical change to be utilized on a metric project today.

7

Soft Metric (continued)

Architectural
Door Hardware
Elevators and Escalators
Filing and Shelving Units
Kitchen Equipment
Landscaping Products
Lavatory Units
Paint Products
Resilient Base
Revolving Entrance Doors
Roofing Membranes
Systems Furniture
Toilets
Toilet Partitions
Vertical Blinds

Civil
Caisson Forms
Reinforced Concrete Pipe

Electrical
Cable Trays
Conduit
Copper Wire Sizes (eventually metric sizes may be used)
Fiber Optic Cables
Fire Alarm Systems and Components
Junction Boxes
Motors
Panelboards
Receptacles
Switches
Switchgear
Transformers
Underfloor Duct Systems
UPS Systems

8

Soft Metric (continued)

Mechanical
Air Handler Units
Boilers
Chillers
Fan Coil Units
Pumps of Any Type
HVAC Control Systems
Pipe
Plumbing Fixtures
Pumps
Valves

Structural
Steel Deck
Structural Steel Shapes

Custom Products

Custom products, often made by computer controlled machinery, are currently able to be specified in any size. These products may therefore be specified in any metric size. Specific firms which are able to make these products in metric are listed later in this document.

Custom Product Examples:

Aluminum Curtainwall Systems
Wood Doors
Glass
Interior Stonework
Precast Facade Systems
Metal Ductwork
Windows

Not all dimensions of custom products can be easily changed.

Example: While length and width of aluminum curtainwall panels can be specified in any metric size, the cross section of the extrusion is not easily modified. The dimensions of the cross section would be simply soft converted during design. This example applies equally to window systems.

Hard Metric

Hard Metric means "Product Requires Physical Change".

The product in question must be physically modified in order to be efficiently utilized in a metric project, which is planned on a metric grid.

A handful of currently used building products must undergo hard conversion to new metric sizes.

Examples of products that must be physically changed:

Air Diffusers and Grilles (lay-in type only)
Brick
CMU
Drywall
Fluorescent Lighting Fixtures (lay-in type only)
Raised Access Flooring
Suspended Ceiling Tiles and Grids

Product Availability
Research has been done on the products listed above. They are all competitively available from respected domestic sources in hard metric sizes.

10

Drawings

SI drawings shall be done as follows:

Millimeters (mm). **SI drawings shall use mm exclusively.**

Each drawing should have the following note on it:

"ALL DIMENSIONS ARE MILLIMETERS (mm) UNLESS OTHERWISE NOTED"

It is then not necessary to write "mm" after each dimension. See Sample Drawings.

SI drawings should almost never show decimal millimeters (Example: 2034.5), unless a high precision part or product thickness is being detailed. Use whole mm. (Example: 2035)

Dual dimensions shall not be used on SI drawings.

Shop drawings shall be submitted using mm only.

Space Between Groups. **If possible, a space should separate groups of three digits on drawing dimensions. This allows faster and more accurate dimensional interpretation.**

Example: A 20 meter dimension would show as: 20 000

Scales **AIA preferred metric scales, all multiples of 1,2 or 5, shall be used. See Graphic Standards, page 819, for other scale information.**

Metric	Current
1:2	1:2
1:5	3"-1'
1:10	1-1/2"-1', 1"-1'
1:20	3/4"-1', 1/2"-1'
1:50	1/4"-1'
1:100	1/8"-1'
1:200	1/16"-1', 1"-20'
1:500	1/32"-1', 1"-40', 1"-50'
1:1000	1"-80', 1"-100'

Sheet Sizes. **While there are standard SI drawing sizes, (see Graphic Standards, page 819) current sheet sizes may be used.**

11

Specifications

Millimeters (mm)

SI specifications shall use mm for almost all measurements. Even large dimensions should be specified in mm.

Use of mm is consistent with how dimensions are specified in major codes, such as BOCA and NEC.

Use of mm leads to integers for all building dimensions and nearly all building product dimensions, so use of the decimal point is almost completely eliminated.

Meters (m)

Meters may be used where large, round metric sizes are meant:

Example: "Contractor will be provided an area of 5 x 20 meters for storage of materials."

Centimeters (cm)

Centimeters shall not be used in specifications. This is consistent with the recommendations of AIA and ASTM.

Centimeters are not used in major codes.

Use of centimeters leads to extensive usage of decimal points.

Whole millimeters should be used for specification measurements, unless extreme precision is being indicated.

A credit card is about 1 mm thick.

Example 1. Mortar Joint Thickness. If a 3/8 inch mortar joint between brick is needed, this would convert to exactly 9.525 mm. Whole mm should be used. Specify 10 mm joint thickness.

Example 2. Bath accessories are commonly made from 22 gage (0.034 inch) thick stainless steel. Exact conversion is 0.8636 mm. This is a precision measurement. An appropriate conversion is 0.86 mm.

12

Rounding and Conversion

During transition, many specifications, handbooks, and other documents will need their dimensions converted to metric. Many metric projects will be undertaken before this is complete.

Simple Mathematical Rounding. This technique should not be used. An example is to take an existing design guidance dimension such as 12 feet, convert this mathemathically to 3658 mm, and use this dimension.

The tradespeople in the field, faced with entire drawing sets of awkward, nonrounded numbers, will conclude that metric is more difficult. It is very important that we convince them that metric is easier to use. We can do this by professionally rounding our design guidance dimensions.

Professional Rounding. This technique takes the result of simple mathematical rounding, and applies professional judgment.

First, a small discussion of metric design is necessary.

The basic module of metric design is 100 mm.

The multimodules and submodules, in preferred order, are:

6000, 3000, 1200, 600, 300, 100, 50, 25, 20, 10

Following are two examples of how to correctly apply professional judgment to design criteria.

Rounding and Conversion (continued)

Example 1 : Conversion of an Existing Code Requirement

To professionally round code requirements, the following process should take place.

Step 1. Determine the nonoffending direction.

1990 BOCA Article 514.7 requires 36 inches (914 mm) of unobstructed pedestrian walkway width. However, 914 mm is not a clean, rational number. It should be rounded to facilitate the cleanest construction possible.

Narrower offends the code. The nonoffending direction is larger, so it is preferred to round larger.

Step 2. Select the largest feasible multimodule.

- The most preferred multimodule, 6000 mm, in not feasible.
- Next preferred multimodule, 3000 mm, is also not feasible.
- 1200 mm is feasible, so this represents a good choice.
- If 1200 is determined too large, try the next multimodule.

- 600 is offending, and 2 x 600, 1200, has been tried.
- 300 yields 300, 600 and 900 mm, all offending dimensions.
- 300 also yields 1200, which has been tried.
- 100 yields 1100 and 1000, the next best choices.

- Every effort should be made to keep design dimensions in increments of 100 mm, the basic module, or multimodules.

- If narrower must be used, submodules of 100 are required.

- Use of 50 yields 950 mm.
- Use of 25 yields 925 mm.
- Use of 20 yields 920 mm.
- 914 can be used, but preferred dimensions are recommended.

In each case, the user must determine the acceptable choice, but the professional is encouraged to present clean, rounded metric dimensions as alternatives.

Simple mathematically converted dimensions should not be used.

Rounding and Conversion (continued)

Example 2: Conversion of an Existing Design Practice

Professional rounding should be used when converting recommended design dimensions from handbooks.

Ceiling Height

A common preferred office ceiling height is 9 feet. Simple mathematical conversion yields 2743 mm. This is an awkward dimension and should not be used on design documents.

Since this is not a code requirement, there is no offending direction, so the process to professionally convert the dimension is somewhat different.

Step 1. Determine the Metric Design Tolerance

If instead of exactly 9 feet the installed height were 8'-10", or 9'-2", the satisfaction of the client would probably be exactly the same.

This variation or plus of minus 2 inches in actual height becomes our "design tolerance" for this example. The selection of design tolerance is a professional judgment. In metric terms, this design tolerance is 50mm.

Step 2. Determine the Acceptable Design Range

The range is the simple mathematical conversion, 2743, plus and minus 50 mm. Acceptable Design Range becomes 2693 to 2793.

Step 3. Select a Preferred Dimension Within The Range

Start with the most preferred multimodule.

- Both 6000 and 3000 are clearly not feasible.
- Use of 1200 yields 2400 and 3600, both not acceptable.
- Use of 300 yields 2400, 2700, and 3000.
- 2700 is within our acceptable design range and could become the new preferred ceiling height, after consideration of other design factors for the particular project.

Other design practices can also be professionally rounded:

Example. Some roof flashing systems require fasteners at a minimum 24 inches on center, which mathematically converts to 609.6 mm. It can be professionally concluded that more fasteners would probably be acceptable. Selection of preferred multimodules yields 600 as a good choice, which will be most easy to construct in the field.

Architectural / General

Module New building construction shall use a 600 mm planning module.

Many domestic manufacturers make products used on this module.

Drywall. Major drywall manufacturers currently offer hard metric sizes. Minimum order quantities apply.

Only sheet length and width is classified in hard metric.

Standard sheet width is 1200 mm.

Lengths are available in 2400 mm, and several longer sizes.

Thicknesses remain the same to minimize production impact. Standard thicknesses are 12.7 mm and 15.9 mm.

Standard stud spacing is 400 mm.

Since minimum order quantities can be significant, it must be evaluated for each project if the metric drywall can be used.

If minimum quantities will not be satisfied, then english size drywall will have to be used even though the project is metric, as is done in Canada.

Doors. A popular metric door size is 900 x 2100 mm. This may be used on metric projects where other project specific design criteria is satisfied.

Sizes may be soft converted. A 3' x 7' door is 915 x 2135 mm.

Door thicknesses will remain the same, being identified by the nominal mm equivalent.

Lighting Fixtures. Use hard metric fixture sizes whenever feasible.

Many domestic manufacturers currently manufacture or can produce hard metric sizes.

Most common sizes are 600 x 600 and 600 x 1200 mm.

Ceiling Systems. Many domestic manufacturers regularly make hard metric tiles and grids, which shall be used in metric projects. Most common sizes are 600 x 600 and 600 x 1200 mm.

16

Architectural / Masonry

The standard metric mortar joint is 10 mm.

Brick

The "metric modular brick" will be the most common.

Its size is 90x57x190 mm. (3-9/16 x 2-1/4 x 7-1/2 inches)

American modular brick is

3-5/8 x 2-1/4 x 7-5/8 (92x57x194 mm) when 3/8 joint is used.
3-1/2 x 2-3/16 x 7-1/2 (89x56x190mm) when 1/2 joint is used.

Thus the standard american modular brick used with a 1/2 inch joint is so close to the metric modular brick that it can be used with only a slight variation in joint thickness during field installation.

Three vertical courses of metric modular brick with 10 mm joints equals 201 mm, which is rounded to 200.

Three vertical courses of 200 equals 600 mm. 600x600 is a preferred nominal building block for masonry.

Other sizes of metric brick are identified in Graphic Standards, page 820.

Block

Metric modular block is 190 x 190 x 390 mm.

This equates to 7-1/2 x 7-1/2 x 15-3/8 inches.

American modular block is 7-5/8 x 7-5/8 x 15-5/8 inches, also quite similar to metric block.

17

Architectural / Sheet Metal

Most specification references use gage number followed by the decimal inch thickness. Example: 22 gage (0.034 inch)

Metric specifications use the absolute mm thickness.

It is not the intent of this guidance to change the thickness of currently used sheeting.

The thickness under "Specify" is thinner than the actual gage thickness, since specifications give minimum thickness.

The following chart may be used to specify sheet metal:

Gage	Inch	Exact mm	Specify (mm)	Percent Thinner than Exact mm
32	0.0134	0.3404	0.34	0.1
30	0.0157	0.3988	0.39	2.2
28	0.0187	0.4750	0.47	1.1
26	0.0217	0.5512	0.55	0.2
24	0.0276	0.7010	0.7	0.1
22	0.0336	0.8534	0.85	0.4
20	0.0396	1.0058	1	0.6
18	0.0516	1.3106	1.3	0.8
16	0.0635	1.6129	1.6	0.8
14	0.0785	1.9939	1.9	4.7
12	0.1084	2.7534	2.7	1.9
10	0.1382	3.5103	3.5	0.3
8	0.1681	4.2697	4.2	1.6

Example of Usage: Provide grab bar with a minimum wall thickness of 18 gage (0.051 inch).

Replace with: Provide grab bar with minimum wall thickness of 1.3 mm.

Since 18 gage is thicker than 1.3 mm, 18 gage is acceptable.

This schedule was developed since no existing material was found to clearly identify existing sheeting in metric units.

Until a more efficient method is developed to address this issue, specifiers may wish to retain the gage number in specifications, and couple this with a rounded mm size.

Example: Provide grab bar with minimum wall thickness of 18 gage (1.311 mm).

1B

Civil / Concrete

Concrete strength is specified in megapascals (MPa).

The following strengths, which are used in Canada, shall be standard in federal metric construction.

The general purpose concrete strengths are reduced from 6 strengths to 4 strengths.

Strengths above 35 MPa shall be specified in 5 MPa intervals. (40, 45, 50, 55, etc)

Previous	Exact Conversion	Specify
psi	MPa	MPa
2500	17.23	20
3000	20.67	20 or 25 (See Note Below)
3500	24.12	25
4000	27.56	30
4500	31.01	35
5000	34.45	35

Note: If code requires 3000 psi, then 25 MPa must be used, otherwise it is a professional judgement on 20 or 25.

Graphic Standards, page 830, contains a psi vs MPa chart.

19

Civil / Reinforcement

Metric projects will use ASTM A615M reinforcing bars for general purpose applications. The M after A615 indicates a metric specification.

A615M reinforcing bar comes in Grades 300 and 400, indicating 300 and 400 MPa yield strength.

There are 8 bar sizes, which replace the 11 bar sizes currently used.

A nominal 15 mm bar is called a "Number 15 Bar".

While many firms can make metric rebar, and they are clearly preferred due to fewer sizes, minimum order quantities apply.

It should be determined for each particular project if metric rebar is feasible, or if existing sizes should be used.

Nominal Diameter	Actual Diameter	Cross Section Area
(mm)	(mm)	(mm^2)
10	11.3	100
15	16.0	200
20	19.5	300
25	25.2	500
30	29.9	700
35	35.7	1000
45	43.7	1500
55	56.4	2500

Some applications may need A616M, A617M, A706M, or A775M.

20

Civil / Surveying

The two primary federal agencies involved in the production of survey information for public use are the National Geodetic Survey (NGS) and the U.S. Geological Survey (USGS). The databases for these two agencies are now totally metric.

The NGS, which maintains a database of hundreds of thousands of horizontal and vertical survey control points on which U.S. surveys are based, has been completely metric since 1983.

The USGS, which produces topographic maps of terrain elevations, has digitally mapped the U.S. surface. The ground distance between each pair of digitized points is 30 meters.

Thus, all survey and mapping data necessary to do metric design and construction in the United States is available.

The following information can be used as guidance on how site plans and topographic maps are to be executed.

Contour Intervals Utilize either 1 000, 500, or 250 mm as contour intervals, dependent on site slope.

Elevations Elevation measurements shall be given in mm.

Benchmark elevations should be converted from feet to mm.

Examples Benchmark is 314.15 feet.
Convert to 95 753

Sample Finished Floor Elevation: 105 025

Sample Top of Curb TC 305 224
Sample Bottom of Curb BC 305 024

Sample Contour Lines:

---------- 106 000 ----------
---------- 105 500 ----------

Contour lines have also been seen on foreign drawings in meters, such as 106, 106.5, 107, etc.

This system may also be used.

21

Electrical / General

Conduit will not change by switching to metric. It becomes classified by the nominal mm size.

ASHRAE SI Guide, page 7, chart B.12, "PIPE/CONDUIT", gives the nominal ISO mm conduit size to be used.

During transition to metric the following paragraph and chart should be placed on electrical cover sheets.

"ALL CONDUIT SIZES ARE INDUSTRY STANDARD CONDUIT DESIGNATED BY THEIR NOMINAL MILLIMETER (mm) DIAMETER EQUIVALENT. SEE CHART BELOW."

Nominal Size

Inch	mm
1/2	15
5/8	16
3/4	20
1	25
1-1/4	32
1-1/2	40
2	50
2-1/2	65
3	80
3-1/2	90
4	100
5	125
6	150

Wire Size. Use AWG until availability of ASTM B682, standard metric conductor sizes, is determined.

22

Mechanical / General

Temperature New construction projects shall use Celcius for temperature measurements.

Renovation projects where the entire building hvac system is to be renovated, should be converted to Celcius temperature where feasible.

Renovation projects where the entire hvac system is not to be renovated, may retain Fahrenheit.

All major manufacturers of hvac control systems offer equipment that operates in Celcius.

GSA currently has two major office buildings that are operating in Celcius temperature, using off the shelf hvac control equipment.

HVAC calculations should be done in metric units.

Air Distribution In new construction, a hard metric ceiling grid must be used, accompanied by hard metric lay-in diffusers and registers.

When a new ceiling grid is to be installed in renovation, a hard metric ceiling grid should be selected if feasible, accompanied by hard metric diffusers and registers.

Many manufacturers of diffusers and registers have indicated they currently offer hard metric sizes.

Ductwork

Rectangular metal ductwork is a custom made product.
Hard metric sizes shall be used. (example: 300 x 600 mm)

Flexible round duct shall be specified in soft converted sizes.

Units Those in the ASHRAE SI Guide, page 6, shall be used.

23

Mechanical / Pipe

Steel pipe and copper tube sizes will not change by switching to the metric system. American sizes are used in many parts of the world.

Initially, they are simply classified by the nominal mm size.

In the future, hard metric pipe sizes will probably be utilized.

ASTM B88M, which gives standardized hard metric copper tube sizes, will not be utilized until ample product availability can be established.

The ASHRAE SI Guide, page 7, chart B.12, "PIPE/CONDUIT", gives the nominal ISO mm size for american pipe, which shall be used to replace the US inch size. See page 32.

Schedule designations remain the same (example: Schedule 40, and type K,L,M)

During transition to metric the following paragraph and chart should be placed on mechanical cover sheets.

"ALL SIZES ARE INDUSTRY STANDARD ASTM A53 PIPE AND ASTM B88 TUBE DESIGNATED BY THEIR NOMINAL MILLIMETER (mm) DIAMETER EQUIVALENT. SEE CHART BELOW."

Nominal Size

Inch	mm
1/2	15
5/8	16
3/4	20
1	25
1-1/4	32
1-1/2	40
2	50
2-1/2	65
3	80
3-1/2	90
4	100
5	125
6	150
8	200
10	250
12	300

24

Structural / General

There are three dominant world steel shape standards:

1. ASTM A6/A6M, American
2. JIS, Japanese Industrial Standard
3. DIN, Deutsches Instituet fuer Normung, (German)

A fourth is the BI, or British Imperial.

None is dominant worldwide, but each is used extensively.

There is no international standard issued by ISO (International Standards Organisation), the official international group that develops worldwide standards.

An ISO standard is currently undergoing development, and will probably involve selection of shapes from the three primary world standards, coupled with elimination of redundant shapes.

Metric Projects

Since no international trend exists on standardization of steel shapes, AISC recommends that metric projects use the same steel shapes currently used, only use the metric dimensions listed in ASTM A6/A6M.

A6/A6M lists both inch and mm dimensions of the shapes.

All LRFD property, shape, and specification design data is available in metric from AISC for A6/A6M steel shapes.

Phone Orders: AISC, Chicago IL, 312 670 5414

Structural calculations should be done in metric.

Fasteners

Large projects shall use ASTM A325M and A490M metric bolts.

There are 7 standard metric bolt sizes, which replace the 9 bolts currently used.

Standard sizes are: 16, 20, 22, 24, 27, 30, and 36 mm

Minimum order quantities may apply, so small metric projects should verify availability during design.

25

Structural / Floor Load

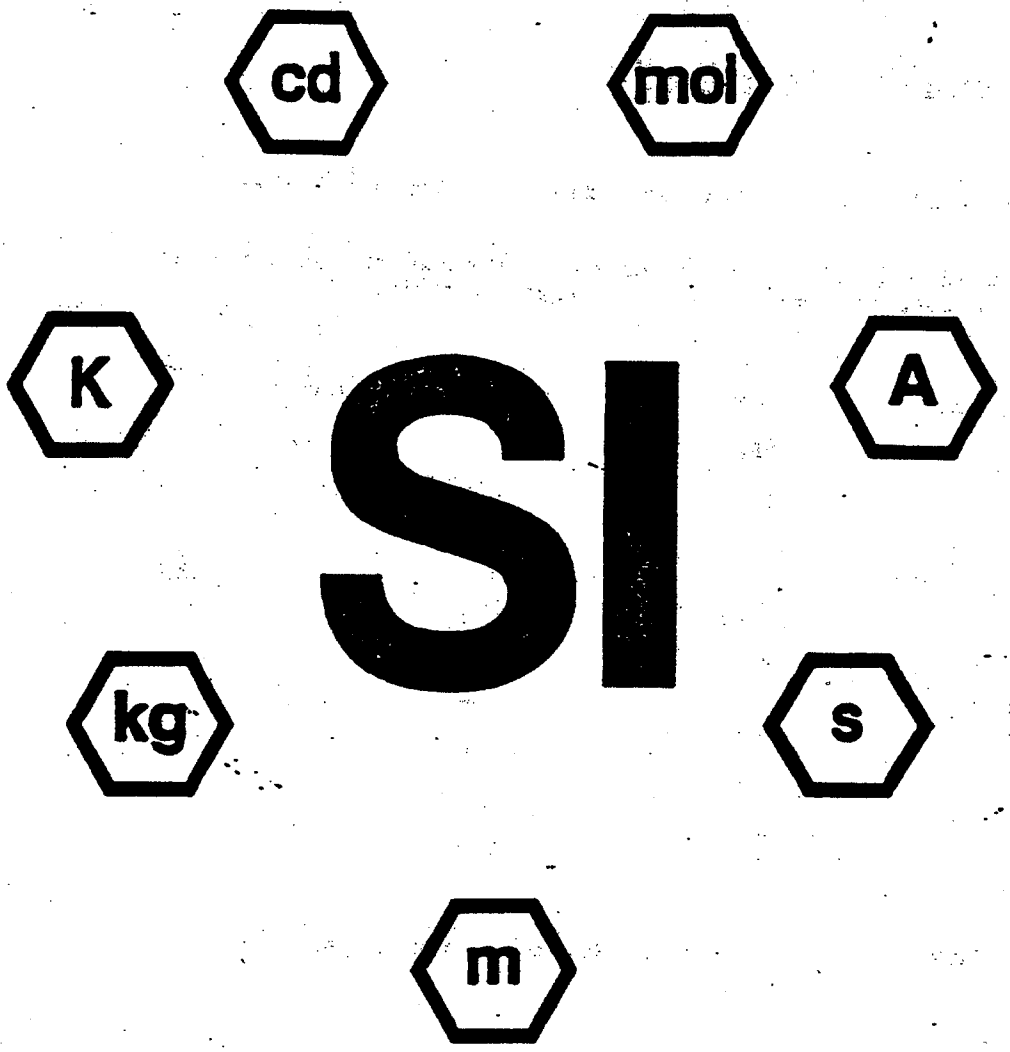
Floor loading capacity is specified in kilopascals (kPa).

The following chart gives the new kPa strength ratings that can be used to replace the psf strength rating:

Previous	New	Percent Stronger
psf	kPa	
50	2.5	4.4
80	4	1.8
100	5	4.4
120	6	4.4
150	7.5	4.4
200	10	4.4
250	12	0.2
300	15	4.4
350	17	1.4
400	20	4.4
450	22	2.1
500	24	0.2

See Graphic Standards, page 830, for chart of psf vs kPa.

