University of Colorado
Boulder

Asbestos Operations and Maintenance Program

Table of Contents

Appendices

Standard Operating Procedures – Authorized Activities

I. Definitions

Amended Water: water to which surfactant (wetting agent) has been added to increase the ability of the liquid to penetrate

Asbestos: includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that has been chemically treated or altered

Asbestos-Containing Material (ACM): any material containing more than one percent (1%) asbestos

Authorized Activity: small-scale short duration job task that is specific to the University of Colorado's Boulder campus, will impact asbestos-containing material, has been approved and documented by EH&S, has a current Negative Exposure Assessment, and is included in this Operations and Maintenance Program

Class I Asbestos Work: the removal of thermal system insulation and/or surfacing material (ACM or PACM)

Class II Asbestos Work: removal of any ACM which is not Class I, such as wallboard, floor tile, ceiling tile, linoleum, transite board, roofing materials, and mastics

Class III Asbestos Work (O&M): repair and maintenance operations where ACM is likely to be disturbed

Class IV Asbestos Work: maintenance and custodial activities during which employees contact but do not disturb ACM, and activities to clean up dust and debris which may be generated by Class I, II, or III work

Clearance Air Monitoring: air monitoring conducted by an Asbestos Project Monitor at the conclusion of an asbestos project; clearance air monitoring includes the successful completion of a final visual inspection for work area debris and the collection and analysis of air samples in accordance with AHERA protocols

Competent Person: means, in addition to the definition in 29 CFR 1926.32 (f), one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32(f): in addition, for Class I and Class II work who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR 763) for supervisor, or its equivalent and, for Class III and Class IV work, who is trained in a manner consistent with EPA requirements for training of local education agency maintenance and custodial staff as set forth at 40 CFR 763.92 (a)(2)

EH&S: University of Colorado Boulder Environmental Health & Safety Department

Friable Asbestos-Containing Material: any material containing more than one percent asbestos, which when dry, may be crumbled, pulverized or reduced to powder by hand pressure

GAC: General Abatement Contractor

High Efficiency Particulate Air (HEPA) Filter: a filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter

HVAC Barrier: one or more layers of polyethylene sheeting sealed over all supply and return air diffusers used to limit the potential of dust and debris from entering HVAC ductwork and migrating into adjacent areas

Threshold Quantity: maximum amount of specific types of ACM that can be removed or disturbed by university personnel under this program; quantities greater than threshold must be conducted by a GAC or with direct approval from EH&S

MMS: Material Management System maintained by EH&S

Negative Exposure Assessment (NEA): a demonstration by the employer, which complies with the criteria in OSHA 29 (CFR) 1926.1101 paragraph (f) (2) (iii), that the employee exposure during the monitored operation is expected to be consistently below the PELs

Non-Friable Asbestos-Containing Material: materials in which asbestos is bound in a matrix which cannot, when dry, be crumbled, pulverized, or reduced to powder by hand pressure (such as floor tile and asphaltic building materials)

Permissible Exposure Limits (PELs):
(1) Time Weighted Average (TWA): the employer shall ensure that no employee is exposed to an airborne concentration of asbestos in excess of 0.1 fiber per cubic centimeter as an eight (8) hour time weighted average
(2) Excursion Limit (EL): the employer shall ensure that no employee is exposed to an airborne concentration of asbestos in excess of 1.0 fiber per cubic centimeter of air as averaged over a sampling period of thirty (30) minutes

PPE: Personal Protective Equipment

Presumed Asbestos-Containing Material (PACM): thermal system insulation and surfacing material in buildings constructed no later than 1980 are assumed to contain asbestos until it has been analyzed to verify or negate its asbestos content

Regulated Area: means an area established by the employer to distinguish areas where airborne concentrations of asbestos exceed or there is a reasonable possibility that they may exceed the permissible exposure limits; the regulated area shall be demarcated in any manner that minimizes the number of persons within the area and protects persons outside the area from exposure to airborne asbestos

Secondary Containment: a system of airtight barriers made out of polyethylene sheeting used to limit the potential of air migration out of the work area

Small-Scale Short Duration (SSSD): removal or disturbance of small quantities of ACM only if required in the performance of another maintenance activity not intended as asbestos abatement

Vinyl Asbestos Floor Tile (VAT): vinyl floor tile, and in some cases its mastic, that contains more than one percent asbestos and must be handled as ACM

II. Purpose and Introduction

This document contains the University of Colorado's Asbestos Operations and Maintenance (O&M) program for the Boulder campus. This program was developed and written by the university's Environmental Health & Safety Department (EH&S) and is the campus standard for O&M activities that will disturb asbestos-containing materials. It is the responsibility of each individual department on campus who wishes to implement this program to ensure the procedures are followed, and that employees maintain current training, respiratory fit testing, and medical surveillance. The objective of this program is to outline the work practices, training requirements, and processes put in place by EH&S to protect building occupants and university employees from asbestos exposure associated with O&M activities. O&M activities or Class III asbestos work means repair and maintenance operations, where "ACM", including TSI and surfacing ACM and PACM, is likely to be disturbed. The O&M program is intended for University of Colorado Boulder employees who have been trained for O&M work by EH&S in accordance with this program. This program is not intended or designed for contractors conducting asbestos abatement on the Boulder campus.

A. Asbestos History and Use on Campus

Asbestos is a class of naturally occurring fibrous minerals. Due to its heat and chemical resistance and its strength and flexibility, asbestos has been used in different building and non-building related materials. While most uses of asbestos have been banned, some asbestos-containing products remain on the market today. The most commonly encountered types of asbestos-containing materials at CU Boulder include drywall joint compound, floor tile and mastic, ceiling tiles, pipe

insulation, fireproofing, window glazing, asbestos cement products and roofing. All building materials in structures built prior to 1989 must be presumed to contain asbestos unless laboratory analytical sample data is available to prove a material is not asbestos-containing. EPA regulations require that all buildings, regardless of age, be surveyed for asbestos prior to demolition or renovation.

B. Asbestos Exposure and Health Concerns

When materials containing asbestos are left intact and undisturbed they do not pose a health risk to building occupants or workers. There is a potential for exposure only when the material becomes damaged to