26



for HVAC & R

SIXTH EDITION 1986
AMERICAN SOCIETY OF HEATING, REFRIGERATING & AIR-CONDITIONING ENGINEERS, INC.
1791 TULLIE CIRCLE NE, ATLANTA GA 30329

27

ASHRAE

POLICY ON UNITS

1. Research Projects, Standards, Special Publications, Journal Articles, and Handbooks shall be prepared using inch-pound (I-P) units and/or the International System of Units (SI) in formats approved by the Publishing Council.
2. The Terminology Committee shall review annually the approved formats for units to be used in ASHRAE publications—considering suggestions from members, Technical Committees/Task Groups/Technical Resource Groups, Standards Project Committees, Research and Technical Committee, Journal, Handbook and other general committees and shall recommend any changes in the approved formats to the Publishing Council.
3. The Publishing Council shall consider annually the recommendations of the Terminology Committee and shall approve the formats to be used in ASHRAE publications.
   a. Until 1989 July 1, the formats for ASHRAE publications shall be *rational I-P (equivalent SI)* and in cases determined by the Publishing Council, two separate versions one *rational I-P* and the other *rational SI*.
   b. Exceptions require the approval of the Director of Publications.
4. The Terminology Committee shall serve as the authority on SI and I-P usage and application.
5. The Terminology Committee shall educate the membership for the eventual exclusive use of SI Units.

Approved by the BOD TORONTO 020701

TERMINOLOGY COMMITTEE
1985-1986

Roger W. Haines, Chmn.
Walter P. Bishop, V. Chmn.
Russell W. Bartholomew
Aldo F. Fioravanti
Jerome J. Gaffney
John F. James
Dennis D. Kiselbach
William V. Richards
Everett C. Shuman
Carl A. Swenson
Kenneth W. Wicks (BOD)
Louis F. Flagg (CO)

Robert A. Parsons (Staff)

FOREWORD

This Guide is intended to be the Heating, Refrigerating, Ventilating and Air Conditioning Supplement to ASTM E 380 —*Standard for Metric Practice*. For more general information and for more extensive conversion factors with more significant digits, see ASTM E 380, a reprint of which may be found in the 1981 ASHRAE FUNDAMENTALS HANDBOOK or ASTM E 380-84.

28

1.0 UNITS AND SYMBOLS

The International System of Units (SI) consists of seven base units and a number of derived units which are combinations of base units. Some derived units have special names and symbols.

1.1 BASE UNITS

QUANTITY	NAME	SYMBOL
length	metre	m
mass	kilogram	kg
time	second	s
electric current	ampere	A
thermodynamic temperature	kelvin	K
amount of substance	mole	mol
luminous intensity	candela	cd

1.2 SOME DERIVED UNITS

QUANTITY	FORMULA	NAME	SYMBOL
acceleration			
—angular	rad/s^2		
—linear	m/s^2		
angle, plane	dimensionless	radian	rad
angle, solid	dimensionless	steradian	sr
area	m^2		
conductivity, thermal	W/(m•K)		
	C)		
density—heat flux	W/m^2		
—mass	kg/m^3		
energy, enthalpy,			
—work	N•m	joule	J
—specific	J/kg		
entropy			
—heat capacity	J/K		
—specific	J/(kg•K)		
	J/(kg•°C)		
force	$kg•m/s^2$	newton	N
frequency			
—periodic	1/s	hertz	Hz
frequency			
—rotating	rev/s		
inductance	Wb/A	henry	H
magnetic flux	V•s	weber	Wb
moment of a force	N•m		
potential, electric	W/A	volt	V
power, radiant flux	J/s	watt	W
pressure, stress	N/m^2	pascal	Pa
resistance, electric	V/a	ohm	Ω
velocity—angular	rad/s		
—linear	m/s		
viscosity—dynamic, μ	Pa•s		
—kinematic,			
ν	m^2/s		
volume	m^3		
volume, specific	m^3/kg		

2.0 USE OF BASE AND DERIVED UNITS

In SI there is only one unit for each physical quantity. The base and derived units may be modified by prefixes as indicated in Section 6.0. All derived units are defined by simple formulas using the base units. This is known as a coherent system and is the simplest measurement system to use. It is incumbent upon the user to protect the basic simplicity of the system by adhering to the approved units.

2.1 *Angle.* The unit for plane angle is the radian. The degree and its decimal fractions may be used but use of the minute and second is discouraged.

2.2 *Area.* The unit of area is the square metre (m^2). Large areas are expressed in hectares (ha) or square kilometres (km^2). The hectare is restricted to land or sea areas and is equal to 10 000 m^2.

2.3 *Energy.* The unit of energy, work, and quantity of heat is the joule (J). The kilowatthour (kWh) is presently permitted as an alternative in electrical applications, but should not be introduced in new applications.

1 kilowatthour (kWh) = 3.6 megajoules (MJ)

The unit for power and heat flow rate is the watt (W).

1 watt (W) = 1 joule per second (J/s)

2.4 *Force.* The unit of force is the newton (N). The newton is also used in derived units which include force.

Examples: pressure or stress = N/m^2 = Pa (pascal)
work = N•m = J (joule)
power = N•m/s = W (watt)

2.5 *Length:* The unit of length is the metre. The convention is for the millimetre to be used on architectural or construction drawings and mechanical drawings. It is not necessary to place mm after each dimension. A note: "All dimensions in mm" is sufficient.

The metre is used for topographical and plot plans. It is always written with a decimal and three figures following the decimal, *i.e.*, 38.560

The centimetre is used only for cloth, clothing sizes and anatomical measurements.

2.6 *Mass.* The unit of mass is the kilogram (kg). Among the base and derived units of SI, the unit of mass is the only one whose name, for historical reason, contains a prefix. Names of multiples of the unit mass are formed by attaching prefixes to the word gram. The multiple, megagram, Mg, (1000 kg, metric ton or tonne, t) is the appropriate unit for describing large masses. Do not use *weight* when *mass* is intended.

2.7 *Pressure.* The unit of stress or pressure, force per unit area, is the newton per square metre. This unit has been given the special name *pascal* (Pa). There is no equivalent symbol for psig or psia. If there is a possibility of misunderstanding, spell out Pa (absolute) or Pa (gage).

2.8 *Volume.* The unit of volume is the cubic metre. Smaller units are the litre, L (m^3/1000); millilitre, mL; and microlitre, μL. No prefix other than 'm' or 'μ' is used. Litre per second replaces gpm and cfm in HVAC usage. Conveniently, one litre of water has a mass of one kilogram at its maximum density (4°C).

2.9 *Temperature.* The unit of thermodynamic (absolute) temperature is the Kelvin. Celsius temperature is measured in degrees Celsius. Temperature intervals may be measured in kelvins or degrees Celsius and are the same in either scale. Thermodynamic temperature is related to Celsius temperature as follows:

$t_c = T - T_0$

where

t_c = Celsius temperatu re, (°C)
T = thermody namic temperatu re, kelvins (K)
T_0 = 273.15 K by definition

2.10 *Time.* When expressing rates, the unit of time is the second. Do not use the minute or hour. In some cases of long cycles it may be necessary to use the day, week, month, or year.

Exception: revolutions per minute may be used, but revolutions per second is the preferred unit.

29

3.0 LANGUAGE USAGE

3.1 Spelled out names are treated as common nouns in English. Therefore, the first letter of a unit is not capitalized except at the beginning of a sentence or in capitalized material such as a title.

Examples: watt; pascal; ampere; volt; newton; kelvin

Exception: The first letter of Celsius is always capitalized.

3.2 Never begin a sentence with a unit symbol—either rearrange the words or write the unit name in full.

3.3 Plurals for spelled out words are used when required by the rules of English grammar.

Examples: metre—metres; henry—henries; kilogram—kilograms; kelvin—kelvins

Irregular: hertz—hertz; lux—lux; siemens—siemens

3.4 A space or hyphen *is not used* between the prefix and unit name.

Example: kilometre *not* kilo metre or kilo-metre
milliwatt *not* milli watt or milli-watt

3.5 When a prefix ends with a vowel and the unit name begins with a vowel, both vowels are retained and both are pronounced.

Example: kiloampere

Exceptions: hectare; kilohm; megohm

3.6 When compound units are formed by multiplication, leave a space between units that are multiplied.

Examples: newton metre; volt ampere

Not newton-metre; not volt-ampere

3.7 Powers: Use the modifier squared or cubed after the unit name.

Example: metre per second squared

Exceptions: For area or volume place the modifier before the units.

Examples: square millimetre; cubic metre

3.8 When compound units are formed by division, use the word *per, not* a solidus (/).

Examples: metre per second; watt per square metre

Not metre/second; not watt/square metre

4.0 SYMBOLS, USAGE

4.1 Correct usage of symbols is very important. An incorrect symbol may change the entire meaning of a quantity. For this reason, there are international agreements on uniform rules for using symbols. There is only one correct way to use symbols and this must be followed.

4.2 There are no abbreviations in SI—only symbols. Therefore, symbols are not followed by a period except at the end of a sentence.

Examples: SI, *not* S.I.; s, *not* sec; A, *not* amp

4.3 Symbols are written in lower case unless the unit name has been taken from a proper name. In this case the first letter of the symbol is capitalized.

Examples: m, metre ; W, watt ; Pa, pascal

Exception: L, litre

4.4 Symbols and prefixes are printed in upright (roman) type regardless of type style in surrounding text.

Example: . . . *a distance of 56* km *between*. . .

4.5 Unit symbols are the same whether singular or plural.

Examples: 1 kg, 14 kg; 1 mm, 25 mm

4.6 A space is left between the numerical value and the symbol.

Examples: 55 mm, *not* 55mm; 100 W, *not* 100W

Exception: No space is left between the numerical value and the symbol for degree Celsius and degree of plane angle. Note that °C is the symbol for degree Celsius and C is the symbol for coulomb.

Examples: 20°C, not 20 °C or 20° C; 45°, not 45 °

4.7 Symbol for product—use a raised dot ·

Examples: N·m; mPa·s; W/(m^2·K)

4.8 Symbol for quotient—use one of the following forms:

Examples: m/s or $\frac{m}{s}$ or use negative exponent

Note: use only one solidus (/) per expression.

4.9 Do not mix symbols and names in the same expression.

Examples: m/s or metres per second,
not—metres/second; *not*—metres/s
J/kg or joules per kilogram,
not—joules/kilogram; *not*—joules/kg

4.10 Modifying terms such as electrical, alternating current, etc., should be placed parenthetically after the symbol with a space between.

Examples: MW (e) *not* MWe *nor* MW(e);
V (ac) *not* Vac *nor* V(ac)
kPa (gage) *not* kPa(gage) *nor* kPa gage

4.11 SI SYMBOLS

SYMBOL	NAME	QUANTITY	FORMULA
A	ampere	electric current	base unit
a	atto	prefix	10^{-18}
Bq	becquerel	activity (of a radio nuclide)	1/s
C	coulomb	quantity of electricity	A·s
°C	degree Celsius	temperature	°C = K
c	centi	prefix	10^{-2}
cd	candela	luminous intensity	base unit
d	deci	prefix	10^{-1}
da	deka	prefix	10^{1}
E	exa	prefix	10^{18}
F	farad	electric capacitance	C/V
f	femto	prefix	10^{-15}
G	giga	prefix	10^{9}
Gy	gray	absorbed dose	J/kg
g	gram	mass	kg/1000
H	henry	inductance	Wb/A
Hz	hertz	frequency	1/s
h	hecto	prefix	10^{2}
ha	hectare	area	10 000 m^2
J	joule	energy, work, heat	N·m
K	kelvin	temperature	base unit
k	kilo	prefix	10^{3}
kg	kilogram	mass	base unit
L	litre	volume	m^3/1000
lm	lumen	luminous flux	cd·sr
lx	lux	illuminance	lm/m^2
M	mega	prefix	10^{6}
m	metre	length	base unit
m	milli	prefix	10^{-3}
mol	mole	amount of substance	base unit
μ	micro	prefix	10^{-6}
N	newton	force	kg·m/s^2
n	nano	prefix	10^{-9}
Ω	ohm	electric resistance	V/A
P	peta	prefix	10^{15}
Pa	pascal	pressure, stress	N/m^2
p	pico	prefix	10^{-12}
rad	radian	plane angle	dimensionless
S	siemens	electric conductance	A/V
Sv	sievert	dose equivalent	J/kg
s	second	time	base unit
sr	steradian	solid angle	dimensionless
T	tera	prefix	10^{12}
T	tesla	magnetic flux density	Wb/m^2
t	tonne, metric ton	mass	1000kg; Mg
V	volt	electric potential	W/A
W	watt	power, radiant flux	J/s
Wb	weber	magnetic flux	V·s

5.0 NUMBERS

5.1 *Large Numbers.* The recommended international practice for large numbers is to separate the digits into groups of three, counting from the decimal to the left and to the right, and to use a space to separate the groups. In numbers of four digits, the space is not necessary except for uniformity in tables.

Examples:
2.345 678; 73 846; 635 041; 600.000; 0.113 501; 7 258

5.2 *Small Numbers.* When writing numbers less than one, a zero should always be written before the decimal marker.

Example: 0.046

5.3 *Decimal Marker.* The recommended decimal marker is a point on the line (period). (In some countries, a comma is used as the decimal marker.)

6.0 PREFIXES

6.1 Prefixes indicate orders of magnitude in steps of 1 000. Prefixes provide a convenient way to express large and small numbers and to eliminate nonsignificant digits and leading zeros in decimal fractions. The following are the more commonly used prefixes:

prefix		symbol		representation
exa	ex'a (*e* as in *about*)	E	1 000 000 000 000 000 000	10^{18}
peta	pet'a (*e* as in *pet*, *a* as in *about*)	P	1 000 000 000 000 000	10^{15}
tera	as in *terra firma*	T	1 000 000 000 000	10^{12}
giga	jig'a (*i* as in *jig*, *a* as in *about*)	G	1 000 000 000	10^{9}
mega	as in *megaphone*	M	1 000 000	10^{6}
kilo	kill'oh	k	1 000	10^{3}
milli	as in *military*	m	0.001	10^{-3}
micro	as in *microphone*	μ	0.000 001	10^{-6}
nano	nan'oh (*an* as in *ant*)	n	0.000 000 001	10^{-9}
pico	peek'oh	p	0.000 000 000 001	10^{-12}

Example: 126 000 watts is the same as 126 kilowatts
0.045 metre is the same as 45 millimetres
65 000 metres is the same as 65 kilometres

6.2 To realize the full benefit of the prefixes when expressing a quantity by numerical value, choose a prefix so that the number lies between 1 and 1 000.

Exceptions: Tables of values of the same quantity.
Comparisons of values.
Where specific units are customarily used.

Examples: The litre per second (L/s) is used for water and air flow even though the quantity may exceed 1000.

The millimetre is used for dimensioning architectural (construction) and mechanical engineering drawings even when the numbers far exceed 1000 mm.

6.3 *Compound units.* A compound unit is a derived unit not having a special name and expressed with two or more units. The prefix is attached to a unit in the numerator.

Examples	V/m	*not*	mV/mm
	mN·m	*not*	N·mm (torque)
	MJ/kg	*not*	kJ/g

6.4 Compound prefixes formed by the combination of two or more prefixes are not used. Only one prefix should be used.

Examples:	2 nm	*not*	2 mμm
	6 m^3	*not*	6 kL
	6 MPa	*not*	6 kkPa

6.5 The following prefixes should be avoided except that centimetre is used for anatomical measurements, cloth and clothing sizes:

prefix	symbol	representation	
hecto (*heck'-o* as in *about*)	h	100	10^{2}
deka (*deck'-a* as in *about*)	da	10	10^{1}
deci (as in *decimal*)	d	0.1	10^{-1}
centi (as in *centipede*)	c	0.01	10^{-2}

6.6 *Exponential Powers.* An exponent attached to a symbol containing a prefix indicates that the multiple of the unit (the unit with its prefix) is raised to the power of 10 expressed by the exponent.

Examples: $1\ mm^3 = (10^{-3}\ m)^3 = 10^{-9} m^3$
$1\ ns^{-1} = (10^{-9} s)^{-1} = 10^{9} s^{-1}$
$1\ mm^2/s = (10^{-3} m)^2/s = 10^{-6} m^2/s$

DEFINITIONS

SI Units:
The international system of units are called SI units
NOT Metric Units
NOT SI Metric Units

I-P Units:
The inch-pound units are called I-P units
NOT Conventional Units
NOT U.S. Customary Units
NOT English Units
NOT Imperial Units

equivalent: approximate conversion; soft converted; (generally expressed in parentheses when both systems, I-P and SI are used)

rational: round numbers; hard converted; (generally expressed first when both systems, I-P and SI are used)

Appendix A—SI UNITS FOR HVAC & R CATALOGS

31

Quantity	Unit
BOILERS	
Heat output	kW
Heat input	kW
Heat release	kW/m²
Steam generation rate	kg/s
Fuel firing rate:	
solid	kg/s
gaseous	L/s
liquid	kg/s, L/s
Volume flow rate (combustion products)	L/s
Power input (to drives)	kW
Operating pressure	kPa
Hydraulic resistance	kPa
Draft conditions	Pa
COIL, COOLING AND HEATING	
Heat exchange rate	kW
Primary medium:	
mass flow rate	kg/s
hydraulic resistance	kPa
Air volume flow rate	L/s
Air flow static pressure loss	Pa
Face area	m²
Fin spacing, center to center	mm
CONTROLS AND INSTRUMENTS	
Flow rate:	
mass	kg/s
volume	L/s, mL/s
Operating pressure	kPa
Hydraulic resistance	kPa
Rotational frequency	rev/s (rpm)*
COOLING TOWERS	
Heat extraction rate	kW
Volume flow rate:	
air	L/s
water	L/s
Power input (to drive)	kW
DIFFUSERS AND GRILLES	
Air volume flow rate	L/s
Air flow pressure loss	Pa
Velocity	m/s
FANS	
Air volume flow rate	L/s
Power input (to drive)	kW
Fan static pressure	Pa
Fan total pressure	Pa
Rotational frequency	rev/s (rpm)*
Outlet velocity	m/s
AIR FILTERS	
Air volume flow rate	L/s
Static pressure loss	Pa
Face area	m²
FUELS	
Heating value:	
solid	MJ/kg
gaseous	MJ/m³
liquid	MJ/kg

Quantity	Unit
HEAT EXCHANGERS	
Heat output	kW
Mass flow rate	kg/s
Hydraulic resistance	kPa
Operating pressure	kPa
Flow velocity	m/s
Heat exchange surface	m²
Fouling factor	m²/W
INDUCTION TERMINALS	
Heating or cooling output	kW
Primary air volume flow rate	L/s
Primary air static pressure loss	Pa
Secondary water mass flow rate	kg/s
Secondary water hydraulic resistance	kPa
PUMPS	
Mass flow rate	kg/s
Volume flow rate	L/s
Power input (to drive)	kW
Developed pressure	kPa
Operating pressure	kPa
Rotational frequency	rev/s (rpm)*
SPACE HEATING APPARATUS	
Heat output	kW
Air flow volume flow rate	L/s
Power input (to drive)	kW
Primary medium mass flow rate	kg/s
Hydraulic resistance	kPa
Operating pressure	kPa
Air flow static pressure loss	Pa
VESSELS	
Operating pressure	kPa
Volumetric capacity	L
AIR WASHERS	
Volume flow rate:	
air	L/s
water	L/s
Mass flow rate, water	kg/s
Power input (to drive)	kW
Air flow static pressure loss	Pa
Hydraulic resistance	kPa
WATER CHILLERS	
Cooling capacity	kW
Mass flow rate, water	kg/s
Power input (to drive)	kW
Refrigerant pressure	kPa
Hydraulic resistance	kPa

*Acceptable

Note: The above units agree with European Community (EC) requirements for export/import.

6

Appendix B—CONSTANTS: TYPICAL CALCULATIONS

B.1 GRAVITY, STANDARD ACCELERATION OF
9.806 65 m/s², exact value by definition.
General Conference of Weights and Measures, 1901 (approximately—32.1740 ft/s²)

B.2 ATMOSPHERIC PRESSURE, STANDARD
101.325 kPa, exact value by definition.
(approximately—29.921 in Hg @ 32°F; 760 mm Hg @ 0°C; 14.696 psi @ 32°F)

B.3 STANDARD AIR, SI
Dry air at 101.325 kPa and 20°C (density ≃ 1.204 kg/m³)

B.4 UNITS FOR MOISTURE CONTENT OF AIR
grams per kilogram of dry air, g/kg

B.5 DENSITY, DRY AIR
$\varrho = 3.48\,p/T$
where
ϱ = density, kg/m³
p = pressure, kPa (absolute)
T = absolute temperature, K

B.6 GAS CONSTANTS
R = 8.31441 J/(mol·K) (NBS-1983—Cohen & Taylor)
where K = thermodynamic temperature, kelvins
Air
R_a = 287 J/(kg·K)
Water vapor
R_w = 462 J/(kg·K)

B.7 PROPERTIES OF DRY AIR @ STANDARD ATMOSPHERIC PRESSURE 101.325 kPa

Temperature, t °C	Density, kg/m³	Viscosity, μ μPa·s	Conductivity, k W/(m·K)
−10	1.34	16.8	
0	1.29	17.2	0.0242
10	1.25	17.7	0.0251
20	1.20	18.2	0.0260
30	1.17	18.7	0.0267
40	1.13	19.1	0.0275
50	1.09	19.6	0.0282

B.8 SPECIFIC HEATS (20°C)
Dry air
constant pressure, c_p = 1.006 kJ/(kg·K)
constant volume, c_v = 0.717 kJ/(kg·K)
Superheated water vapor, c_p = 1.84 kJ/(kg·K)

B.9 HEATING
sensible heat $h_s = 1.2Q\Delta t$
latent heat $h_l = 3.0Q\Delta w$
total heat $h_t = 1.2Q\Delta h$
where
Δt = temperature difference, K or °C
Δw = moisture content difference, g/kg (dry air)
Δh = enthalpy difference, kJ/kg (dry air)
Q = volume flow rate, L/s (standard air)
h_s, h_l, h_t = heat flow, W

B.10 THERMAL EXPANSION—PIPE & TUBING
(average values)
mm/m (temperature range measured from 0°C)

Temperature Range, °C	Steel Pipe	Copper Tubing	Aluminum Tubing
0	0	0	0
50	0.57	0.89	1.18
100	1.14	1.77	2.35
150	1.71	2.66	3.53
200	2.28	3.55	
250	2.85	4.43	
300	3.42	5.32	

B.11 PREFERRED NUMBERS
The series of preferred numbers is a very useful engineering tool for rationalizing the intervals between sizes and thus reducing production and inventory costs. Examples of uses of preferred series are fan wheels, duct sizes, fasteners, pipe and tubing sizes, sheet metal gauges, wire sizes and electric motors.

BASIC SERIES*

R5	R10	R20	R40
1.00	1.00	1.00	1.00
			1.06
		1.12	1.12
			1.18
	1.25	1.25	1.25
			1.32
		1.40	1.40
			1.50
1.60	1.60	1.60	1.60
			1.70
		1.80	1.80
			1.90
	2.00	2.00	2.00
			2.12
		2.24	2.24
			2.36
2.50	2.50	2.50	2.50
			2.65
		2.80	2.80
			3.00
	3.15	3.15	3.15
			3.35
		3.55	3.55
			3.75
4.00	4.00	4.00	4.00
			4.25
		4.50	4.50
			4.75
	5.00	5.00	5.00
			5.30
		5.60	5.60
			6.00
6.30	6.30	6.30	6.30
			6.70
		7.10	7.10
			7.50
	8.00	8.00	8.00
			8.50
		9.00	9.00
			9.50
10.00	10.00	10.00	10.00

*FROM ISO 497-1973

B.12 PIPE/CONDUIT

Nominal Sizes US Inch	*ISO mm	i.d. mm	o.d. mm	Volume L/m
1/8	6	6.8	10.3	0.0363
1/4	8	9.2	13.7	0.0665
3/8	10	12.5	17.1	0.123
1/2	15	15.8	21.3	0.196
3/4	20	20.9	26.7	0.343
1	25	26.6	33.4	0.556
1-1/4	32	35.1	42.2	0.968
1-1/2	40	40.9	48.3	1.31
2	50	52.5	60.3	2.16
2-1/2	65	62.7	73.0	3.09
3	80	77.9	88.9	4.77
3-1/2	90	90.1	101.6	6.38
4	100	102.3	114.3	8.22
5	125	128.2	141.3	12.9
6	150	154.1	168.3	18.6
8	200	202.7	219.1	32.3
[illegible]	[illegible]	253.2	273.1	50.4
		304.8	323.9	73.0

33

B.13 METRIC COPPER TUBING SIZES

ASSUMED WALL THICKNESS mm	OUTSIDE DIAMETER mm R10 SERIES	ASTM B 88M	BS 2871 :71	DIN 1754
				3
	3.15			
	4			4
0.70	5			5
		6	6	6
	6.3			
	8	8	8	8
0.80	10	10	10	10
		12	12	12
0.9	12.5			
				14
		15	15	15
1.0	16			16
		18		18
1.1	20			20
		22	22	22
				24
1.2	25			25
				26
		28	28	28
				30
1.4	31.5			
				34
		35	35	35
				36
				38
	40			40
1.5		42	42	42
				44
				44.5
				45
				46
				48
1.7	50			50
		54	54	54
				55
				56
				57
				60
	63			
2.0				64
				65
				66
		67	67	
				70
				74
				75
			76	76
		79		
				80
2.3	80			84
				85
				86
				89
	100			100
				104
2.8		105		105
				106
			108	108
				114
	125			
3.1				129
		130		130
				131
			133	133

Note: No metric copper tubing is manufactured in U.S. as

B.14 VOLUME RATE OF FLOW

Litre per second (L/s) is the flow unit for air conditioning usage for both air and water. With water, this is approximately one kilogram per second (kg/s). The range 1 to 1 000 L/s is approximately equal to 2 to 2 000 cfm for air or 16 to 16 000 gpm for water.

B.15 CIRCULATING WATER REQUIREMENT

$Q = h/(4.2\Delta t)$

where

Q = volume flow rate, L/s
h = cooling or heating rate, kW
Δt = temperature difference, K or °C

B.16 VELOCITY IN PIPE

$V = 1273\,Q/d^2$

where

V = velocity, m/s
Q = volume flow rate, L/s
d = internal pipe diameter, mm

B.17 REYNOLDS NUMBER

$R_e = dV\varrho/\mu$

where

V = velocity, m/s
d = internal pipe diameter, mm
ϱ = density, kg/m³
μ = viscosity (absolute, dynamic), mPa·s

B.18 PRESSURE LOSS DUE TO PIPE FRICTION

$\Delta p = f\varrho LV^2/2d$

where

Δp = pressure loss, kPa
f = friction factor
ϱ = density, kg/m³
L = length of pipe, m
d = internal pipe diameter, mm
V = velocity, m/s

B.19 FRICTION FACTOR

$$f \simeq 0.0055\left[1 + (20\,000\ \varepsilon/d + 10^6/R_e)^{1/3}\right]$$

where

ε/d = relative roughness

ε = absolute roughness, mm
d = internal diameter, mm
R_e = Reynolds number

'Approximate equation when $\varepsilon/d < 0.01$ and $4000 < R_e < 10\,000\,000$

B.20 ABSOLUTE ROUGHNESS

Material	ε, mm
Smooth drawn tubing brass, copper, steel	0.0015
New steel pipe	0.046
Cast iron pipe, asphalt coated	0.12
Galvanized iron pipe	0.15
Cast iron pipe	0.25
Concrete, medium rough	0.91

B.21 TYPICAL PRESSURE DROP, COIL

Water side 5 to 50 kPa

B.22 WATER

Heat of vaporization at 101.325 kPa and 100°C = 2257 kJ/kg

Heat of fusion at 0°C = 335 kJ/kg

Average specific heat capacity, 4°C through 100°C = 4.2 kJ/(kg·°C)

Triple point (ice, water and steam in equilibrium)

nition

34

B.23 PROPERTIES OF WATER AT SATURATION

Temp °C	Specific Enthalpy kJ/kg	Density, ϱ kg/m³	Viscosity, μ (absolute, dynamic) mPa·s
0.01	0.01	999.8	1.78
4	16.8	1000.0	1.56
5	21.0	1000.0	1.52
6	25.2	1000.0	1.48
7	29.4	999.8	1.44
8	33.6	999.8	1.39
9	37.8	999.7	1.35
10	42.0	999.6	1.30
20	84.0	998.2	1.002
30	125.8	995.7	0.797
40	167.6	992.3	0.652
50	209.3	988.0	0.546
60	251.1	983.1	0.466
70	293.0	977.7	0.404
80	334.9	971.7	0.354
90	376.9	965.3	0.314
100	419.0	958.3	0.281
120	503.7	943.1	0.230
140	589.1	926.2	0.195
160	675.6	907.4	0.169
180	763.2	887.0	0.149
200	852.4	864.7	0.134

B.24 TYPICAL DENSITIES, kg/m³ @ 20°C

Gases (101.325 kPa)		Liquids	
butane	2.412	mercury	13 550
propane	1.829	sulphuric acid	1 830
oxygen	1.330	refrigerant 12	1 329
air, dry	1.204	glycerine	1 264
carbon dioxide	1.970	battery electrolyte	1 260
air, 50% Rh	1.191	refrigerant 22	1 213
acetylene	1.173	water	998
nitrogen	1.164	mineral oil	900
natural gas	0.719 -	kerosene	820
helium	0.166	ethyl alcohol	791
hydrogen	0.083	gasoline	730
		propane	580

Solids	
lead	11 300
copper	8 900
steel	7 830
cast iron	7 200
aluminum	2 700
glass	2 500
concrete	2 300
brick	1 921
hardwood	750
softwood	540
fiberglass board	80
polystyrene	20

B.25 VELOCITY, AIR (FROM MEASURED VELOCITY PRESSURE IN A DUCT)

$$V = 1.3\sqrt{p_v}$$

where
V = velocity, m/s
p_v = velocity pressure, Pa

B.26 VELOCITY PRESSURE

$$p_v = \varrho V^2/2$$

where
p_v = velocity pressure, Pa
ϱ = density, kg/m³
V = velocity, m/s

B.27 DUCT DIMENSIONS

size	length	cross sectional area
mm × mm	m	A = mm × mm/1 000 000 = m²

diameter	supports
mm	mm (center to center)

B.28 PRESSURE OF AIR USING MANOMETER

Measure height of water column, mm
Multiply by 9.8 = pressure in pascals, Pa
(multiplying by 10 is usually close enough)

B.29 FAN POWER

$$P = Q\ p/1000\eta$$

where
P = fan shaft power, W
Q = volume flow rate, L/s
Δp = pressure difference across fan, Pa
η = efficiency

B.30 FAN TIP SPEED

$$S_t = \pi dN/1000$$

where
S_t = tip speed, m/s
d = fan diameter, mm
N = revolutions per second, r/s

B.31 TYPICAL RANGE OF AIR VELOCITIES (m/s)

Application	Residences	Commercial	Industrial
filters	1.3-1.5	1.5-1.8	1.8-2.5
cooling coils	1.5-2.0	2.0-2.5	2.5-3.5
outside air intakes	2.5-4.0	2.5-4.5	2.5-6.0
heating coils	2.3-2.5	2.5-4.0	3.5-5.0
air washers	2.5	2.5	2.5
fan inlets	3.5-4.5	4.0-5.0	5.0-7.0
fan outlets	5.0-8.5	6.5-11	8.0-14
main ducts	3.5-6.0	5.0-8.0	6.0-11
branch ducts	3.0-5.0	3.0-6.5	4.5-9.0

B.32 VENTILATING RATES—TYPICAL

per person
2.5 L/s (≃5 cfm)
5.0 L/s (≃10 cfm)
10 L/s (≃20 cfm)
15 L/s (≃30 cfm)

Per square metre floor area
1.3 L/(s·m²) [≃ 0.25 cfm/ft²]

Air change rate
changes per hour = $3.6\ Q/V$

where
V = space volume, m³
Q = volume flow rate, L/s

B.33 ACOUSTICS

$$L_w = 10 \log_{10} W/W_O$$

where
L_w = sound power level, dB
W = sound power under consideration, watts (W)
W_O = reference sound power = 1 pW

Velocity of sound in air at 20°C and 50% RH ≅ 344 m/s.

35

B.34 HEAT FLOW

Thermal conductivity, a property of a material
λ = W/m•K or W/(m•°C) k-factor = 1/unit R-value

Thermal conductance, heat flow induced by a specific temperature difference
C = W/(m²•K) or W/(m²•°C) C-factor = 1/R

Thermal resistivity, a property of a material
R = m•K/W or m²•°C/W unit R-value

Thermal resistance, resistance to heat flow of a material or a construction
R = m•K/W or m•°C/W R-value

Heat flow
$q = A \cdot \Delta T / R$

where
A = area, m²
ΔT = temperature difference, K or °C
R = R-value

B.35 FOULING FACTOR, HEAT EXCHANGER

0.0001 m²•°C/W (≅ 0.0005 ft²•°F•h/Btu)
0.0002 m²•°C/W (≅ 0.001 ft²•°F•h/Btu)
0.0004 m²•°C/W (≅ 0.002 ft²•°F•h/Btu)

B.36 VAPOR TRANSMISSION

$w = \mu A \Delta p / L$

where
w = mass flow rate of vapor transmitted, ng/s
μ = permeability (perm metre), ng/(s• m•Pa)
A = area, m²
Δp = difference of vapor pressure between ends of flow path, Pa
L = length of flow path, m

B.37 FUEL ENERGY

No. 2 fuel oil, 140 000 Btu/gal = 38 MJ/L
No. 6 fuel oil, 150 000 Btu/gal = 42 MJ/L
Propane, 84 000 Btu/gal = 24 MJ/L
Natural gas, 1 000 Btu/ft³ = 37 kJ/L
Kilowatt hour = 3.6 MJ
Therm, 100 000 Btu (exact) = 105.5 MJ
Coal = 21 MJ/kg

B.38 FUEL BURNING RATES

power (watts) = volume rate of flow × fuel energy per unit volume

Oil, propane
kW = kJ/s = (mL/s)(MJ/L)

Natural gas
kW = kJ/s = (L/s)(kJ/L)

B.39 TEMPERATURE CONVERSION (exact)

$t_c = (t_F - 32)/1.8$ $\quad t_F = 1.8\, t_c + 32$
$t_c = T - 273.15$ $\quad t_F = T_R - 459.67$
$T = T_R/1.8$ $\quad T_R = 1.8\, T$
$T = t_c + 273.15$ $\quad T_R = t_F + 459.67$

where
t_c = Celsius temperature, °C
T = thermodynamic (absolute) temperature, kelvins (K)
t_F = Fahrenheit temperature, °F
T_R = thermodynamic (absolute) temperature degrees Rankine (°R)

and

°C = K °F = °R
°C = 1.8°F °F = °C/1.8

NOTES

When making conversions, remember that a converted value is no more precise than the original value. Round off the final answer of a series of calculations to no more than the same number of significant figures that occurs in the original values.

WARNING: The conversion tables are useful mainly to show equivalent SI units. **THE CONVERSION VALUES HAVE BEEN ROUNDED TO THREE OR FOUR SIGNIFICANT FIGURES**, which may be sufficiently accurate for most practical applications. For a more complete conversion table with more significant figures, see ASTM E 380.

Multiply	By	To Obtain
acre	0.405	ha
bar	*100	kPa
barrel (42 US gal, petroleum)	159	L
	0.159	m^3
Btu, IT	1.055	kJ
Btu/ft^3	37.3	kJ/m^3; J/L
Btu/gal	0.279	kJ/L
$Btu \cdot ft/h \cdot ft^2 \cdot °F$	1.731	$W/(m \cdot K)$
$Btu \cdot in/(h \cdot ft^2 \cdot °F)$ (thermal conductivity, *k*)	0.144	$W/(m \cdot K)$ $W/(m \cdot °C)$
Btu/h	0.293	W
Btu/ft^2	11.4	kJ/m^2
$Btu/(y \cdot ft^2)$	0.000293	$kWh/(y \cdot m^2)$ (not SI)
$Btu/(y \cdot ft^2)$	0.0000114	$GJ/(y \cdot m^2)$
$Btu/(h \cdot ft^2)$	3.15	W/m^2
$Btu/(h \cdot ft^2 \cdot °F)$ (overall heat trans coeff, *U*) (thermal conductance, *C*)	5.68	$W/(m^2 \cdot K)$ $W/(m^2 \cdot °C)$
Btu/lb	2.33	kJ/kg
Btu/(lb·°F) (specific heat, *c*)	4.19	$kJ/(kg \cdot K)$ $kJ/(kg \cdot °C)$
bushel	0.0352	m^3
calorie, gram	4.19	J
calorie, kilogram; kilocalorie	4.19	kJ
centipoise, viscosity, μ (absolute, dynamic)	*1.00	mPa·s
centistokes, kinematic viscosity, ν	*1.00	mm^2/s
cost, $ per square (100 sq ft)	0.108	$/$m^2$
cost, $ per square foot	10.8	$/$m^2$
cost, $ per pound	2.20	$/kg
cost, $ per ton (refrigeration)	0.284	$/kW
$dyne/cm^2$	*0.100	Pa
EDR hot water (150 Btu/h)	44.0	W
EDR steam (240 Btu/h)	70.3	W
EER	0.293	COP
fuel cost comparison @ 100% eff. cents per gallon	0.264	¢/L
cents per gallon (no. 2 fuel oil)	0.0677	$/GJ
cents per gallon (no. 6 fuel oil)	0.0632	$/GJ
cents per gallon (propane)	0.113	$/GJ
cents per kWh	2.78	$/GJ
cents per therm	0.0948	$/GJ
ft	*0.3048	m
ft	*304.8	mm
ft/min, fpm	0.00508	m/s
ft/s, fps	*0.3048	m/s
ft of water	2.99	kPa
ft of water per 100 ft pipe	0.0981	kPa/m
ft^2	0.0929	m^2
$ft^2 \cdot h \cdot °F/Btu$ (thermal resistance, *R*)	0.176	$m^2 \cdot K/W$ $m^2 \cdot °C/W$
ft^2/s, kinematic viscosity, ν	92 900	mm^2/s
ft^3	28.3	L
ft^3	0.0283	m^3
ft^3/h, cfh	7.87	mL/s
ft^3/min, cfm	0.47	L/s
ft^3/s, cfs	28.3	L/s
footcandle	10.76	lx
$ft \cdot lb_f$ (torque or moment)	1.36	N·m
$ft \cdot lb_f$ (work)	1.36	J
$ft \cdot lb_f/lb$ (specific energy)	2.99	J/kg
$ft \cdot lb_f/min$ (power)	0.0226	W
gallon (US, 231 in^3)	3.79	L
gallon	0.00379	m^3
gph	1.05	mL/s
gpm	0.0631	L/s
gpm/ton ref.	0.0179	mL/J
grain (1/7000 lb)	0.0648	g
gr/gal	17.1	mg/L
gr/lb	0.143	g/kg
To Obtain	**By**	**Divide**

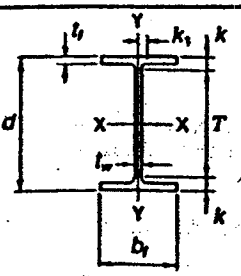
Multiply	By	To Obtain
horsepower (boiler)	9.81	kW
horsepower (550 $ft \cdot lb_f/s$)	0.746	kW
inch	*25.4	mm
in of mercury (60°F)	3.38	kPa
in of water (60°F)	249	Pa
in/100 ft, thermal expansion	0.833	mm/m
$in \cdot lb_f$ (torque or moment)	113	mN·m
in^2	645	mm^2
in^3 (volume)	16.4	mL
in^3/min (SCIM)	0.273	mL/s
in^3 (section modulus)	16 400	mm^3
in^4 (section moment)	416 000	mm^4
km/h	0.278	m/s
kWh	*3.60	MJ
$kWh/(y \cdot ft^2)$	0.0388	$GJ/(y \cdot m^2)$
kWh/1000 cfm	2.12	J/L
kilopond (kg force)	9.81	N
kip (1000 lb_f)	4.45	kN
kip/in^2 (ksi)	6.89	MPa
litre	*0.001	m^3
micron of mercury (60°F)	133	mPa
mile	1.61	km
mile, nautical	1.85	km
mph	1.61	km/h
mph	0.447	m/s
millibar	*0.100	kPa
mm of mercury (60°F)	0.133	kPa
mm of water (60°F)	9.80	Pa
metre of water	9.80	kPa
ounce (mass, avoirdupois)	28.3	g
ounce (force or thrust)	0.278	N
ounce (liquid, US)	29.6	mL
ounce inch (torque, moment)	7.06	mN·m
ounce (avoirdupois) per gallon	7.49	g/L
perm (permeance)	57.4	$ng/(s \cdot m^2 \cdot$
perm inch (permeability)	1.46	$ng/(s \cdot m \cdot P$
pint (liquid, US)	473	mL
pound lb (mass)	0.454	kg
lb (mass)	454	g
lb_f (force or thrust)	4.45	N
lb/ft (uniform load)	1.49	kg/m
$lb_m/(ft \cdot h)$ viscosity (absolute, dynamic, μ)	0.413	mPa·s
$lb_f/(ft \cdot s)$ viscosity (absolute, dynamic, μ)	1 490	mPa·s
lb/h	0.126	g/s
lb/min	0.00756	kg/s
lb of steam per hour @ 212°F (100°C)	0.284	kW
lb_f/ft^2	47.9	Pa
$lb_f \cdot s/ft^2$ viscosity (absolute, dynamic μ)	47 900	mPa·s
lb/ft^2	4.88	kg/m^2
lb/ft^3 (density, ρ)	16.0	kg/m^3
lb/gallon	120	kg/m^3
ppm (by mass)	*1.00	mg/kg
psi	6.89	kPa
quad	1.055	EJ
quart (liquid U.S.)	0.946	L
square (100 sq ft)	9.29	m^2
tablespoon (approximately)	15	mL
teaspoon (approximately)	5	mL
therm (US)	105.5	MJ
ton, long (2 240 lb)	1.016	t (tonne); Mg
ton, short (2 000 lb)	0.907	t (tonne); Mg
ton, refrigeration (12 000 Btu/h)	3.52	kW
torr (1 mm Hg@0°C)	133	Pa
watt per square foot	10.8	W/m^2
yd	*0.9144	m
yd^2	0.836	m^2
yd^3	0.765	m^3
To Obtain	**By**	**Divide**

*Conversion factor is exact.

Units are US values unless otherwise noted.

~~Steel Shape Data~~

37



W SHAPES
Dimensions

Designation				Area	Depth	Web		Flange		Distance		
						Thickness	$\frac{t_w}{2}$	Width	Thickness			
				A	d	t_w		b_f	t_f	T	k	k_1
mm x kg/m		in. x lb/ft		mm²	mm	mm	mm	mm	mm	mm	mm	mm
W 610 x 732[a]		W 24 x 492		93300	753	50.00	25.00	359.0	89.9	533	110	38
W 610 x 670[a]		W 24 x 450		85400	739	46.00	23.00	354.0	83.1	533	103	36
W 610 x 608[a]		W 24 x 408		77400	725	41.90	20.95	351.0	75.9	535	95	34
W 610 x 551[a]		W 24 x 370		70200	711	38.60	19.30	347.0	69.1	533	89	32
W 610 x 498[a]		W 24 x 335		63500	699	35.10	17.55	343.0	63.0	533	83	31
W 610 x 455[a]		W 24 x 306		57900	689	32.00	16.00	340.0	57.9	533	78	29
W 610 x 415[a]		W 24 x 279		52900	679	29.50	14.75	338.0	53.1	533	73	28
W 610 x 372[a]		W 24 x 250		47400	669	26.40	13.20	335.0	48.0	533	68	26
W 610 x 341		W 24 x 229		43400	661	24.40	12.20	333.0	43.9	533	64	25
W 610 x 307		W 24 x 207		39200	653	22.10	11.05	330.0	39.9	533	60	24
W 610 x 285		W 24 x 192		36300	647	20.60	10.30	329.0	37.1	533	57	23
W 610 x 262		W 24 x 176		33300	641	19.00	9.50	327.0	34.0	533	54	23
W 610 x 241		W 24 x 162		30800	635	17.90	8.95	326.0	31.0	533	51	22
W 610 x 217		W 24 x 146		27700	628	16.50	8.25	328.0	27.7	532	48	21
W 610 x 195		W 24 x 131		24900	622	15.40	7.70	327.0	24.4	534	44	20
W 610 x 174		W 24 x 117		22200	616	14.00	7.00	325.0	21.6	534	41	20
W 610 x 155		W 24 x 104		19800	611	12.70	6.35	324.0	19.0	535	38	19
W 610 x 153[b]		W 24 x 103		19500	623	14.00	7.00	229.0	24.9	535	44	20
W 610 x 140		W 24 x 94		17900	617	13.10	6.55	230.0	22.2	535	41	19
W 610 x 125		W 24 x 84		15900	612	11.90	5.95	229.0	19.6	532	40	19
W 610 x 113		W 24 x 76		14400	608	11.20	5.60	228.0	17.3	534	37	18
W 610 x 101		W 24 x 68		12900	603	10.50	5.25	228.0	14.9	533	35	18
W 610 x 92		W 24 x 62		11800	603	10.90	5.45	179.0	15.0	533	35	18
W 610 x 82		W 24 x 55		10500	599	10.00	5.00	178.0	12.8	533	33	18

[a] For application refer to Notes in Table 1.
[b] Heavier shapes in this series are available from some producers.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION

38

Introduction

As mentioned earlier, over 95% of all products currently used in building construction will not undergo any physical change during the conversion to the metric system.

All that will occur is that their dimensions will be drawn and specified in metric dimensions.

For manufacturers of these products, samples of which are listed in the "Soft Metric" section, the most important step is to develop metric product literature for architects and engineers to use during the design process.

Some products will undergo physical change to new hard metric sizes. These products are commercially available today, on a competitive basis.

This directory is an initial attempt to list domestic manufacturers of commercial building products in one of the following classes:

1. Manufacturers who make products that will not change during metric conversion, but have developed product literature with metric dimensions in it.

2. Manufacturers who currently manufacture or can manufacture the new hard metric product sizes.

Each section will identify if the product being discussed is a soft dimensioned product or a new hard metric product size.

All building products in this directory are made in USA.

This directory is open to all firms making building products commonly used in federal building construction. Firms interested in being included may do so by contacting us at the address listed on page 2.

CEPOA-EN-ES-M
U.S. Army Corps of
Engineers

Alaska District

Technical Memorandum

Hazardous Materials Survey, Boy Scouts of America and Horse Stable Facilities Demolition, Elmendorf Air Force Base, Alaska, August 2002

31 October 2002

Engineering Services Branch, Materials Section

EXECUTIVE SUMMARY

The Horse Facility and Boy Scouts of America facility on Elmendorf Air Force base were evaluated by the US Army Corps of Engineers, Alaska District, Engineering Services Branch to determine the existence and location of asbestos, lead, and other hazardous materials at the facilities. The information obtained will be used to guide the demolition, relocation, and disposal activities to be performed on these facilities to develop the Alternate Aircraft Fuel Systems Maintenance Hangar.

Based on current findings for the Horse Facilities and Boy Scouts of America facility, asbestos is present at concentrations greater than 1% in floor tile, floor tile mastics, thermal system insulation, joint compound, and roof system mastics.

Lead was detected in paints above 0.5 percent by weight. For the Boy Scouts of America and the Horse facilities, all painted surfaces should be assumed to be covered with lead containing paint and lead based paints, except for the tan and white paints found on the non-wallpapered walls in the office area of the Boy Scouts of America building 8675. The preliminary toxicity characteristic leaching procedure (TCLP) results for lead indicate that the Boy Scout Facility and Horse Facilities debris waste will not be classified as hazardous waste. Other miscellaneous hazardous materials are present in batteries, fire extinguishers, and exit signs. Work associated with these materials are addressed under specific sections of EPA, DOT, OSHA, and various other federal and state regulations.

Building 8661 was not surveyed for the original report. This building was to be handled by the Air Force, and was not part of the scope of work tasks contracted to the Army Corps of Engineers. The Air Force representative present at the charrette for this project removed this building from the original scope of work. Building 8661 however was added to this project at a 95% RFP review on October 9th, 2002. Building 8661 was not included in any of the wastestream analysis samples; because the customer has stated that this building is to be relocated to the new Horse Stable location. This facility was believed to have been erected in 1997, based on statements from Horse stable occupants. This building was still sampled for clarification of issues.

Suitable precautions must be taken to prevent worker exposure, emissions to the environment, and to comply with applicable regulations. Friable and non-friable asbestos-containing material (ACM) that will become friable during demolition activities should be removed prior to building demolitions. Non-friable asbestos-containing material that is not likely to release asbestos fibers during demolition activities may be left in place. Lead sources are accessible and could be a health hazard if ingested or the dust is inhaled during demolition. Worker protection is required by labor standards in 29 CFR and Alaska Administrative Code Title 8 (Chapter 61). Waste management is regulated under 40 CFR. Transportation of asbestos and lead waste is regulated under 49 CFR.

Background

The objective of the project is to construct a new fuel maintenance facility on the present site of the Boy Scouts of America and Horse facilities, north of Arctic Warrior Drive. The project has been downsized from the original proposal due to elimination of the requirement to support C-130 aircraft because of mission changes. The new facility will have a smaller footprint than originally planned, and its relocation to the F-22 beddown area will provide better support for fighter aircraft.

This report describes the asbestos-containing material (ACM) and other hazardous materials in the buildings as a whole and then discusses their potential impacts on work to be performed during the demolition of the hangar. The purpose of this investigation was to determine the presence and location of hazardous materials that will be impacted during construction, relocation, and demolition activities. The information obtained will be used to design hazard abatement, waste transportation, and disposal activities associated with the project.

Survey

Methods and Limitations

CEPOA-EN-ES-M was tasked to provide a survey of asbestos and lead containing materials in the facility. In addition to the lead and asbestos containing materials (ACM) survey, any hazardous materials encountered while conducting the survey were also documented. This report describes the kinds of ACM, lead, and other hazardous materials in the buildings as a whole. The report also discusses these materials' potential impacts on work to be performed during the construction, relocation, and demolition activities.

In August of 2002 an investigative team from the Alaska District, U.S. Army Corps of Engineers, Engineering Division-Engineering Services Branch-Materials Section visited the buildings located on the projected resite on Elmendorf Air Force Base to perform asbestos sampling, lead sampling, and other hazardous materials inspection. The primary inspector was Mr. Damian Walter, Industrial Hygienist (CEPOA-EN-ES-M). The site visit was part of an overall investigation being performed on the Horse Stable facilities and Boy Scouts of America facility to facilitate hazardous materials abatement during demolition and relocation activities. The Boy Scouts of America facility encompasses only one building, which is building 8675. The Horse Stable facilities' are comprised of seven primary buildings and multiple horse arena/corral areas. There are also a number of old horse transport crates (roughly six) that are either used for storage or single horse housing. Only five of the seven primary buildings are numbered, see Figure 4 for a general layout of the Horse Stable facilities and building numbering.

Prior to sampling, historical information and building schematics were collected, and a sampling strategy was developed. All work was performed in compliance with applicable EPA/AHERA guidelines. The data will be used to define the work practices and characterize the wastestreams that will be generated during the demolition of the buildings. The survey concentrated on collecting samples from materials suspected to contain hazardous materials and characterizing the potential wastestreams as hazardous or non-hazardous wastes (excluding building 8661).

Results

Asbestos

The results of the asbestos analysis are provided in Appendix A and are discussed below. ACM is present in floor tile, floor tile mastics, pipe insulation, joint compound, and roof system mastics. Asbestos analysis was performed on 85 materials collected from 73 locations located throughout the interior and exterior of facilities located at the proposed construction site. All of the asbestos samples were submitted for analysis by polarized light microscopy (PLM), EPA600/R-93/116 at SciLab Boston, Inc. of Weymouth, Massachusetts. Approximate sample locations and descriptions are provided in Figures 2-4 and Table 1. Sample descriptions and laboratory data are provided in Appendix A. Additional observations and information associated with the samples as well as descriptions of individual rooms and building components are provided in the field log supplied in Appendix B.

Results for Horse Facilities and Boy Scouts of America Facility

Floor Tile/Mastic:

Floor tile and floor tile mastics in the clubhouse rooms of the Horse facilities and an area within the Boy Scout Facility contain asbestos at concentrations greater than 1%. Tile adhered with an asbestos containing mastic was found in the Boy Scout Facility at the transition point between the kennels and the office/conference rooms. In the horse facility clubhouse, mastics used on the floor tile and the green 9" by 9" tile found in the furnace room, bathroom closet, and water heaters' storage areas were reported to have asbestos at concentrations greater than 1%. The floor tile and mastics are generally not friable and, in most cases, is loose or can be easily dislodged at seems and edges of the floors.

Wallboard system:

Samples taken of the wallboard joint compound had positive detections of asbestos greater than 1%. Wallboard joint compound used throughout the buildings contains asbestos up to 5%. Asbestos containing joint compound was detected in samples taken that represent the clubhouse of the horse facilities. Wallboard is intermixed sporadically with plywood throughout the horse stable clubhouse. It is impossible to differentiate between joint compound that tested positive and those that did not.

Corrugated Paneling:

All of the exterior corrugated panelings found on the quonset huts contain asphaltic mastic at the transition points between panels that contains asbestos at concentrations greater than 1%. This mastic appears to be non-friable. There is other corrugated paneling; some is plastic and some is metal found as roofing and siding for horse stables. While surveying the facilities these corrugated panels did not appear to have a mastic, between the panels of these unpainted corrugated panels. Also upon speaking with members of the organization that occupy the facility they confirmed this.

Thermal Insulation:

Asbestos-containing pipe insulation exists on the pipe runs under the floors of the Boy Scouts of America facility. With the exception of some relatively small sections, the pipe insulation is generally in good condition but should be considered friable. These pipe runs located in the crawl space appear to all be abandoned. It appears that new copper piping was run in the facility and these lines typically appear to have been run through either a lowered ceiling or through the walls and attic.

Asbestos containing material was detected in the pipe insulation found on the piping related to the fire line suppression system located in the clubhouse of the horse facility. Asbestos containing and non-asbestos containing portions could not to be visually differentiated. With positive results in various samples, all thermal insulation wrap found in relation to the fire water line is assumed to be asbestos containing.

Window Glazing:

All window glazing on all windows at building 8659 is assumed to contain asbestos at concentrations greater than 1%. The glazing is generally in good condition and is not likely to release fibers during demolition activities.

Roof System:

Asbestos was detected in the asphaltic mastics found on the roof of the Boy Scout facility and the flat roof over the main structure of building 8659. These mastics are considered non-friable. Asphaltic mastics on the other smaller unnumbered horse facilities are assumed to be asbestos containing.

Lead

Lead was detected at a variety of concentrations in the paints sampled from the various buildings. Lead concentrations ranged from non-detect to 20.8% by weight. Interior and exterior paint samples tested from these various buildings did not result in concentration levels high enough to qualify all paints as lead-based paint; but lead was detected at low levels in all paint samples except paint samples taken of the tan and white paints found on the none wallpapered walls in the office areas of the Boy Scouts of America building. The current cream and brown exterior paint layer on building 8659 and 8657 has an undercoating in areas that is lead containing; but the surface layer when tested resulted in a non-detect. It is impossible to determine which areas have undercoats and which do not so all paints are assumed to be lead-containing. However, just because not all paint levels exceeded the current lead-based paint definition does not eliminate potential health hazards of lead that must be addressed during demolition work practices. Lead analysis was performed on 37 paint samples collected from 37 locations located throughout the interior and exterior of the buildings. The samples were analyzed using EPA SW846 method 7420.

Paint on the facilities are extremely weathered and peeling in some areas. Majority of the Quonset hut building 8663 is peeling. The rest of the facilities have about 5 to 10% of their paints peeling. The only exception is Building 8675, which at the time of the survey only had about 1% of its paint peeling.

Lead Batteries:

Lead containing batteries were found in exit signs of the facilities located on the proposed site. A total of 10 Exittronic signs are located throughout the facilities. The batteries in these units are lead-acid; but voltage was unable to be determined.

TCLP:

Debris:

A composite sample: poured concrete, wood siding, wallboard, metal and wood materials and bracing, was collected from Building 8675 (Boy Scouts of America Facility) and tested to determine if the materials might need to be disposed of as a hazardous waste. The result of the TCLP analysis for lead in the debris was nondetect at the reporting limit of 0.50 mg/l. The associated method-reporting limit is below the 5-mg/l level that would require that the debris be treated as hazardous waste.

A composite sample: poured concrete, wallboard systems, metal and plastic siding, wood frame and posts etc. were collected from all the horse facilities materials and tested to determine if the materials might need to be disposed of as a hazardous waste. The result of the TCLP analysis for lead in the debris was 1.56 mg/l at the reporting limit of 0.50 mg/l. The associated method-reporting limit is below the 5 mg/l level that would require that the debris be treated as hazardous waste. Also a composite of all the facilities peeling paints were collected and tested to determine if the materials might need to be disposed of as a hazardous waste. The result of the TCLP analysis for lead in the paint debris was 3.21 mg/l at the reporting limit of 0.50 mg/l. The peeling paints associated method-reporting limit is below the 5 mg/l level that would require that the debris be treated as hazardous waste.

Total PCB analysis and PCB leachate analysis was performed on the same debris samples mentioned above. No PCBs were reported in any of the samples. Building 8661 was not included in any of the above wastestream analysis samples; because the customer has stated that this building is to be relocated to a new Horse Stable facility location.

Lead Flashing:

There is a lead flashing around three vent pipe penetrations on building 8675, the Boy Scouts of America facility. This material was tested and resulted in a 45.7 percent lead by weight. This material should be taken into consideration by the designer/contractor performing this work.

Other HTRW Materials:

Polychlorinated biphenyls

Ballasts:

Of the ballast examined throughout the facilities all were labeled as non-PCB containing. Members of the Midnight sun rider club (occupants of facility) stated that just a few years ago the facility was brought up to code and all the wiring, lighting, and plumbing was replaced in the facilities they occupy.

Other Materials Encountered

Mercury-Containing Materials:

Fluorescent lamps were present throughout the building and are assumed to be mercury containing. Throughout the facilities there are approximately 12 mercury containing thermostats.

Fire Extinguishers:

Fire extinguishers are located throughout the facilities. Approximately 8 fire extinguishers are located throughout the facilities. These extinguishers are primarily a 20 pound model that is an ammonium phosphate base.

Fire Doors:

Two fire doors had labels in building 8675. These doors were 1.5 hour rated Warnock Hersey door manufactured by Steelcraft MFG. Co. Other doors within the facilities were either not fire doors, missing labels or painted over making the ability to obtain information without damaging the label practically impossible. From past examinations of similar doors in buildings built during the same time period these doors are believed to be non-asbestos containing.

Heating System:

The heating systems in these facilities are a forced air system. Only two buildings have a heating system, these buildings are 8659 (clubhouse area only) and 8675.

Pressure Treated/Creosote Wood:

Pressure treated wood is used throughout the horse stable facilities and arena/corral areas. On the Boy Scouts of America Facility (Building 8675) there is a pressure treated trim board that runs along the whole outside of the facility, hidden behind the outside tongue and groove surfacing near ground level. On the horse facility buildings pressure treated/creosote wood is dispersed throughout the structures and sporadically it has been replace with plastic wood composite boards. It is hard to differentiate painted treated woods from painted non-treated woods. The only area that does not appear to contain any pressure treated/creosote wood is the locker room and latrine areas of building 8659. The arena and obstacle course areas a primarily made of treated wood materials.

Transformers:

There are two-power pole transformers located on utility poles on the proposed construction site. These were unable to be assessed due to inaccessibility and the rushed survey schedule. These two transformers will need to be addressed by the designer or contractor performing this work.

Results for Building 8661:

Club members that occupy the horse stable facilities stated that Building 8661 is believed to have been erected in 1997. The facility was still test based on concerns of human health and safety issues. None of the materials tested resulted in asbestos or lead detection. However, there are two exit signs and two emergency light units. Dual-Light

is the manufacturer of the emergency lights, as for the exit signs there were no indications of manufacturer; but both contained the same battery types. The back-up batteries in these units had no brand or manufacturer name; but the part number 12-704 (SN 8703000227). These batteries are assumed to be nickel-cadmium.

Discussion

Asbestos

Airborne asbestos is a health hazard. It is regulated under both Alaska State and Federal OSHA Labor standards. Alaska regulations have adopted, as State regulation, substantially all Federal OSHA standards for general industry, construction and some other industries. The State maintains enforcement authority. The Federal OSHA regulation governing worker exposure to asbestos is 29 CFR 1910.12 and 1910.1001. The permissible exposure limit (PEL) for most types of asbestos is 0.1 fibers per cc of air for an 8-hour work period. Presumed asbestos-containing material (PACM) includes thermal insulation and surfacing found in buildings constructed no later than 1980 and directs levels of worker protection when present during some tasks. Rebuttal of presumption requires analysis of three bulk samples from each homogenous area. The analysis must be done by a NVLAP or other accredited laboratory and must demonstrate that the asbestos level present does not exceed 1%.

Lead

Lead is a human health hazard when exposures are possible through inhalation and ingestion. Lead is regulated by both State and Federal labor regulations. The State has adopted Federal OSHA standards for its regulations. The Federal labor standard for lead in construction is 29 CFR 1926.62 and 1910.1025. The maximum PEL for lead is generally 50 micrograms per cubic meter of air over an 8-hour day. The standard establishes reduced PELs for longer work periods and sometimes for some individuals. Medical monitoring, personal protection, and administrative requirements are part of the regulations when lead is present in the work place. The standards also prescribe specific levels of personal protection whenever lead is present and airborne lead concentrations have not been measured for the particular site and tasks.

General

The presence of asbestos in ACM is not a health hazard unless the asbestos fibers are freed from their matrix and become airborne, i.e. capable of being inhaled or ingested. The term "friable" is a general description for ACM that is likely to release fibers if it is disturbed. The term "non-friable ACM" refers to ACM where the asbestos fibers are bound in a stiff matrix, such as vinyl, asphalt, or cement, and consequently unlikely to release fibers unless the matrix is damaged. Non-friable ACM is governed by less stringent regulations than friable ACM and consequently non-friable ACM is less expensive to remove and dispose of than friable ACM.

Friable ACM exists in the thermal system insulation found on piping in the facilities (bldg 8659 & 8675) and joint compound. Non-friable ACM exists in the floor tile, roofing mastics, and floor tile mastics/caulkings.

Lead does not present a health hazard unless disturbed to generate an exposure route. Removal procedures that generate an airborne source (inhalation) and possible

ingestion source will result in a health risk and possible hazardous waste production. Such procedures would require special precautions and compliance with relevant federal, state, and local regulations.

Conclusions

To ensure the protection of personnel and the environment, most hazardous materials should be removed and disposed of as a separate wastestream from the general construction debris. However, if abatement of ACM and lead does not present a significant hazard to workers or is not expected to be disturbed, some ACM and lead may be left in place during the buildings' demolition and relocation. If ACM and lead are to remain in specific buildings' locations during demolition and relocation, special demolition and relocation disturbance procedures may be required, along with special debris disposal practices.

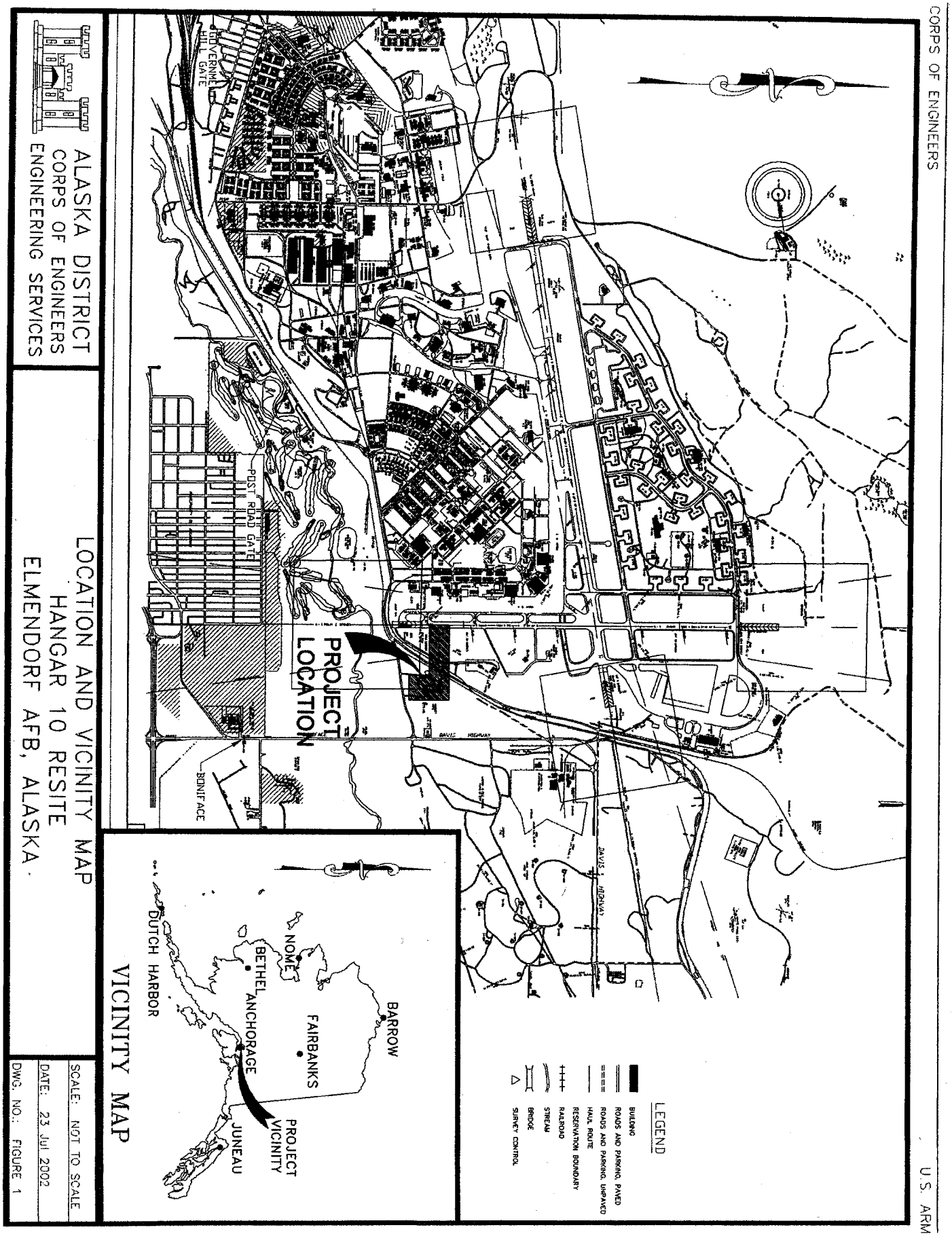

CORPS OF ENGINEERS
U.S. ARM
LEGEND
BUILDING
ROADS AND PARKING, PAVED
ROADS AND PARKING, UNPAVED
HAUL ROUTE
RESERVATION BOUNDARY
RAILROAD
STREAM
BRIDGE
SURVEY CONTROL
PROJECT LOCATION
GOVERNMENT HILL GATE
POST ROAD GATE
BONIFACE
DAVIS HIGHWAY
VICINITY MAP
BARROW
FAIRBANKS
NOME
BETHEL
ANCHORAGE
DUTCH HARBOR
PROJECT VICINITY
JUNEAU
ALASKA DISTRICT
CORPS OF ENGINEERS
ENGINEERING SERVICES
LOCATION AND VICINITY MAP
HANGAR 10 RESITE
ELMENDORF AFB, ALASKA
SCALE: NOT TO SCALE
DATE: 23 Jul 2002
DWG. NO.: FIGURE 1

TABLE: 1

Sample #	Sample ID #	Sample Description and Location
1	ELM179New001BK	Roofing tar material w/rock and asphalt
2	ELM179New002BK	Roofing/Tar paper
3	ELM179New003BK	Mastic from vents over furnace
4	ELM179New004BK	Mastic/Tar from over furnace vents
5	ELM179New005BK	Grayish tar/mastic off vents over furnace (fiberous)
6	ELM179New006BK	Piece of roof shingle
7	ELM179New007BK	Mastic from pipe vent punch
8	ELM179New008BK	Black mastic from edge of roof
9	ELM179New009BK	Shield from pipe vents
10	ELM179New010BK	A tar like paper, between exterior layers of plywood
11	ELM179New011BK	Tan exterior paint
12	ELM179New012BK	Tar/mastic w/exterior paint
13	ELM179New013BK	Fabric/weeve of wire housing
14	ELM179New014BK	Black casing material on exterior wiring
15	ELM179New015BK	Tar paper front of facility behind exterior tongue and groove
16	ELM179New016BK	Brown and Red paint from exterior concrete steps
17	ELM179New017BK	Brown and White paint from exterior door trim
18	ELM179New018BK	TSI off piping in crawl space (length/elbow)
19	ELM179New019BK	TSI off piping in crawl space (length)
20	ELM179New020BK	TSI off piping in crawl space (width)
21	ELM179New021BK	Roof mastic off pipe punch on Horse barn
22	ELM179New022BK	Roof/tar paper from horse barn
23	ELM179New023BK	Roof paper from horse stable
24	ELM179New024BK	Roofing material from above stables
25	ELM179New025BK	Tar/Mastic w/asphalt from connection area on horse barn
26	ELM179New026BK	Roof paper and tar from connection area on horse barn
27	ELM179New027BK	Fabric material found as patch
28	ELM179New028BK	Tar paper from fabric patch area
29	ELM179New029BK	Tan paint found on walls that are not wallpapered
30	ELM179New030BK	Texturing off ceiling in main hall
31	ELM179New031BK	Texturing & wallboard from ceiling
32	ELM179New032BK	12 by 12 floor tile
33	ELM179New033BK	12 by 12 tan floor tile
34	ELM179New034BK	Floor tile from under carpeted room
35	ELM179New035BK	White baseboard trim w/cream mastic
36	ELM179New036BK	White paint from interior from BSA
37	ELM179New037BK	Textured wallpaper
38	ELM179New038BK	Weeve wall covering
39	ELM179New039BK	Wallboard from around outlet in teaching room
40	ELM179New040BK	Brown baseboard w/ white mastic
41	ELM179New041BK	Gray & red paint found covering mechanical room floor\
42	ELM179New042BK	White tile w/ black mastic found at edge of kennels
43	ELM179New043BK	Wallboard from exterior interior wall
44	ELM179New044BK	Strange orangish yellow brick found in outside kennel
45	ELM179New045BK	Wallboard from mechanical room
46	ELM179New046BK	Wallboard from interior exterior wall
47	ELM179New047BK	12 by 12 tile from Horse office
48	ELM179New048BK	Green 9 by 9 tile
49	ELM179New049BK	12 by 12 white tile w/ mastic

TABLE 1: *continued*

Sample #	Sample ID #	Sample Description and Location
50	ELM179New050BK	TSI off piping
51	ELM179New051BK	Mulit-paint layer found on older walls (green, gray, white)
52	ELM179New052BK	Wallboard joint tape
53	ELM179New053BK	Joint tape
54	ELM179New054BK	Exterior walls multi-layer paint
55	ELM179New055BK	Yellow interior paint
56	ELM179New056BK	Brown baseboard trim w/ light brown mastic
57	ELM179New057BK	Joint compound
58	ELM179New058BK	Wallboard
59	ELM179New059BK	Gray, red, black, white paint
60	ELM179New060BK	Wallboard from oldest wall
61	ELM179New061BK	Wallboard from closet
62	ELM179New062BK	White 12 by 12 tile w/black mastic
63	ELM179New063BK	Rap on piping
64	ELM179New064BK	TSI off fire supply piping
65	ELM179New065BK	Black matting on floor
66	ELM179New066BK	Gray paint
67	ELM179New067BK	White paint
68	ELM179New068BK	White and gray stable fencing paint
69	ELM179New069BK	Brown exterior paint
70	ELM179New070BK	Window caulking
71	ELM179New071BK	Yellow/cream exterior paint
72	ELM179New072BK	Cream paint
73	ELM179New073BK	Paint on QH 8663
74	ELM179New074BK	Interior paint from QH 8663
75	ELM179New075BK	Fiberboard from QH 8663
76	ELM179New076BK	Mastic at transition points in QH 8663
77	ELM179New077BK	Mastic found under siding at transition points
78	ELM179New078BK	Fiberboard from inside QH 1
79	ELM179New079BK	White paint from inside QH 1
80	ELM179New080BK	Gray paint from inside QH1
81	ELM179New081BK	White exterior paint from QH1
82	ELM179New082BK	White exterior paint over green from QH1
83	ELM179New083BK	Fiberous divider materials on metal corregated siding QH1
84	ELM179New084BK	Fiberous divider materials on metal corregated siding QH3
85	ELM179New085BK	White and yellow paint from QH3
86	ELM179New086BK	Gray and white paint from interior of QH3
87	ELM179New087BK	White exterior paint from QH2
88	ELM179New088BK	Fiberboard from QH3
89	ELM179New089BK	Black tar/mastic found on entryways of huts
90	ELM179New090BK	Roof paper from wood structure
91	ELM179New091BK	Gray paint from horse transfer bldg
92	ELM179New092BK	Cream paint from Annex horse stable
93	ELM179New093BK	White paint in storage closet of horse offices
94	ELM179New094BK	12 by 12 tile w/brown mastic
95	ELM179New095BK	Metal from Quenset Huts
96	ELM179New096BK	Gray paint from judging box
97	ELM179New097BK	Red paint from judging box
98	ELM179New098BK	Multi-paint layer from corral
99	ELM179New099BK	Asphalt tar paper from transport box

TABLE 1: *continued*

Sample #	Sample ID #	Sample Description and Location
100	ELM179New100BK	Fiberous wiring of QH# 8663
TCLP	ELM179NewBSATCLP	Boyscouts of America Facility
TCLP	ELM179PeelingPtTCLP	Peeling Paint from Horse Facilities
TCLP	ELM179HorseFacTCLP	Building materials from Horse Facilities
101	ELM179New101BK	Paint from inside hay barn
102	ELM179New102BK	Wallboard System from inside hay barn
103	ELM179New103BK	Joint Compound/mud from wallboard sytem\
104	ELM179New104BK	Wallboard System from inside hay barn
105	ELM179New105BK	Mud between 2 sheet rock boards
106	ELM179New106BK	Caulking from between metal roof panels
107	ELM179New107BK	Brown trim paint
108	ELM179New108BK	Brown trim paint
109	ELM179New109BK	White caulking from between trim boards
110	ELM179New110BK	Caulking from between metal roof panels

--END OF APPENDIX--

APPENDIX A
Laboratory Data

SCILAB BOSTON, INC.
8 SCHOOL STREET
WEYMOUTH, MA 02189
TEL: (781) 337-9334 • FAX: (781) 337-7642

FACSIMILE TELECOPY TRANSMISSION

To: Damian Walter
US Army Corps of Engineers
Fax #: (907)753-2636

Date: Monday, August 26, 2002
Time: 19:17:19
Comments:

From: Steven Grevelis
SCILAB Job#: 502081406
Subject: PLM 24 hour Results
Client Project: 01-029: FYI 01 3rd Site: Elmendorf AFB, AK

Number of Pages: 21
(including cover sheet)

THE SCILAB GROUP OF LABORATORIES

Certified Analysis *Service 24 Hours A Day • 7 Days A Week* *Competitive Prices*

visit our web site - www.scilabs.com

SCIENTIFIC LABORATORIES, INC.
117 EAST 30TH STREET
NEW YORK, NY 10016
TEL: (212) 679-8600
FAX: (212) 679-9392

SCILAB CALIFORNIA, INC.
24416 SOUTH MAIN ST.
CARSON, CA 90745
TEL: (310) 834-4868
FAX: (310) 834-4772

SCILAB BOSTON, INC.
8 SCHOOL STREET
WEYMOUTH, MA 02189
TEL: (781) 337-9334
FAX: (781) 337-7642

SCIENTIFIC LABORATORIES, INC.
13635 GENITO ROAD
MIDLOTHIAN, VA 23112
TEL: (804) 763-1200
FAX: (804) 763-1800

NEW YORK • LOS ANGELES • BOSTON • RICHMOND

U.S. Army Corps of Engineers
P.O. Box 898
Anchorage, AK 99506
(907) 753-5582

SHIP TO: SciLab
Christina Benoit
8 School Street
Weymouth, MA 02189
(888) 724-5221

502081406

CHAIN OF CUSTODY RECORD

PROJ NO.	PROJECT NAME
01-029	FY 01 3rd Site, Elmendorf AFB, AK
SAMPLERS: (Signature) D. Walter	

SAMPLE ID #	Date	Time	Station Location	Number of Containers	Asbestos by PLM	Lead in Paint	TCLP for Lead	Total PCBS	TCLP for PCBs					Notes
ELM179New076BK	20 Aug 02		Mastic at transition points in QH 8663	1	1									Pg 1 of 1
ELM179New077BK	20 Aug 02		Mastic found under siding at transition points	1	1									
ELM179New078BK	20 Aug 02		Fiberboard from inside QH 1	1	1									24 hours on Asbestos and Lead
ELM179New079BK	20 Aug 02		White paint from inside QH 3	1		1								48 hours on TCLP for Lead
ELM179New080BK	20 Aug 02		Gray paint from inside QH1	1		1								48 hours on TCLP for PCBs
ELM179New081BK	20 Aug 02		White exterior paint from QH1	1		1								48 hours on Total PCBs in Paint chips
ELM179New082BK	20 Aug 02		White exterior paint over green from QH1	1		1								
ELM179New083BK	20 Aug 02		Fiberous divider materials on metal corrugated siding QH1	1	1									
ELM179New084BK	20 Aug 02		Fiberous divider materials on metal corrugated siding QH3	1	1									
ELM179New085BK	20 Aug 02		White and yellow paint from QH3	1		1								
ELM179New086BK	20 Aug 02		Gray and white paint from interior of QH3	1		1								
ELM179New087BK	20 Aug 02		White exterior paint from QH2	1		1								
ELM179New088BK	20 Aug 02		Fiberboard from QH3	1	1									
ELM179New089BK	20 Aug 02		Black bituminatic found on entryways of huts	1	1									
ELM179New090BK	20 Aug 02		Roof paper from wood structure	1	1									
ELM179New091BK	20 Aug 02		Gray paint from horse transfer bldg	1		1								
ELM179New092BK	20 Aug 02		Cream paint from Annex horse stable	1		1								
ELM179New093BK	20 Aug 02		White paint in storage closet of horse offices	1		1								
ELM179New094BK	20 Aug 02		12 by 12 tile w/brown mastic	1	1									
ELM179New095BK	21 Aug 02		Metal from Quonset Huts	1		1								
ELM179New096BK	21 Aug 02		Gray paint from judging box	1		1								
ELM179New097BK	21 Aug 02		Red paint from judging box	1		1								
ELM179New098BK	21 Aug 02		Multi-paint layer from corral	1		1								No more samples
ELM179New099BK	21 Aug 02		Asphalt tar paper from transport box	1	1									To Arrive
ELM179New100BK	21 Aug 02		Fiberous wiring of QH# 8663	1	1									

Relinq. by: (Signature)	Date	Time	Received by: (Signature)		Date	Time	Remarks:
	8-22-02	1320 hrs					
Received by: (Signature)	Date	Time	Relinq. by: (Signature)	Received by: (Signature)	Date	Time	24 HOUR TURNAROUND ON ASBESTOS & LEAD; 48 HOUR ON TCLP FOR LEAD & PCBs & TOTAL PCBs
Relinq. by: (Signature)	Date	Time	Received for laboratory by: (Signature)		Date	Time	

Distribution: Original accompanies Shipment; Copy to Coordinate Field File

PR&C % 2337105

U.S. Army Corps of Engineers
P.O. Box 898
Anchorage, AK 99506
(907) 753-5582

502081406

SHIP TO: SciLab
Christina Berot
8 School Street
Weymouth, MA 02189
(888) 724-5221

CHAIN OF CUSTODY RECORD

PROJ NO.	PROJECT NAME
01-029	FY 01 3rd Site, Elmendorf AFB, AK

SAMPLERS: (Signature) D. Walter

SAMPLE ID #	Date	Time	Station Location	Number of Containers	Asbestos by PLM	Lead in Paint
ELM179New051BK	20 Aug 02		Multi-paint layer found on older walls (green, gray, white) 48	1		1
ELM179New052BK	20 Aug 02		Wallboard joint tape 49	1	1	
ELM179New053BK	20 Aug 02		Joint tape 48	1	1	
ELM179New054BK	20 Aug 02		Exterior walls multi-layer paint	1		1
ELM179New055BK	20 Aug 02		Yellow interior paint	1		1
ELM179New056BK	20 Aug 02		Brown baseboard trim w/ light brown mastic 49 50	1	1	
ELM179New057BK	20 Aug 02		Joint compound 51	1	1	
ELM179New058BK	20 Aug 02		Wallboard 52	1	1	
ELM179New059BK	20 Aug 02		Gray, red, black, white paint	1		1
ELM179New060BK	20 Aug 02		Wallboard from oldest wall 53	1	1	
ELM179New061BK	20 Aug 02		Wallboard from closet 54	1	1	
ELM179New062BK	20 Aug 02		White 12 by 12 tile w/black mastic 55 56	1	1	
ELM179New063BK	20 Aug 02		Rap on piping 57	1	1	
ELM179New064BK	20 Aug 02		TSI off fire supply piping 58	1	1	
ELM179New065BK	20 Aug 02		Black matting on floor 59	1	1	
ELM179New066BK	20 Aug 02		Gray paint	1		1
ELM179New067BK	20 Aug 02		White paint	1		1
ELM179New068BK	20 Aug 02		White and gray stable fencing paint	1		1
ELM179New069BK	20 Aug 02		Brown exterior paint	1		1
ELM179New070BK	20 Aug 02		Window caulking 60	1	1	
ELM179New071BK	20 Aug 02		Yellow/cream exterior paint	1		1
ELM179New072BK	20 Aug 02		Cream paint	1		1
ELM179New073BK	20 Aug 02		Paint on QH 8663	1		1
ELM179New074BK	20 Aug 02		Interior paint from QH 8663	1		1
ELM179New075BK	20 Aug 02		Fiberboard from QH 8663 101	1	1	

Pg 1 of 1

Notes

24 hours on Asbestos and Lead
48 hours on TCLP for Lead
48 hours on TCLP for PCBs
48 hours on Total PCBs in Paint chips

More Samples To Arrive

Relinq. by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
	082202	1000 hrs			
Received by: (Signature)	Date	Time	Relinq. by: (Signature)	Date	Time
Relinq. by: (Signature)	Date	Time	Received for laboratory by: (Signature)	Date	Time

Remarks:

24 HOUR TURNAROUND ON ASBESTOS & LEAD;
48 HOUR ON TCLP FOR LEAD & PCBs & TOTAL PCBs

Distribution: Original accompanies Shipment; Copy to Coordinate Field Files

PRAC %22337105

50208140

U.S. Army Corps of Engineers
P.O. Box 898
Anchorage, AK 99506
(907) 753-5582

SHIP TO: SciLab
Christina Berot
8 School Street
Weymouth, MA 02189
(888) 724-5221

CHAIN OF CUSTODY RECORD

PROJ NO.	PROJECT NAME
1-029	FY 01 3rd Site, Elmendorf AFB, AK

SAMPLERS: (Signature) D. Walter

SAMPLE ID #	Date	Time	Station Location	Number of Containers	Asbestos by PLM	Lead in Paint
LM179New026BK	19 Aug 02		Roof paper and tar from connection area to horse barn 21	1	1	
LM179New027BK	19 Aug 02		Fabric material found as patch 22	1	1	
LM179New028BK	19 Aug 02		Tar paper from fabric patch area 23	1	1	
LM179New029BK	19 Aug 02		Tan paint found on walls that are not wallpapered	1		1
LM179New030BK	19 Aug 02		Texturing off ceiling in main hall 24	1	1	
LM179New031BK	19 Aug 02		Texturing & wallboard from ceiling 25	1	1	
LM179New032BK	19 Aug 02		12 by 12 floor tile 26	1	1	
LM179New033BK	19 Aug 02		12 by 12 tan floor tile 27	1	1	
LM179New034BK	19 Aug 02		Floor tile from under carpeted room 28	1	1	
LM179New035BK	19 Aug 02		White baseboard trim w/cream mastic 29 30	1	1	
LM179New036BK	19 Aug 02		White paint from interior from BSA	1		1
LM179New037BK	19 Aug 02		Textured wallpaper 31	1	1	
LM179New038BK	19 Aug 02		Weeve wall covering 32	1	1	
LM179New039BK	19 Aug 02		Wallboard from around outlet in teaching room 33	1	1	
LM179New040BK	19 Aug 02		Brown baseboard w/ white mastic 34 35	1	1	
LM179New041BK	19 Aug 02		Gray & red paint found covering mechanical room floor	1		1
LM179New042BK	19 Aug 02		White tile w/ black mastic found at edge of kennels 36 37	1	1	
LM179New043BK	19 Aug 02		Wallboard from exterior interior wall 38	1	1	
LM179New044BK	19 Aug 02		Strange orangish yellow brick found in outside kennel 39	1	1	
LM179New045BK	19 Aug 02		Wallboard from mechanical room 40	1	1	
LM179New046BK	19 Aug 02		Wallboard from interior exterior wall 41	1	1	
LM179New047BK	20 Aug 02		12 by 12 tile from Horse office 42	1	1	
LM179New048BK	20 Aug 02		Green 9 by 9 tile 43	1	1	
LM179New049BK	20 Aug 02		12 by 12 white tile w/ mastic 44 45	1	1	
LM179New050BK	20 Aug 02		TSI off piping 46	1	1	

Pg 1 of 1

Notes

24 hours on Asbestos and Lead
48 hours on TCLP for Lead
48 hours on TCLP for PCBs
48 hours on Total PCBs in Paint chips

More Samples To Arrive

Relinq. by: (Signature) Dan Walter	Date 8/22/02	Time 1000 hrs	Received by: (Signature) [illegible]		Date	Time	**Remarks:**
Received by: (Signature)	Date	Time	Relinq. by: (Signature)	Received by: (Signature)	Date	Time	**24 HOUR TURNAROUND ON ASBESTOS & LEAD; 48 HOUR ON TCLP FOR LEAD & PCBs & TOTAL PCBs**
Relinq. by: (Signature)	Date	Time	Received for laboratory by: (Signature)		Date	Time	

Distribution: Original accompanies Shipment; Copy to Coordinate Field Files

PR&C % 2233705

50208140(

U.S. Army Corps of Engineers
P.O. Box 898
Anchorage, AK 99506
(907) 753-5582

SHIP TO: SciLab
Christina Berot
8 School Street
Weymouth, MA 02189
(888) 724-5221

CHAIN OF CUSTODY RECORD

PROJ NO.: 01-029
PROJECT NAME: FY 01 3rd Site, Elmendorf AFB, AK
SAMPLERS: D. Walter (Signature) [signature]

Pg 1 of 1

SAMPLE ID #	Date	Time	Station Location	Number of Containers	Asbestos by PLM	Lead in Paint	Notes
ELM179New001BK	19 Aug 02		Roofing tar material w/rock and asphalt 1	1	1		
ELM179New002BK	19 Aug 02		Roofing/Tar paper 2	1	1		24 hours on Asbestos and Lead
ELM179New003BK	19 Aug 02		Mastic from vents over furnace 3	1	1		48 hours on TCLP for Lead
ELM179New004BK	19 Aug 02		Mastic/Tar from over furnace vents 4	1	1		48 hours on TCLP for PCBs
ELM179New005BK	19 Aug 02		Grayish tar/mastic off vents over furnace (fiberous) 5	1	1		48 hours on Total PCBs in Paint chips
ELM179New006BK	19 Aug 02		Piece of roof shingle 6	1	1		
ELM179New007BK	19 Aug 02		Mastic from pipe vent punch 7	1	1		
ELM179New008BK	19 Aug 02		Black mastic from edge of roof 8	1	1		
ELM179New009BK	19 Aug 02		Shield from pipe vents	1		1	
ELM179New010BK	19 Aug 02		A tar like paper, between exterior layers of plywood 9	1	1		
ELM179New011BK	19 Aug 02		Tan exterior paint	1		1	
ELM179New012BK	19 Aug 02		Tar/mastic w/exterior paint	1		1	
ELM179New013BK	19 Aug 02		Fabric/weave of wire housing 10	1	1		
ELM179New014BK	19 Aug 02		Black casing material on exterior wiring 11	1	1		
ELM179New015BK	19 Aug 02		Tar paper front of facility behind exterior tongue and groove 12	1	1		
ELM179New016BK	19 Aug 02		Brown and Red paint from exterior concrete steps	1		1	
ELM179New017BK	19 Aug 02		Brown and White paint from exterior door trim	1		1	
ELM179New018BK	19 Aug 02		TSI off piping in crawl space (length/elbow) 13	1	1		
ELM179New019BK	19 Aug 02		TSI off piping in crawl space (length) 14	1	1		
ELM179New020BK	19 Aug 02		TSI off piping in crawl space (width) 15	1	1		
ELM179New021BK	19 Aug 02		Roof mastic off pipe punch on Horse barn 16	1	1		
ELM179New022BK	19 Aug 02		Roof/tar paper from horse barn 17	1	1		
ELM179New023BK	19 Aug 02		Roof paper from horse stable 18	1	1		More Samples
ELM179New024BK	19 Aug 02		Roofing material from above stables 19	1	1		To Arrive
ELM179New025BK	19 Aug 02		Tar/Mastic w/asphalt from connection area on horse barn 20	1	1		

Relinq. by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature]	8-22-02	1000	[signature] 940 082302		
Received by: (Signature)	Date	Time	Relinq. by: (Signature) / Received by: (Signature)	Date	Time
Relinq. by: (Signature)	Date	Time	Received for laboratory by: (Signature)	Date	Time

Remarks:
24 HOUR TURNAROUND ON ASBESTOS & LEAD; 48 HOUR ON TCLP FOR LEAD & PCBs & TOTAL PCBs

Distribution: Original accompanies Shipment; Copy to Coordinate Field Files

PRAC % 22337105

SCILAB BOSTON, INC.
8 SCHOOL STREET
WEYMOUTH, MA 02189
TEL: (781) 337-9334 • FAX: (781) 337-7642

PLM Bulk Asbestos Report

US Army Corps of Engineers
Attn: Damian Walter
Alaska EN-ES-M
P.O. Box 6898
Elmendorf, AK 99506-6898

Date Received 08/23/2002 **SciLab Job No.** 502081406
Date Examined 08/26/2002 **P.O. #** 01-029
Page 1 **of** 16
RE: 01-029; FYI 01 3rd Site; Elmendorf AFB, AK

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ELM179New001BK	502081406-01	*No*	NAD
Location: With Rock and Asphalt			
Description: Black, Heterogeneous, Roofing Tar Material			
Asbestos Types:			
Other Material: Non-fibrous 100. %			
ELM179New002BK	502081406-02	*No*	NAD
Location:			
Description: Black, Heterogeneous, Roofing Roof/Tar Paper			
Asbestos Types:			
Other Material: Non-fibrous 100. %			
ELM179New003BK	502081406-03	*No*	NAD
Location:			
Description: Black, Homogeneous, Mastic From Vents Over Furnace			
Asbestos Types:			
Other Material: Fibrous glass <1. %, Non-fibrous 100. %			
ELM179New004BK	502081406-04	*No*	NAD
Location: From Over Furnace Vents (Fiberous)			
Description: Black, Heterogeneous, Mastic/Tar			
Asbestos Types:			
Other Material: Cellulose 25. %, Non-fibrous 75. %			
ELM179New005BK	502081406-05	*Yes*	25 %
Location: Off Vents Over Furnace (Fiberous)			
Description: Grey, Homogeneous, Greyish Tar/Mastic			
Asbestos Types: Chrysotile 25. %			
Other Material: Non-fibrous 75. %			

SCILAB BOSTON, INC.
8 SCHOOL STREET
WEYMOUTH, MA 02189
TEL: (781) 337-9334 • FAX: (781) 337-7642

PLM Bulk Asbestos Report

US Army Corps of Engineers
Attn: Damian Walter
Alaska EN-ES-M
P.O. Box 6898
Elmendorf, AK 99506-6898

Date Received 08/23/2002 **SciLab Job No.** 502081406
Date Examined 08/26/2002 **P.O. #** 01-029
Page 2 **of** 16
RE: 01-029; FYI 01 3rd Site; Elmendorf AFB, AK

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ELM179New006BK	502081406-06	*No*	NAD

Location:

Description: Brown/Black, Heterogeneous, Piece Of Roof Shingle
Asbestos Types:
Other Material: Fibrous glass 7. %, Non-fibrous 93. %

ELM179New007BK	502081406-07	*No*	NAD

Location:

Description: Black, Homogeneous, Mastic From Pipe Vent Punch
Asbestos Types:
Other Material: Cellulose 5. %, Non-fibrous 95. %

ELM179New008BK	502081406-08	*No*	NAD

Location:

Description: Black, Homogeneous, Black Mastic From Edge Of Roof
Asbestos Types:
Other Material: Cellulose 12. %, Non-fibrous 88. %

ELM179New010BK	502081406-09	*Yes*	<1.%

Location: Between Exterior Layers Of Plywood

Description: Black, Heterogeneous, Tar Like Paper
Asbestos Types: Chrysotile <1. %
Other Material: Cellulose 12. %, Non-fibrous 88. %

ELM179New013BK	502081406-10	*No*	NAD

Location:

Description: Grey, Heterogeneous, Fabric/Weeve Of Wire Housing
Asbestos Types:
Other Material: Cellulose 80. %, Non-fibrous 20. %

SCILAB

SCILAB BOSTON, INC.
8 SCHOOL STREET
WEYMOUTH, MA 02189
TEL: (781) 337-9334 • FAX: (781) 337-7642

PLM Bulk Asbestos Report

US Army Corps of Engineers
Attn: Damian Walter
Alaska EN-ES-M
P.O. Box 6898
Elmendorf, AK 99506-6898

Date Received 08/23/2002 **SciLab Job No.** 502081406
Date Examined 08/26/2002 **P.O. #** 01-029
Page 3 **of** 16
RE: 01-029; FYI 01 3rd Site; Elmendorf AFB, AK

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ELM179New014BK	502081406-11	*No*	NAD

Location: On Exterior Wiring

Description: Black, Homogeneous, Black Casing Material
Asbestos Types:
Other Material: Non-fibrous 100. %

ELM179New015BK	502081406-12	*No*	NAD

Location: Front Of Facility Behind Exterior Tongue And Groove

Description: Black, Heterogeneous, Tar Paper
Asbestos Types:
Other Material: Cellulose 60. %, Non-fibrous 40. %

ELM179New018BK	502081406-13	*Yes*	12 %

Location: Off Piping In Crawl Space (Length/Elbow)

Description: Off-White, Homogeneous, TSI
Asbestos Types: Amosite 5. %, Chrysotile 7. %
Other Material: Non-fibrous 88. %

ELM179New019BK	502081406-14	*Yes*	10 %

Location: Off Piping In Crawl Space (Length)

Description: White, Homogeneous, TSI
Asbestos Types: Amosite 9. %, Chrysotile 1. %
Other Material: Non-fibrous 90. %

ELM179New020BK	502081406-15	*Yes*	10 %

Location: Off Piping In Crawl Space (Width)

Description: White, Homogeneous, TSI
Asbestos Types: Amosite 9. %, Chrysotile 1. %
Other Material: Non-fibrous 90. %

SCILAB BOSTON, INC.
8 SCHOOL STREET
WEYMOUTH, MA 02189
TEL: (781) 337-9334 • FAX: (781) 337-7642

PLM Bulk Asbestos Report

US Army Corps of Engineers
Attn: Damian Walter
Alaska EN-ES-M
P.O. Box 6898
Elmendorf, AK 99506-6898

Date Received 08/23/2002 **SciLab Job No.** 502081406
Date Examined 08/26/2002 **P.O. #** 01-029
Page 4 **of** 16
RE: 01-029; FYI 01 3rd Site; Elmendorf AFB, AK

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ELM179New021BK	502081406-16	*No*	NAD

Location: Off Pipe Punch On Horse Barn

Description: Black, Homogeneous, Roof Mastic
Asbestos Types:
Other Material: Fibrous glass <1. %, Non-fibrous 100. %

ELM179New022BK	502081406-17	*No*	NAD

Location:

Description: Black, Homogeneous, Roof/Tar Paper From Horse Barn
Asbestos Types:
Other Material: Fibrous glass 3. %, Non-fibrous 97. %

ELM179New023BK	502081406-18	*No*	NAD

Location:

Description: Black, Heterogeneous, Roof Paper From Horse Stable
Asbestos Types:
Other Material: Fibrous glass 7. %, Non-fibrous 93. %

ELM179New024BK	502081406-19	*No*	NAD

Location: From Above Stables

Description: Black, Heterogeneous, Roofing Material
Asbestos Types:
Other Material: Fibrous glass 3. %, Non-fibrous 97. %

ELM179New25BK	502081406-20	*No*	NAD

Location: From Connection Area On Horse Barn

Description: Black, Heterogeneous, Tar/Mastic With Asphalt
Asbestos Types:
Other Material: Fibrous glass 5. %, Non-fibrous 95. %

SCILAB BOSTON, INC.
8 SCHOOL STREET
WEYMOUTH, MA 02189
TEL: (781) 337-9334 • FAX: (781) 337-7642

PLM Bulk Asbestos Report

US Army Corps of Engineers
Attn: Damian Walter
Alaska EN-ES-M
P.O. Box 6898
Elmendorf, AK 99506-6898

Date Received 08/23/2002 **SciLab Job No.** 502081406
Date Examined 08/26/2002 **P.O. #** 01-029
Page 5 **of** 16
RE: 01-029; FYI 01 3rd Site; Elmendorf AFB, AK

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ELM179New026BK	502081406-21	*Yes*	5 %

Location: From Connection Area On Horse Barn

Description: Black, Heterogeneous, Roof Paper And Tar
Asbestos Types: Chrysotile 5. %
Other Material: Cellulose 3. %, Fibrous glass 2. %, Non-fibrous 90. %

ELM179New027BK	502081406-22	*No*	NAD

Location:

Description: Grey, Heterogeneous, Fabric Material Found As Patch
Asbestos Types:
Other Material: Cellulose 80. %, Non-fibrous 20. %

ELM179New028BK	502081406-23	*No*	NAD

Location: From Fabric Patch Area

Description: Black, Heterogeneous, Tar Paper
Asbestos Types:
Other Material: Fibrous glass 3. %, Non-fibrous 97. %

ELM179New030BK	502081406-24	*No*	NAD

Location: In Main Hall

Description: Off-White, Heterogeneous, Texturing Off Ceiling
Asbestos Types:
Other Material: Cellulose 5. %, Non-fibrous 95. %

SCILAB

SCILAB BOSTON, INC.
8 SCHOOL STREET
WEYMOUTH, MA 02189
TEL: (781) 337-9334 • FAX: (781) 337-7642

PLM Bulk Asbestos Report

US Army Corps of Engineers
Attn: Damian Walter
Alaska EN-ES-M
P.O. Box 6898
Elmendorf, AK 99506-6898

Date Received 08/23/2002 **SciLab Job No.** 502081406
Date Examined 08/26/2002 **P.O. #** 01-029
Page 6 **of** 16
RE: 01-029; FYI 01 3rd Site; Elmendorf AFB, AK

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ELM179New031BK	502081406-25.1	*No*	NAD

Location: From Ceiling

Description: Off-White, Heterogeneous, Texturing & Wallboard
Asbestos Types:
Other Material: Cellulose 5. %, Non-fibrous 95. %
Comment: Texturing

ELM179New031BK	502081406-25.2	*No*	NAD

Location: From Ceiling

Description: Off-White, Heterogeneous, Texturing & Wallboard
Asbestos Types:
Other Material: Cellulose 4. %, Fibrous glass 1. %, Non-fibrous 95. %
Comment: Wallboard

ELM179New032BK	502081406-26	*No*	NAD

Location:

Description: Tan, Homogeneous, 12"x12" Floor Tile
Asbestos Types:
Other Material: Non-fibrous 100. %

ELM179New033BK	502081406-27	*No*	NAD

Location:

Description: Tan, Homogeneous, 12"x12" Floor Tile (Tan)
Asbestos Types:
Other Material: Non-fibrous 100. %

SCILAB BOSTON, INC.
8 SCHOOL STREET
WEYMOUTH, MA 02189
TEL: (781) 337-9334 • FAX: (781) 337-7642

PLM Bulk Asbestos Report

US Army Corps of Engineers
Attn: Damian Walter
Alaska EN-ES-M
P.O. Box 6898
Elmendorf, AK 99506-6898

Date Received 08/23/2002 **SciLab Job No.** 502081406
Date Examined 08/26/2002 **P.O. #** 01-029
Page 7 **of** 16
RE: 01-029; FYI 01 3rd Site; Elmendorf AFB, AK

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ELM179New034BK	502081406-28	*No*	NAD

Location: From Under Carpeted Room

Description: Tan, Homogeneous, Floor Tile
Asbestos Types:
Other Material: Non-fibrous 100. %

ELM179New035BK	502081406-29	*No*	NAD

Location:

Description: Off-White, Homogeneous, White Baseboard Trim
Asbestos Types:
Other Material: Non-fibrous 100. %

ELM179New035MBK	502081406-30	*No*	NAD

Location:

Description: Off-White, Homogeneous, Creme Mastic
Asbestos Types:
Other Material: Non-fibrous 100. %

ELM179New037BK	502081406-31	*No*	NAD

Location:

Description: Off-White, Heterogeneous, Textured Wallpaper
Asbestos Types:
Other Material: Cellulose 65. %, Non-fibrous 35. %

ELM179New038BK	502081406-32	*No*	NAD

Location:

Description: Brown, Heterogeneous, Weeve Wall Covering
Asbestos Types:
Other Material: Cellulose 85. %, Non-fibrous 15. %

SCILAB BOSTON, INC.
8 SCHOOL STREET
WEYMOUTH, MA 02189
TEL: (781) 337-9334 • FAX: (781) 337-7642

PLM Bulk Asbestos Report

US Army Corps of Engineers
Attn: Damian Walter
Alaska EN-ES-M
P.O. Box 6898
Elmendorf, AK 99506-6898

Date Received 08/23/2002 **SciLab Job No.** 502081406
Date Examined 08/26/2002 **P.O. #** 01-029
Page 8 **of** 16
RE: 01-029; FYI 01 3rd Site; Elmendorf AFB, AK

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ELM179New039BK	502081406-33	*No*	NAD

Location: From Around Outlet In Teaching Room

Description: Off-White, Heterogeneous, Wallboard
Asbestos Types:
Other Material: Cellulose 3. %, Fibrous glass 2. %, Non-fibrous 95. %

ELM179New040BK	502081406-34	*No*	NAD

Location:

Description: Brown, Homogeneous, Brown Baseboard
Asbestos Types:
Other Material: Non-fibrous 100. %

ELM179New040MBK	502081406-35	*No*	NAD

Location:

Description: Off-White, Homogeneous, White Mastic
Asbestos Types:
Other Material: Non-fibrous 100. %

ELM179New042BK	502081406-36	*Yes*	7 %

Location: Found At Edge of Kennels

Description: Off-White, Homogeneous, White Tile
Asbestos Types: Chrysotile 7. %
Other Material: Non-fibrous 93. %

ELM179New042MBK	502081406-37	*Yes*	15 %

Location: Found At Edge of Kennels

Description: Black, Homogeneous, Black Mastic
Asbestos Types: Chrysotile 15. %
Other Material: Non-fibrous 85. %

SCILAB BOSTON, INC.
8 SCHOOL STREET
WEYMOUTH, MA 02189
TEL: (781) 337-9334 • FAX: (781) 337-7642

PLM Bulk Asbestos Report

US Army Corps of Engineers
Attn: Damian Walter
Alaska EN-ES-M
P.O. Box 6898
Elmendorf, AK 99506-6898

Date Received 08/23/2002 **SciLab Job No.** 502081406
Date Examined 08/26/2002 **P.O. #** 01-029
Page 9 **of** 16
RE: 01-029; FYI 01 3rd Site; Elmendorf AFB, AK

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ELM179New043BK	502081406-38	*No*	NAD

Location: From Exterior/Interior Wall

Description: Off-White, Heterogeneous, Wallboard
Asbestos Types:
Other Material: Cellulose 5. %, Non-fibrous 95. %

ELM179New044BK	502081406-39	*No*	NAD

Location: Found In Outside Kennel

Description: Yellow, Homogeneous, Cementitious, Strange Orange Yellow Brick
Asbestos Types:
Other Material: Non-fibrous 100. %

ELM179New045BK	502081406-40	*No*	NAD

Location: From Mechanical Room

Description: Off-White, Heterogeneous, Wallboard
Asbestos Types:
Other Material: Cellulose 5. %, Fibrous glass 2. %, Non-fibrous 93. %

ELM179New046BK	502081406-41	*No*	NAD

Location: From Interior/Exterior Wall

Description: Off-White, Heterogeneous, Wallboard
Asbestos Types:
Other Material: Cellulose 5. %, Fibrous glass 2. %, Non-fibrous 93. %

ELM179New047BK	502081406-42	*No*	NAD

Location:

Description: Off-White, Homogeneous, 12"x12" Tile From Horse Office
Asbestos Types:
Other Material: Cellulose 3. %, Non-fibrous 97. %

SCILAB

SCILAB BOSTON, INC.
8 SCHOOL STREET
WEYMOUTH, MA 02189
TEL: (781) 337-9334 • FAX: (781) 337-7642

PLM Bulk Asbestos Report

US Army Corps of Engineers
Attn: Damian Walter
Alaska EN-ES-M
P.O. Box 6898
Elmendorf, AK 99506-6898

Date Received 08/23/2002 **SciLab Job No.** 502081406
Date Examined 08/26/2002 **P.O. #** 01-029
Page 11 **of** 16
RE: 01-029; FYI 01 3rd Site; Elmendorf AFB, AK

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ELM179New053BK	502081406-48	*No*	NAD
Location:			
Description: Tan, Heterogeneous, Joint Tape			
Asbestos Types:			
Other Material: Cellulose 20. %, Cellulose 80. %			
ELM179New056BK	502081406-49	*No*	NAD
Location:			
Description: Brown, Homogeneous, Brown Baseboard Trim			
Asbestos Types:			
Other Material: Non-fibrous 100. %			
ELM179New056MBK	502081406-50	*No*	NAD
Location:			
Description: Light Brown, Homogeneous, Light Brown Mastic			
Asbestos Types:			
Other Material: Non-fibrous 100. %			
ELM179New057BK	502081406-51	*Yes*	5 %
Location:			
Description: Off-White, Homogeneous, Joint Compound			
Asbestos Types: Chrysotile 5. %			
Other Material: Non-fibrous 95. %			
ELM179New058BK	502081406-52	*No*	NAD
Location:			
Description: Off-White, Homogeneous, Wallboard			
Asbestos Types:			
Other Material: Cellulose 7. %, Non-fibrous 93. %			

SCILAB

SCILAB BOSTON, INC.
8 SCHOOL STREET
WEYMOUTH, MA 02189
TEL: (781) 337-9334 • FAX: (781) 337-7642

PLM Bulk Asbestos Report

US Army Corps of Engineers
Attn: Damian Walter
Alaska EN-ES-M
P.O. Box 6898
Elmendorf, AK 99506-6898

Date Received 08/23/2002 **SciLab Job No.** 502081406
Date Examined 08/26/2002 **P.O. #** 01-029
Page 12 **of** 16
RE: 01-029; FYI 01 3rd Site; Elmendorf AFB, AK

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ELM179New060BK	502081406-53	*No*	NAD

Location:
Description: Off-White, Homogeneous, Wallboard From Oldest Wall
Asbestos Types:
Other Material: Cellulose 5. %, Non-fibrous 95. %

ELM179New061BK	502081406-54	*No*	NAD

Location:
Description: Off-White, Heterogeneous, Wallboard From Closet
Asbestos Types:
Other Material: Cellulose 5. %, Non-fibrous 95. %

ELM179New062BK	502081406-55	*No*	NAD

Location:
Description: Off-White, Homogeneous, 12"x12" Floor Tile (White)
Asbestos Types:
Other Material: Cellulose 3. %, Non-fibrous 97. %

ELM179New062MBK	502081406-56	*Yes*	12 %

Location:
Description: Black, Heterogeneous, Black Mastic
Asbestos Types: Chrysotile 12. %
Other Material: Non-fibrous 88. %

ELM179New063BK	502081406-57	*No*	NAD

Location:
Description: Multi-Colored, Heterogeneous, Rap on Piping
Asbestos Types:
Other Material: Cellulose 45. %, Non-fibrous 55. %

SCILAB BOSTON, INC.
8 SCHOOL STREET
WEYMOUTH, MA 02189
TEL: (781) 337-9334 • FAX: (781) 337-7642

PLM Bulk Asbestos Report

US Army Corps of Engineers
Attn: Damian Walter
Alaska EN-ES-M
P.O. Box 6898
Elmendorf, AK 99506-6898

Date Received 08/23/2002 **SciLab Job No.** 502081406
Date Examined 08/26/2002 **P.O. #** 01-029
Page 13 **of** 16
RE: 01-029; FYI 01 3rd Site; Elmendorf AFB, AK

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ELM179New064BK	502081406-58	*Yes*	20 %

Location: Off Fire Supplyiping

Description: Off-White, Homogeneous, TSI
Asbestos Types: Amosite 5. %, Chrysotile 15. %
Other Material: Non-fibrous 80. %

ELM179New065BK	502081406-59	*No*	NAD

Location:

Description: Black, Homogeneous, Black Matting On Floor
Asbestos Types:
Other Material: Non-fibrous 100. %

ELM179New070BK	502081406-60	*No*	NAD

Location:

Description: Off-White, Homogeneous, Window Caulking
Asbestos Types:
Other Material: Non-fibrous 100. %

ELM179New075BK	502081406-61	*No*	NAD

Location:

Description: Brown, Homogeneous, Fiberboard From QH 8663
Asbestos Types:
Other Material: Cellulose 85. %, Non-fibrous 15. %

ELM179New076BK	502081406-62	*Yes*	15 %

Location: At Transition Points In QH 8663

Description: Black, Homogeneous, Mastic
Asbestos Types: Chrysotile 15. %
Other Material: Non-fibrous 85. %

SCILAB BOSTON, INC.
8 SCHOOL STREET
WEYMOUTH, MA 02189
TEL: (781) 337-9334 • FAX: (781) 337-7642

PLM Bulk Asbestos Report

US Army Corps of Engineers
Attn: Damian Walter
Alaska EN-ES-M
P.O. Box 6898
Elmendorf, AK 99506-6898

Date Received 08/23/2002 **SciLab Job No.** 502081406
Date Examined 08/26/2002 **P.O. #** 01-029
Page 14 **of** 16
RE: 01-029; FYI 01 3rd Site; Elmendorf AFB, AK

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ELM179New077BK	502081406-63	*Yes*	15 %

Location: Found Under Siding At Transition Points

Description: Black, Homogeneous, Mastic
Asbestos Types: Chrysotile 15. %
Other Material: Non-fibrous 85. %

ELM179New078BK	502081406-64	*No*	NAD

Location:

Description: Brown/White, Heterogeneous, Fiberboard From Inside QH 1
Asbestos Types:
Other Material: Cellulose 80. %, Non-fibrous 20. %

ELM179New083BK	502081406-65	*No*	NAD

Location: On Metal Corregated Siding QH1

Description: Black, Homogeneous, Fiberous Divider Materials
Asbestos Types:
Other Material: Cellulose 15. %, Non-fibrous 85. %

ELM179New084BK	502081406-66	*No*	NAD

Location: On Metal Coregated Siding QH3

Description: Black, Homogeneous, Fiberous Divider Materials
Asbestos Types:
Other Material: Cellulose 15. %, Non-fibrous 85. %

ELM179New088BK	502081406-67	*No*	NAD

Location:

Description: Brown/White, Heterogeneous, Fiberboard From QH3
Asbestos Types:
Other Material: Cellulose 80. %, Non-fibrous 20. %

SCILAB BOSTON, INC.
8 SCHOOL STREET
WEYMOUTH, MA 02189
TEL: (781) 337-9334 • FAX: (781) 337-7642

PLM Bulk Asbestos Report

US Army Corps of Engineers
Attn: Damian Walter
Alaska EN-ES-M
P.O. Box 6898
Elmendorf, AK 99506-6898

Date Received 08/23/2002 **SciLab Job No.** 502081406
Date Examined 08/26/2002 **P.O. #** 01-029
Page 15 **of** 16
RE: 01-029; FYI 01 3rd Site; Elmendorf AFB, AK

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ELM179New089BK	502081406-68	*Yes*	15 %

Location: Found On Entryways Of Huts

Description: Black, Homogeneous, Black Tar/Mastic
Asbestos Types: Chrysotile 15. %
Other Material: Non-fibrous 85. %

ELM179New090BK	502081406-69	*No*	NAD

Location:

Description: Black, Homogeneous, Roof Paper From Wood Structure
Asbestos Types:
Other Material: Cellulose 35. %, Non-fibrous 65. %

ELM179New094BK	502081406-70	*No*	NAD

Location:

Description: Off-White, Homogeneous, 12"x12" Floor Tile
Asbestos Types:
Other Material: Cellulose 3. %, Non-fibrous 97. %

ELM179New094MBK	502081406-71	*No*	NAD

Location:

Description: Brown, Homogeneous, Brown Mastic
Asbestos Types:
Other Material: Non-fibrous 100. %

ELM179New099BK	502081406-72	*No*	NAD

Location: From Transport Box

Description: Black, Heterogeneous, Asphalt Tar Paper
Asbestos Types:
Other Material: Cellulose 25. %, Non-fibrous 75. %

SCILAB BOSTON, INC.
8 SCHOOL STREET
WEYMOUTH, MA 02189
TEL: (781) 337-9334 • FAX: (781) 337-7642

PLM Bulk Asbestos Report

US Army Corps of Engineers
Attn: Damian Walter
Alaska EN-ES-M
P.O. Box 6898
Elmendorf, AK 99506-6898

Date Received 08/23/2002 **SciLab Job No.** 502081406
Date Examined 08/26/2002 **P.O. #** 01-029
Page 16 **of** 16
RE: 01-029; FYI 01 3rd Site; Elmendorf AFB, AK

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ELM179New100BK	502081406-73	*No*	NAD

Location:

Description: Black/White, Heterogeneous, Fiberous Wiring Of QH# 8663
Asbestos Types:
Other Material: Cellulose 10. %, Fibrous glass 10. %, Synthetic fibers 10. %, Non-fibrous 70. %

Reporting Notes:

Analyzed by: Steven Grevelis _____; Date Analyzed: 8/26/02

*NAD/NSD = no asbestos detected; NA = not analyzed; NA/PS = not analyzed / positive stop; PLM Bulk Asbestos Analysis by EPA 600/M4-82-020 per 40 CFR 763 (NVLAP Lab #102079-0); Note: PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. TEM is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos-containing in New York State (also see EPA Advisory for floor tile, FR 59, 146, 38970, 8/1/94).
 This PLM report relates ONLY to the items tested.

Reviewed By:_____

Please Reply To:

SCILAB

SCILAB BOSTON, INC.
Eight School Street
Weymouth, MA 02189
TEL:(781)337-9334 FAX:(781)337-7642

FACSIMILE TELECOPY TRANSMISSION

To: Mr. Damian Walter
US Army Corps Of Engineers

Fax # SEE CHRIS BEROT

SCILAB Job# 0208-00400
Subject: FY 01 3RD SITE, ELMENDORF A
Pages: 9

Date: Monday, August 26, 2002
Time: 8:56:16PM

Comments:

THE SCILAB GROUP OF LABORATORIES

Certified Analysis *Service 24 Hours a Day - 7 Days a Week* *Competitive Prices*
Visit our website - www.scilabs

SCIENTIFIC LABORATORIES, INC.
117 EAST 30TH STREET
NEW YORK, NY 10016
TEL: (212) 679-8600
FAX: (212) 679-9392

SCILAB CALIFORNIA, INC.
24416 SOUTH MAIN ST.
CARSON, CA 90745
TEL: (310) 843-4868
FAX: (310) 834-4772

SCILAB BOSTON, INC.
8 SCHOOL STREET
WEYMOUTH, MA 02189
TEL: (781) 337-9334
FAX: (781) 337-7642

SCIENTIFIC LABORATORIES, INC.
13635 GENITO ROAD
MIDLOTHIAN, VA 23112
TEL: (804) 783-1200
FAX: (804) 783-1800

SCILAB

Customer: US Army Corps Of Engineers

Workorder No. 0208-00400

To the best of my knowledge this report is true and accurate.

Authorized By:

John J. Sulkowski, Laboratory Director

SCILAB

Eight School Street
Weymouth, MA 02189
781-337-9334

Laboratory Report

Report Date 08/26/2002
Workorder No. 0208-00400

Customer: US Army Corps Of Engineers
Alaska EN-ES-M
PO BOX 898
ANCHORAGE, AK 99506

Attention: Mr. Damian Walter

Subject: FY 01 3RD SITE, ELMENDORF AFB

Sample: 001 ELM179NEW009BK, SHIELD FROM VENTS
Date: 08/19/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	45.7	%	0.0125	JRH	08/26/2002	

Sample: 002 ELM179NEW011BK, TAN EXTERIOR PAINT
Date: 08/19/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	20.8	%	0.0125	JRH	08/26/2002	

Sample: 003 ELM179NEW012BK, TAR/MASTIC W/EXTERIOR PAINT
Date: 08/19/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	0.377	%	0.0125	JRH	08/26/2002	

Sample: 004 ELM179NEW016BK, BROWN AND RED PAINT FROM EXTERIOR CONCRETE STEPS
Date: 08/19/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	0.0337	%	0.0125	JRH	08/26/2002	

Certifications: MA: MA069 NY:10982 CT: PH0119 RI:A45 CA:2050 NJ: 59744

SCILAB

Customer: US Army Corps Of Engineers

Workorder No. 0208-00400

Sample: 005 ELM179NEW017BK, BROWN AND WHITE PAINT FORM EXTERIOR DR TRIM
Date: 08/19/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	ND	%	0.0379	JRH	08/26/2002	

Sample: 006 ELM179NEW029BK, TAN PAINT FOUND ON WALLS NOT WALLPAPERED
Date: 08/19/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	ND	%	0.0125	JRH	08/26/2002	

Sample: 007 ELM179NEW036BK, WHITE PAINT FROM INTERIOR BSA
Date: 08/19/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	ND	%	0.0125	JRH	08/26/2002	

Sample: 008 ELM179NEW041BK, GREY & RED PAINT FOUND COVERING MECHANICAL ROOM FLOOR
Date: 08/19/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	0.270	%	0.0125	JRH	08/26/2002	

Sample: 009 ELM179NEW051BK, MULITPAINT LAYER FOUND ON OLDER WALLS (GREEN,GRAY,WHITE
Date: 08/20/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	0.252	%	0.0125	JRH	08/26/2002	

Sample: 010 ELM179NEW054BK. EXTERIOR WALLS MULITLAYER PAINT

Certifications: MA: MA069 NY:10982 CT: PH0119 RI:A45 CA:2050 NJ: 59744

SCILAB

Customer: US Army Corps Of Engineers

Workorder No. 0208-00400

Sample: 010 **ELM179NEW054BK. EXTERIOR WALLS MULITLAYER PAINT**
(Continued)

Date: 08/20/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	0.180	%	0.0125	JRH	08/26/2002	

Sample: 011 **ELM179NEW055BK, YELLOW INTERIOR PAINT**
Date: 08/19/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	0.0558	%	0.0125	JRH	08/26/2002	

Sample: 012 **ELM179NEW059BK, GRAY, RED, BLANK, WHITE PAINT**
Date: 08/20/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	0.143	%	0.0282	JRH	08/26/2002	

Sample: 013 **ELM179NEW066BK, GRAY PAINT**
Date: 08/20/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	0.0931	%	0.0153	JRH	08/26/2002	

Sample: 014 **ELM179NEW067BK, WHITE PAINT**
Date: 08/20/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	2.97	%	0.0125	JRH	08/26/2002	

Sample: 015 **ELM179NEW068BK, WHITE AND GRAY STABLE PAINT**

Certifications: MA: MA069 NY:10982 CT: PH0119 RI:A45 CA:2050 NJ: 59744

SCILAB

Customer: US Army Corps Of Engineers

Workorder No. 0208-00400

Sample: 015 **ELM179NEW068BK, WHITE AND GRAY STABLE PAINT**
(Continued)

Date: 08/20/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	0.0458	%	0.0125	JRH	08/26/2002	

Sample: 016 **ELM179NEW069BK, BROWN EXTERIOR PAINT**
Date: 08/20/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	ND	%	0.0125	JRH	08/26/2002	

Sample: 017 **ELM179NEW071BK, YELLOW/CREAM EXTERIOR PAINT**
Date: 08/20/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	ND	%	0.0125	JRH	08/26/2002	

Sample: 018 **ELM179NEW072BK, CREAM PAINT**
Date: 08/20/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	ND	%	0.0125	JRH	08/26/2002	

Sample: 019 **ELM179NEW073BK, PAINT ON QH8663**
Date: 08/20/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	ND	%	0.0125	JRH	08/26/2002	

Sample: 020 **ELM179NEW074BK, INTERIOR PAINT FORM QH 8663**

Certifications: MA: MA069 NY:10982 CT: PH0119 RI:A45 CA:2050 NJ: 59744

SCILAB

Customer: US Army Corps Of Engineers

Workorder No. 0208-00400

Sample: 020 **ELM179NEW074BK, INTERIOR PAINT FORM QH 8663**
(Continued)

Date: 08/20/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	15.4	%	0.0125	JRH	08/26/2002	

Sample: 021 **ELM179NEW079BK, WHITE PAINT FROM INSIDE QH1**
Date: 08/20/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	0.0700	%	0.0125	JRH	08/26/2002	

Sample: 022 **ELM179NEW080BK, GRAY PAINT FORM INSIDE QH1**
Date: 08/20/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	0.105	%	0.0125	JRH	08/26/2002	

Sample: 023 **ELM179081BK, WHITE EXTERIOR PAINT FROM QH1**
Date: 08/20/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	4.72	%	0.0125	JRH	08/26/2002	

Sample: 024 **ELM179NEW082BK, WHITE EXTERIOR PAINT OVER GREEN FROM QH1**
Date: 08/20/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	0.186	%	0.0125	JRH	08/26/2002	

Sample: 025 **ELM179NEW085BK, WHITE AND YELLOW PAINT FROM QH3**

Certifications: MA: MA069 NY:10982 CT: PH0119 RI:A45 CA:2050 NJ: 59744

SCILAB

Customer: US Army Corps Of Engineers

Workorder No. 0208-00400

Sample: 025 **ELM179NEW085BK, WHITE AND YELLOW PAINT FROM QH3**
(Continued)

Date: 08/20/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	2.58	%	0.0125	JRH	08/26/2002	

Sample: 026 **ELM179NEW086BK, GRAY AND WHITE PAINT FROM INTERIOR OF QH3**
Date: 08/20/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	0.265	%	0.0125	JRH	08/26/2002	

Sample: 027 **ELM179NEW087BK, WHITE EXTERIOR PAINT FORM QH2**
Date: 08/20/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	0.694	%	0.0125	JRH	08/26/2002	

Sample: 028 **ELM179091BK, GRAY PAINT FROM HORSE TRANSFER BLDG**
Date: 08/20/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	0.0715	%	0.0243	JRH	08/26/2002	

Sample: 029 **ELM179NEW092BK, CREAM PAINT FROM ANNEX HORSE STABLE**
Date: 08/20/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	ND	%	0.0144	JRH	08/26/2002	

Sample: 030 **ELM179NEW093BK, WHITE PAINT IN STORAGE CLOSET OF HORSE OFFIC**

Certifications: MA: MA069 NY:10982 CT: PH0119 RI:A45 CA:2050 NJ: 59744

SCILAB

Customer: US Army Corps Of Engineers

Workorder No. 0208-00400

Sample: 030 **ELM179NEW093BK, WHITE PAINT IN STORAGE CLOSET OF HORSE OFFIC**
(Continued)

Date: 08/20/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	0.327	%	0.0125	JRH	08/26/2002	

Sample: 031 **ELM179NEW095BK, METALS FROM QUENSET HUTS**
Date: 08/21/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	0.0563	%	0.0125	JRH	08/26/2002	

Preliminary

Sample: 032 **ELM179NEW096BK, GRAY PAINT FORM JUDGING BOX**
Date: 08/21/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	ND	%	0.0280	JRH	08/26/2002	

Sample: 033 **ELM179NEW097BK, RED PAINT FORM JUDGING BOX**
Date: 08/21/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	ND	%	0.0259	JRH	08/26/2002	

Sample: 034 **ELM179NEW098BK, MULTI PAINT LAYER FROM CORRAL**
Date: 08/21/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	2.97	%	0.0144	JRH	08/26/2002	

Certifications: MA: MA069 NY:10982 CT: PH0119 RI:A45 CA:2050 NJ: 59744

Please Reply To:

SCILAB BOSTON, INC.
Eight School Street
Weymouth, MA 02189
TEL:(781)337-9334 FAX:(781)337-7642

FACSIMILE TELECOPY TRANSMISSION

To: Mr. Damian Walter
US Army Corps Of Engineers

Fax # SEE CHRIS BEROT
907-753-2636

SCILAB Job# 0208-00403
Subject: FY 01 3RD SITE, ELMENDORF A

Pages: _____

Date: Thursday, August 29, 2002

Time: 11:59:30AM

Comments:

SCILAB

Eight School Street
Weymouth, MA 02189
781-337-9334

Laboratory Report

Report Date 08/29/2002
Workorder No. 0208-00403

Customer: US Army Corps Of Engineers
Alaska EN-ES-M
P.O. Box 6898
Elmendorf, AK 99506-6898

Attention: Mr. Damian Walter

Subject: FY 01 3RD SITE, ELMENDORF AFB

Sample: 001 ELM179NewBSATCLP
Date: 08/19/2002
Matrix: SOLID

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, TCLP	SW-846 6010B	ND	mg/L	0.50	VEN	08/27/2002	
PCBs EPA 608					MB	08/27/2002	
PCB-1016	EPA 608	ND	ug/L	5	MB	08/27/2002	
PCB-1221	EPA 608	ND	ug/L	10	MB	08/27/2002	
PCB-1232	EPA 608	ND	ug/L	5	MB	08/27/2002	
PCB-1242	EPA 608	ND	ug/L	5	MB	08/27/2002	
PCB-1248	EPA 608	ND	ug/L	5	MB	08/27/2002	
PCB-1254	EPA 608	ND	ug/L	5	MB	08/27/2002	
PCB-1260	EPA 608	ND	ug/L	5	MB	08/27/2002	
PCB-1262	EPA 608	ND	ug/L	5	MB	08/27/2002	
TCMX (SURROGATE)		32.1	%		MB	08/27/2002	
DCB (SURROGATE)		76.3	%		MB	08/27/2002	
TCLP extraction	1311, EPA	complete		0	DMR	08/24/2002	
Percent Solids		100	%		DMR	08/28/2002	
PCBs EPA 8082					MB	08/28/2002	
PCB-1016	EPA 8082	ND	ug/Kg	114	MB	08/28/2002	
PCB-1221	EPA 8082	ND	ug/Kg	114	MB	08/28/2002	
PCB-1232	EPA 8082	ND	ug/Kg	114	MB	08/28/2002	
PCB-1242	EPA 8082	ND	ug/Kg	227	MB	08/28/2002	
PCB-1248	EPA 8082	ND	ug/Kg	114	MB	08/28/2002	
PCB-1254	EPA 8082	ND	ug/Kg	114	MB	08/28/2002	
PCB-1260	EPA 8082	ND	ug/Kg	114	MB	08/28/2002	
PCB-1262	EPA 8082	ND	ug/Kg	114	MB	08/28/2002	
PCB-1268	EPA 8082	ND	ug/Kg	114	MB	08/28/2002	
TCMX (SURROGATE)		132	%		MB	08/28/2002	
DCB (SURROGATE)		150	%		MB	08/28/2002	

Certifications: MA: MA069 NY:10982 CT: PH0119 RI:A45 CA:2050 NJ: 59744

SCILAB

Customer: US Army Corps Of Engineers

Workorder No. 0208-00403

Sample: 002 ELM179PEELINGPtTCLP
Date: 08/19/2002
Matrix:

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, TCLP	SW-846 6010B	3.21	mg/L	0.50	VEN	08/27/2002	
PCBs EPA 608					MB	08/27/2002	
PCB-1016	EPA 608	ND	ug/L	5	MB	08/27/2002	
PCB-1221	EPA 608	ND	ug/L	10	MB	08/27/2002	
PCB-1232	EPA 608	ND	ug/L	5	MB	08/27/2002	
PCB-1242	EPA 608	ND	ug/L	5	MB	08/27/2002	
PCB-1248	EPA 608	ND	ug/L	6	MB	08/27/2002	
PCB-1254	EPA 608	ND	ug/L	5	MB	08/27/2002	
PCB-1260	EPA 608	ND	ug/L	5	MB	08/27/2002	
PCB-1262	EPA 608	ND	ug/L	5	MB	08/27/2002	
TCMX (SURROGATE)		45.6	%		MB	08/27/2002	
DCB (SURROGATE)		102	%		MB	08/27/2002	
TCLP extraction	1311, EPA	complete		0	DMR	08/24/2002	
PCBs EPA 8082					MB	08/28/2002	
PCB-1016	EPA 8082	ND	ug/Kg	152	MB	08/28/2002	
PCB-1221	EPA 8082	ND	ug/Kg	152	MB	08/28/2002	
PCB-1232	EPA 8082	ND	ug/Kg	152	MB	08/28/2002	
PCB-1242	EPA 8082	ND	ug/Kg	303	MB	08/28/2002	
PCB-1248	EPA 8082	ND	ug/Kg	152	MB	08/28/2002	
PCB-1254	EPA 8082	ND	ug/Kg	152	MB	08/28/2002	
PCB-1260	EPA 8082	ND	ug/Kg	152	MB	08/28/2002	
PCB-1262	EPA 8082	ND	ug/Kg	152	MB	08/28/2002	
PCB-1268	EPA 8082	ND	ug/Kg	152	MB	08/28/2002	
TCMX (SURROGATE)		81.0	%		MB	08/28/2002	
DCB (SURROGATE)		73.8	%		MB	08/28/2002	
Percent Solids		100	%		DMR	08/28/2002	

Sample: 003 ELM179HorseFacTCLP
Date: 08/21/2002
Matrix: SOLID

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, TCLP	SW-846 6010B	1.56	mg/L	0.50	VEN	08/27/2002	

Certifications: MA: MA069 NY:10982 CT: PH0119 RI:A45 CA:2050 NJ: 59744

SCILAB

Customer: US Army Corps Of Engineers

Workorder No. 0208-00403

Sample: 003 **ELM179HorseFacTCLP**
(Continued)

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
PCBs EPA 608					MB	08/27/2002	
PCB-1016	EPA 608	ND	ug/L	5	MB	08/27/2002	
PCB-1221	EPA 608	ND	ug/L	5	MB	08/27/2002	
PCB-1232	EPA 608	ND	ug/L	5	MB	08/27/2002	
PCB-1242	EPA 608	ND	ug/L	5	MB	08/27/2002	
PCB-1248	EPA 608	ND	ug/L	5	MB	08/27/2002	
PCB-1254	EPA 608	ND	ug/L	5	MB	08/27/2002	
PCB-1260	EPA 608	ND	ug/L	5	MB	08/27/2002	
PCB-1262	EPA 608	ND	ug/L	5	MB	08/27/2002	
TCMX (SURROGATE)		44.6	%		MB	08/27/2002	
DCB (SURROGATE)		82.2	%		MB	08/27/2002	
TCLP extraction	1311, EPA	complete		0	DMR	08/24/2002	
PCBs EPA 8082					MB	08/28/2002	
PCB-1016	EPA 8082	ND	ug/Kg	108	MB	08/28/2002	
PCB-1221	EPA 8082	ND	ug/Kg	108	MB	08/28/2002	
PCB-1232	EPA 8082	ND	ug/Kg	108	MB	08/28/2002	
PCB-1242	EPA 8082	ND	ug/Kg	215	MB	08/28/2002	
PCB-1248	EPA 8082	ND	ug/Kg	108	MB	08/28/2002	
PCB-1254	EPA 8082	ND	ug/Kg	108	MB	08/28/2002	
PCB-1260	EPA 8082	ND	ug/Kg	108	MB	08/28/2002	
PCB-1262	EPA 8082	ND	ug/Kg	108	MB	08/28/2002	
PCB-1268	EPA 8082	ND	ug/Kg	108	MB	08/28/2002	
TCMX (SURROGATE)		90.8	%		MB	08/28/2002	
DCB (SURROGATE)		93.3	%		MB	08/28/2002	
Percent Solids		100	%		DMR	08/28/2002	

Certifications: MA: MA069 NY:10982 CT: PH0119 RI:A45 CA:2050 NJ: 59744

SCILAB

Customer: US Army Corps Of Engineers

Workorder No. 0208-00403

To the best of my knowledge this report is true and accurate.

Authorized By:

John J. Sulkowski, Laboratory Director

Certifications: MA: MA069 NY:10982 CT: PH0119 RI:A45 CA:2050 NJ: 59744

SCILAB BOSTON, INC.
8 SCHOOL STREET
WEYMOUTH, MA 02189
TEL: (781) 337-9334 • FAX: (781) 337-7642

October 25, 2002

US Army Corps of Engineers
Attn: Damian Walter
Alaska EN-ES-M
P.O. Box 6898
Elmendorf, AK 99506-6898

RE: US Army Corps of Engineers
Job Number 502101312
P.O. # 01-029
01-029; FY 01 3rd Site, Elmendorf AFB, AK

Dear Damian Walter:

Enclosed are the results for PLM asbestos analysis of the following US Army Corps of Engineers samples received at SCILAB on Tuesday, October 22, 2002, for a 48 hour turnaround:

ELM179New102BK, ELM179New103BK, ELM179New104BK, ELM179New105BK, ELM179New106BK, ELM179New109BK, ELM179New110BK

The 7 samples contained in zip lock bags were shipped to SciLab via Federal Express. These samples were prepared and analyzed according to the EPA Interim Method (EPA 600/M4-82-020 per 40 CFR 763, subpt F, App. A). The required analytical information, analysis results, analyst signature and laboratory identification is contained in the Analyst's Report.

This report relates ONLY to the sample analysis expressed as percent asbestos. SciLab assumes no responsibility for customer supplied data such as "sample type", "location", or "area sampled". This report must not be used to claim product endorsement by SciLab, NVLAP or any agency of the U. S. Government. The National Institute of Standards and Technology Accreditation requirements, mandates that this report must not be reproduced, except in full without the written approval of the laboratory. This report may contain specific data not covered by NVLAP or ELAP accreditations respectively, if so identified in revelant footnotes.

SciLab appreciates this opportunity to serve your organization. Please contact us for any further assistance or with any questions.

Sincerely,

Todd Nardozzi
NVLAP Approved Signatory

SCILAB BOSTON, INC.
8 SCHOOL STREET
WEYMOUTH, MA 02189
TEL: (781) 337-9334 • FAX: (781) 337-7642

PLM Bulk Asbestos Report

US Army Corps of Engineers
Attn: Damian Walter
Alaska EN-ES-M
P.O. Box 6898
Elmendorf, AK 99506-6898

Date Received 10/22/2002 **SciLab Job No.** 502101312
Date Examined 10/23/2002 **P.O. #** 01-029
Page 2 **of** 2
RE: 01-029; FY 01 3rd Site, Elmendorf AFB, AK

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ELM179New109BK	502101312-06	*No*	NAD

Location: Between Trim Boards
Description: Grey, Homogeneous, White Caulking
Asbestos Types:
Other Material: Non-fibrous 100. %

ELM179New110BK	502101312-07	*No*	NAD

Location: Between Metal Roof Panels
Description: Grey, Homogeneous, Caulking
Asbestos Types:
Other Material: Non-fibrous 100. %

Reporting Notes:

Analyzed by: John A. Burns ; Date Analyzed: 10/28/02

*NAD/NSD = no asbestos detected; NA = not analyzed; NA/PS = not analyzed / positive stop; PLM Bulk Asbestos Analysis by EPA 600/M4-82-020 per 40 CFR 763 (NVLAP Lab #102079-0); Note: PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. TEM is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos-containing in New York State (also see EPA Advisory for floor tile, FR 59, 146, 38970, 8/1/94). National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the laboratory. This PLM report relates ONLY to the items tested.
Reviewed By:_____

SCILAB BOSTON, INC.
8 SCHOOL STREET
WEYMOUTH, MA 02189
TEL: (781) 337-9334 • FAX: (781) 337-7642

PLM Bulk Asbestos Report

US Army Corps of Engineers
Attn: Damian Walter
Alaska EN-ES-M
P.O. Box 6898
Elmendorf, AK 99506-6898

Date Received 10/22/2002 **SciLab Job No.** 502101312
Date Examined 10/23/2002 **P.O. #** 01-029
Page 1 **of** 2
RE: 01-029; FY 01 3rd Site, Elmendorf AFB, AK

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
ELM179New102BK	502101312-01	*No*	NAD

Location: Inside Hay Barn

Description: Grey, Homogeneous, Wallboard System
Asbestos Types:
Other Material: Cellulose 15. %, Fibrous glass 5. %, Non-fibrous 80. %

ELM179New103BK	502101312-02	*No*	NAD

Location: From Wallboard System

Description: White, Homogeneous, Joint Compound/Mud
Asbestos Types:
Other Material: Non-fibrous 100. %

ELM179New104BK	502101312-03	*No*	NAD

Location: Inside Hay Barn

Description: Grey, Homogeneous, Wallboard System
Asbestos Types:
Other Material: Cellulose 20. %, Fibrous glass 5. %, Non-fibrous 75. %

ELM179New105BK	502101312-04	*No*	NAD

Location: Between Two Sheetrock Boards

Description: Off-White, Homogeneous, Mud
Asbestos Types:
Other Material: Non-fibrous 100. %

ELM179New106BK	502101312-05	*No*	NAD

Location: Between Metal Roof Panels

Description: Grey, Homogeneous, Caulking
Asbestos Types:
Other Material: Non-fibrous 100. %

U.S. Army Corps of Engineers
P.O. Box 898
Anchorage, AK 99506
(907) 753-5582

SHIP TO: SciLab
Christina Beaot
8 School Street
Weymouth, MA 02189
(888) 724-5221

50210131 2

CHAIN OF CUSTODY RECORD

PROJ NO. 01-029 | PROJECT NAME: FY 01 3rd Site, Elmendorf AFB, AK

SAMPLERS: D. Walter (Signature) [signature]

Pg 1 of 1

SAMPLE ID #	Date	Time	Station Location	Number of Containers	Asbestos by PLM	Lead in Paint	Notes
ELM179New101BK	17 Oct 02		Paint from inside hay barn	1		1	48 hours on Asbestos and Lead
ELM179New102BK	17 Oct 02	1	Wallboard System from inside hay barn	1	1		
ELM179New103BK	17 Oct 02	2	Joint Compound/mud from wallboard sytem\	1	1		
ELM179New104BK	17 Oct 02	3	Wallboard System from inside hay barn	1	1		
ELM179New105BK	17 Oct 02	4	Mud between 2 sheet rock boards	1	1		
ELM179New106BK	17 Oct 02	5	Caulking from between metal roof panels	1	1		
ELM179New107BK	17 Oct 02	'	Brown trim paint	1		1	
ELM179New108BK	17 Oct 02		Brown trim paint	1		1	
ELM179New109BK	17 Oct 02	6	White caulking from between trim boards	1	1		
ELM179New110BK	17 Oct 02	7	Caulking from between metal roof panels	1	1		
		MJP					

No more samples To Arrive

Relinq. by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Remarks:
[signature]	10/18/02	1300 hrs	[signature] 10-22 · 0940			
Received by: (Signature)	Date	Time	Relinq. by: (Signature) / Received by: (Signature)	Date	Time	48 HOUR TURNAROUND ON ASBESTOS & LEAD;
Relinq. by: (Signature)	Date	Time	Received for laboratory by: (Signature)	Date	Time	

Distribution: Original accompanies Shipment; Copy to Coordinate Field Files

PR4C%22337/05

SCILAB

Eight School Street
Weymouth, MA 02189
781-337-9334

Laboratory Report

Report Date 10/24/2002
Workorder No. 0210-00295

Customer: US Army Corps Of Engineers
Alaska EN-ES-M
P.O. Box 6898
Elmendorf, AK 99506-6898

Attention: Mr. Damian Walter

Subject: FY 01 3RD SITE: Pb CHIPS

Sample: 001 **ELM179NEW101BK: PAINT FROM INSIDE HAY BARN**
Date: 10/17/2002
Matrix: CHIP

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	ND	%	0.0114	TDJ	10/23/2002	

Sample: 002 **ELM179NEW107BK: BROWN TRIM PAINT**
Date: 10/17/2002
Matrix: CHIP

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	ND	%	0.0557	TDJ	10/23/2002	

Sample: 003 **ELM179NEW108BK: BROWN TRIM PAINT**
Date: 10/17/2002
Matrix: CHIP

Parameter	Method	Results	Units	PQL	Analyst	Analysis Date	Qual
Lead, Chip	7420, SW-846	ND	%	0.0442	TDJ	10/23/2002	

Certifications: MA: MA069 NY:10982 CT: PH0119 RI:A45 CA:2050 NJ: 59744

SCILAB

Customer: US Army Corps Of Engineers

Workorder No. 0210-00295

To the best of my knowledge this report is true and accurate.

Authorized By:

John J. Sulkowski, Laboratory Director

U.S. Army Corps of Engineers
P.O. Box 898
Anchorage, AK 99506
(907) 753-5582

0210-295

SHIP TO: SciLab
Christina Berot
8 School Street
Weymouth, MA 02189
(888) 724-5221

CHAIN OF CUSTODY RECORD

PROJ NO.	PROJECT NAME
01-029	FY 01 3rd Site, Elmendorf AFB, AK
SAMPLERS: (Signature)	
D. Walter	

Pg 1 of 1

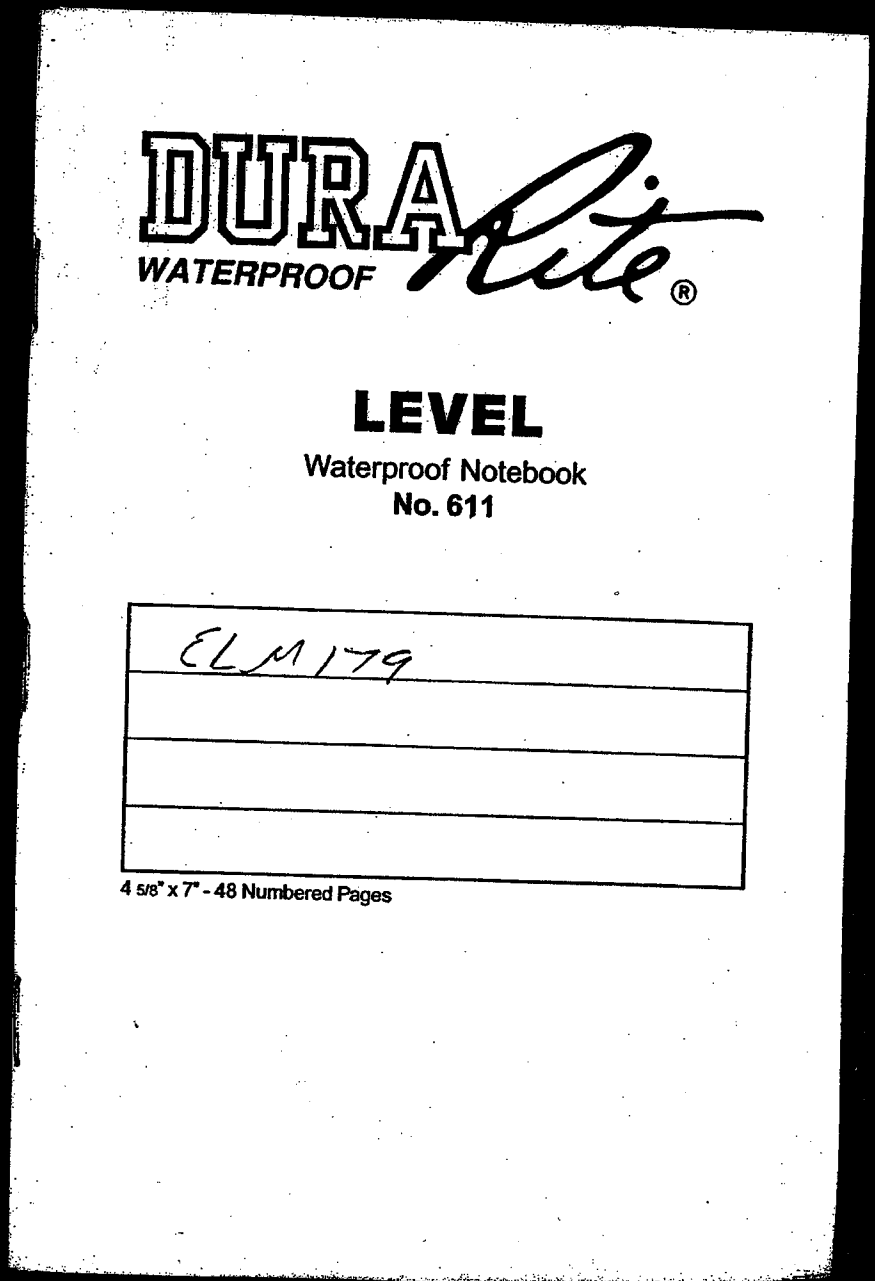
SAMPLE ID #	Date	Time	Station Location	Number of Containers	Asbestos by PLM	Lead in Paint	Notes
ELM179New101BK	17 Oct 02		Paint from inside hay barn	1		1	
ELM179New102BK	17 Oct 02		Wallboard System from inside hay barn	1	1		48 hours on Asbestos and Lead
ELM179New103BK	17 Oct 02		Joint Compound/mud from wallboard system	1	1		
ELM179New104BK	17 Oct 02		Wallboard System from inside hay barn	1	1		
ELM179New105BK	17 Oct 02		Mud between 2 sheet sock boards	1	1		
ELM179New106BK	17 Oct 02		Caulking from between metal roof panels	1	1		
ELM179New107BK	17 Oct 02		Brown trim paint	1		1	
ELM179New108BK	17 Oct 02		Brown trim paint	1		1	
ELM179New109BK	17 Oct 02		White caulking from between trim boards	1	1		
ELM179New110BK	17 Oct 02		Caulking from between metal roof panels	1	1		
							No more samples To Arrive

Relinq. by: (Signature)	Date 10/18	Time 1300	Received by: (Signature)	1022.0940		Date	Time	Remarks:
Received by: (Signature)	Date	Time	Relinq. by: (Signature)		Received by: (Signature)	Date	Time	48 HOUR TURNAROUND ON ASBESTOS & LEAD;
Relinq. by: (Signature)	Date	Time	Received for laboratory by: (Signature)			Date 10/22/02	Time 0935	

Distribution: Original accompanies Shipment; Copy to Coordinate Field Files

PRAC#22337105

APPENDIX B
Field Log


DURA-Rite
WATERPROOF
LEVEL
Waterproof Notebook
No. 611
ELM179
4 5/8" x 7" - 48 Numbered Pages

DURA Rite®
WATERPROOF

4950 - 557-4487

Name Mike Carol
428-3035
Address V-P Keith

Phone

Project

Clear Vinyl Protective Slipcovers (Item No. 30) are available for this style of notebook. Helps protect your notebook from wear & tear. Contact your dealer or the J. L. Darling Corporation.

CONTENTS

PAGE REFERENCE DATE

~~Sgt Botterdick~~ P# ~~428-7~~2148
~~C# 748-2437~~

TSgt Lester
DP - ~~552-~~ 3310 C# 930-9492
HP - 753-5236

Roof
Base Roof Eng:
~~552-~~ 3224

Roof Contract:
Western Roofing Ser.
2594 Oakdale Ave
San Francisco, CA 94124
415-648-6470
Ext. 2070

Laura Kiszer - Realestate
552-3139

Lt. Raosh:
552-2312

2

8-19-02 1015 hrs Cloudy.

ELM179NewSite 001Bk
Roofing tar material, w/ rock/asphalt

ELM179NS 002Bk
Roofing/Tar paper

003Bk
Mastic from vents over furnace

004Bk
Different Mastic/Tar from vents over furnace

005Bk
Grayish tar/mastic off vents over furnace (fiberous)

3

006Bk
Piece of roof shingle

007Bk
Mastic from pipe vent ponch

008Bk
Black Mastic from edge of roof

009Bk
Shield from pipe vents, appears to be lead

010Bk
A tar like paper between plywood exterior at ground level

011BK
Tan exterior paint, taken near roof line of exterior joist

012BK
Tar/mastic w/exterior paint

013BK
Fabric/weave wire housing taken at old exterior wire area

014BK
Black casing material on exterior wiring of 13

015BK
Tar paper from front of facility between tongue & coo groove boards & plywood

Piece of 1X4 CCA pressure treated wood as trim all around facility

016BK
Brown & Red paint from concrete steps, lead to ~~door~~ facility door entrances

017BK
Brown & white paint at exterior door & door wood trim

018BK
TSI ~~of~~ & pipping in crawl runs length

019BK
TSI of pipe run in crawl space different than 18

6

020 Bk
TSI & piping in crawl space
different Than 18 & 19 rons width

Figure 41 ron length
16 ron width

1145: When over to horse barn to
sample & examine roof
Flat roof

021 Bk
Roof mastic taken off pipe porch
Through over horse stable

022 Bk
Roof tar over paper from horse stable

023 Bk
Roof paper over from horse stable

7

024 Bk
Roofing material at horse barn

025 Bk
Tar / Mastic w/ asphalt from
connecton area on horse barn

026 Bk
Roof paper & tar from connection
area on horse barn

027 Bk
Fabric matrial found as patch
like area on roof

028 Bk
Tar paper from same area as 27 under
fabric -

8

Returned to BSA ≈ 1230 hrs

Heat Detector - 13
Edwards
Farmington CT 06032

11 Dry Chem. Fire Ext
General Model TGP-10G
20 lbs

1 Kidde 3 lbs

1 Amerex 10 lbs

1111 Exittronix - Exit Signs
Emergency Lighting

1111 Smoke Detectors in Attic

9

029BK
Tan paint found on walls, That are not wall papered

030BK
Texturing & ceiling in main hall, taken above south and front door

031BK
Texturing & wallboard & ceiling in room nearest kennel area

Of lights examined all transformers non PCB - none in facility

33 lights

032 BK
12x12 tan Floor tile from hallway outside conference room

033 BK
12 x 12 tan floor tile from outside bathroom hallway

034 BK
Floor tile from under tan carpeted room w/ carpet mastic & tile mastic

035 BK
White baseboard trim w/ cream mastic from carpeted office

036 BK
White paint from interior

037 BK
Textured wallpaper covering majority of walls & to ceiling

038
Weave wall covering 4' → bottom found throughout facility

039 BK
Wallboard from around outlet in teaching room

040 BK
Brown baseboard w/ white mastic found throughout rest of facility except carpeted office, kennels, & mechanical room.

* 2 mercury Thermostats

C411
Gray & red paint found covering mechanical room floor

C412
White tile w/ black mastic found at edge of office entering into kennel area
± 2500 SF total

C413BK
Wallboard from exterior interior wall

C414BK
Strange orangish yellow brick found on Northend kennels.

C415BK
Wallboard from mechanical room

C416BK
Wallboard from interior exterior wall

Newer metal windows, caulking rubber

New furnaces, earliest date 95

Forced heat

New copper piping, PVC etc
Inbarless map of black foam
Abandoned old lines under facility

Attic blown in insulation & some rolled

Backdoor
Capitol Glass Co
16 CFR 1201 Cat II Safety Glazing
1820 Gambell St
Anchorage, AK
272-2433

Warnock Hersey
Listed 1 1/2 hr Fire door
WHI-A 056463
Steelcraft MFG. Co
Cincinati, OH 45242
PN 31324

Frame
Warnock-Hersey
WHI-B-101062
same as above
PN-31326

Frame
WHI-B-100858

Door
WHI-A-056467

1011 hrs
Horse stables
New furnace, electric, piping
≈ 2-3 yr ago.

look like still lot old piping in facility

2PW 93BK
~~045BK~~
White paint found in storage closet
w/ joint compound

16

2PW 44 BK

046BK
White/light gray 12x12 tile w/ chocolate brown mastic taken in bathroom near water heater

047BK
12x12 tile, taken in entry way

048BK
Green 9x9 tile (cond in water heater area, closets in baths.

049BK
12x12 white tile (CDA) taken near stable area, w/mastic

050BK
TSI off piping in entry way

17

051BK
Multi-paint layer (cond on old walls - limegreen, gray, white

052BK
Wall board joint tape

053BK
Joint tape

054BK
Exterior walls typically plywood w/ multi-paint layers

055BK
Yellow interior paint

056BK
Brown baseboard trim w/ light brown mastic

1 Honeywell mercury Thermostat
1 Buckeye 20 Dura Edge

057BK
Joint compound from outlet near main entrance

058BK
Wallboard from outlet same area as 57

Assume window glazing asbesto

059BK
Gray, red, black & white paint layer on windows sills & door trim etc

060BK
Wallboard from oldest look walls in closet

061 Wallboard from closet

062 BK
White 12x12 vc differing mastic black

063BK
Rap board on a straight section of pipe

064BK
TSI of fire supply housing near main entrance

Stables: no info on J could not access
5 exit signs w/ backup batteries
3 fire extinguishers - General Triplex
Poured concrete, w/ rubber mats on top

20

Stable Mix treat regular
4 plastic composite

1 warranty Thermostat in barn area

065 BK
Black matting on floor

066 BK
Gray paint in stable areas

067 BK
White paint in stable areas

068 BK
Wh/gray mix on stable fencing

21

069 BK
Brown exterior paint over yellow paint

070 BK
Window caulking/cut/paint

071 BK
Yellow/cream exterior paint

072 BK
Cream paint over white & red paint

073 BK
Paint on Metal hut # 8663

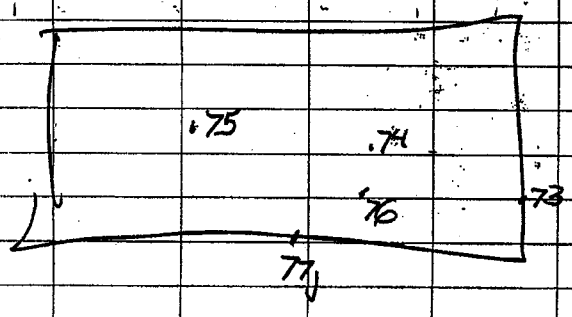
074 BK
Paint from in Quonset huts # 8663

22

075BK
Fiber board from inside Quonset hut # 8663

076Bk
Mastic at transition points on Q/H # 8663 metal siding

077Bk
Mastic found under siding at transition point of metal siding

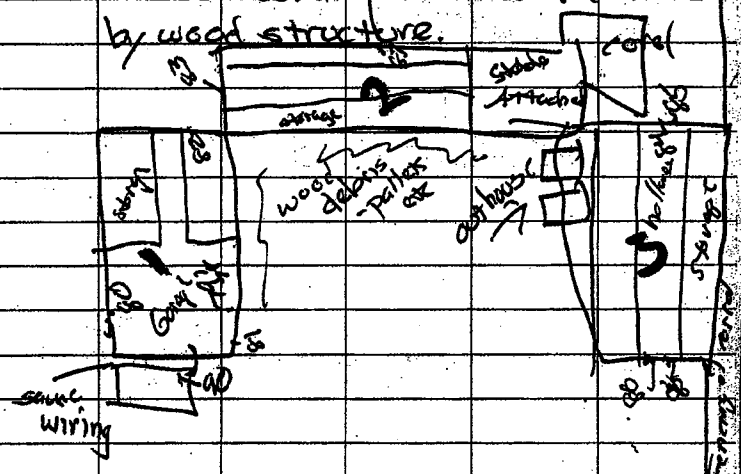


Burning fabric - assume asbestos

23

Quonset
Three backside huts, be viewed as one.
Maybe total peeling paint via surface area & paint surface inside & out - a < 6% peeling
- paint missing a ~~less~~ 5% but not peeling at all These areas

- Plus building attached at corners by wood structure.



19 fire extinguishers
- inside wood store units/lockers
Plywood & 2x4 mostly unpainted.

078BK Fiberboard from inside QH #1

079BK
White from inside QH #1 on fiberboard

080BK
Gray paint on inside fiberboard QH #1

081BK
White exterior paint on QH #1

082BK
White exterior paint over green paint QH #1

083BK
Fiberous divider on ~~metal corrugated~~ side on Quonset Huts, QH #1

084BK
Fiberous divider on Quonset huts QH #3

085BK
White & yellow paint from QH #3

086BK
Gray & white paint from interior of QH #3

087BK
White paint on QH #3

088BK Fiberboard from QH #3

089BK
Black tar/waste found at entryways road lines

26

C90BK
Red paper found on wood structure attached to QH

C91BK
Gray paint on horse trailer case That has been turned into a storage shield

C92BK
Cream paint of Annex horse stables

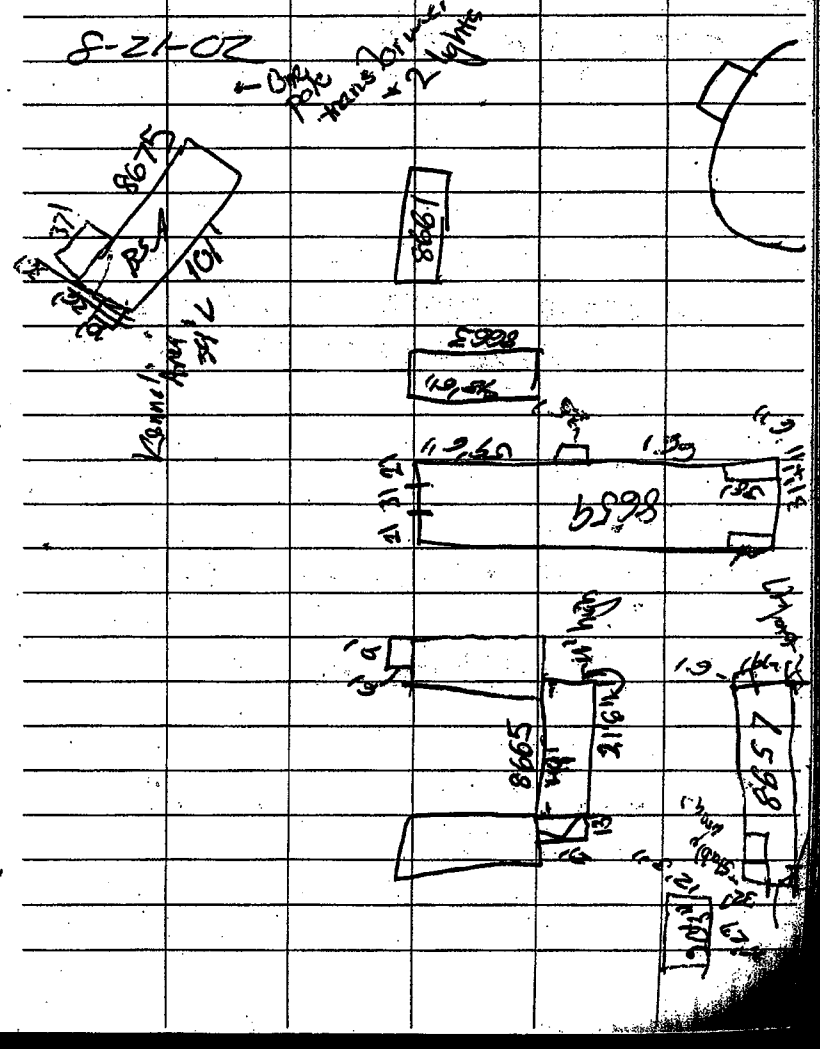
From discussing w/ occupant The Gray storage area was established in The 80's

2 Thermostats memory on Horse stables

27

93494 used on page 15416

8-21-02



28

095Bk metal of Quonset Hut
8663 (by lead analysis

096Bk
Gray paint of judging/viewing box
at corral

097Bk
Red paint of judging viewing box
at corral

098Bk
Multi paint, yellow, gray, & brown
@ corral

099Bk
Asphalt tar paper off Gray horse transport;
(New storage)

29

Add 3 more mercury Thermostat

ELM179 New BSABK

Boyscout Facility TCLP

ELM179 New ~~P~~ Peeling Pt TCLP

~~P~~ Lead, PCB-Total & TCLP

ELM179 New Horse Str. TCLP
All Horse facility structures
Lead-TCLP
PCB-Total & TCLP

100Bk
Fiberous wiring of QH #8663

30

No materials/waste found between corregated roofing over steel/s etc.

On Wednesday October 9th The Air Force added bldg 8661 to be sampled.

1000hrs - 1017-02

Bldg - no piping

Bk101
Paint from inside of hay barn

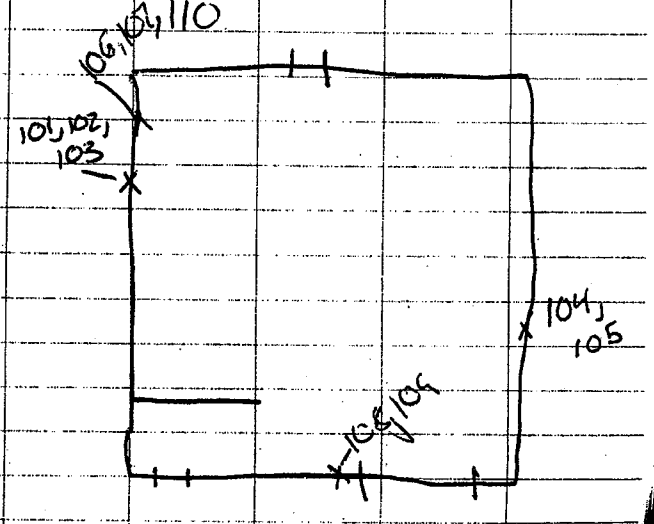
Bk102
Wallboard System

31

Bk103
Joint Compound / Mud over connect point on sheet rock wallboard

Bk104
Wallboard System

Bk105
Mud between 2 sheets of wallboard



Emergency Light over North Door

Same batteries as described for exit light below

Exit Light over North Door

- Battery Part Number 12-704 (6310?)
- SN 87Ø3ØØØ227

Lights believed to be High Pres Sodium

Fred - Ex. President of Horse Club

Lumalux -
LO150/55
Sottuana

Lamp - Thomas Ind. Inc
C# FAG-72152-2
Benjamin Div
PO Box 180
Sparta TN 38583

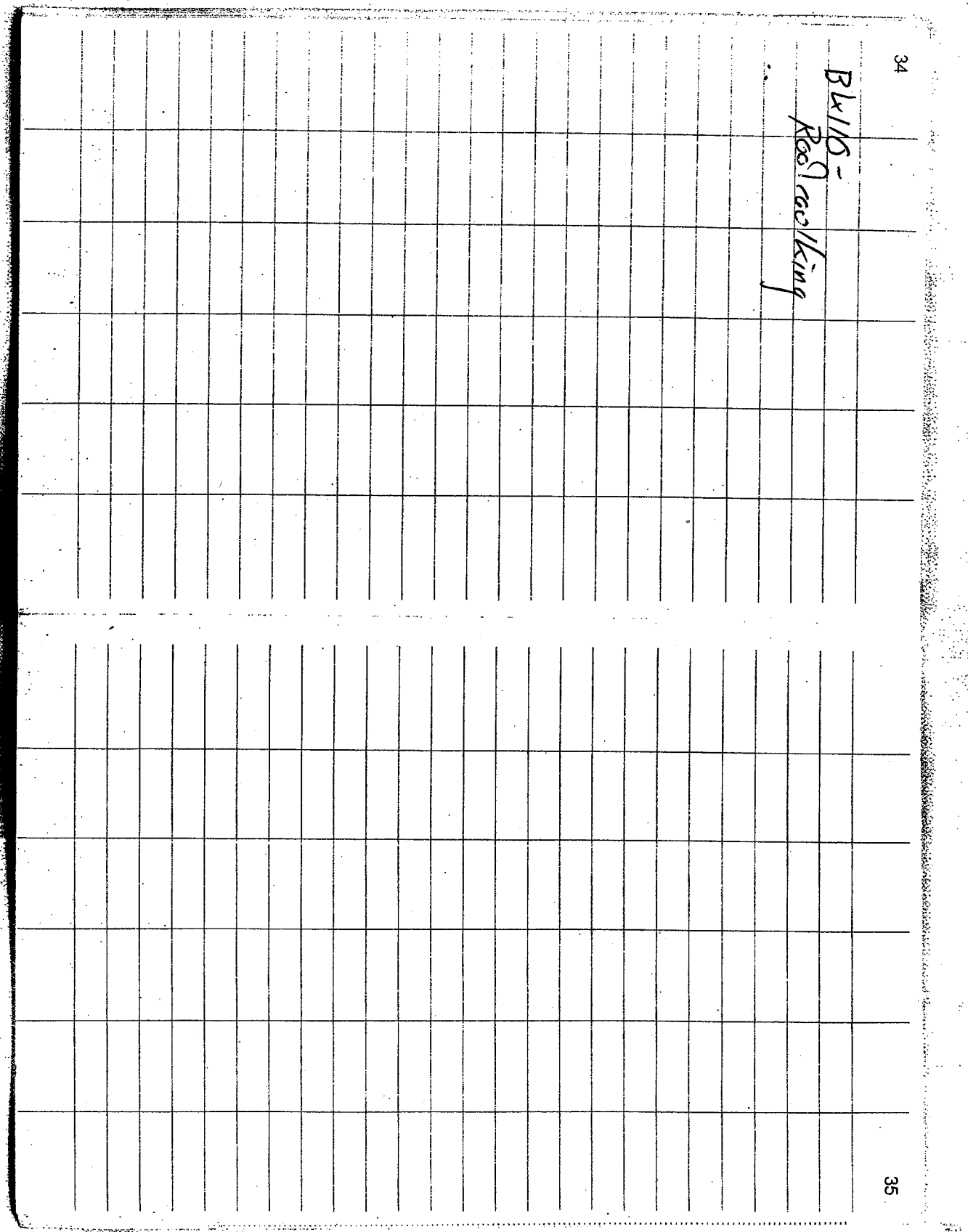
Plate: 120, 208, 240 etc
150w S-55 lamp

Bk106 -
roof caulking on roof metal panels

Bk107
Brown trim paint

Bk108
Brown trim paint

Bk109
White caulking between trim boards



--END OF APPENDIX--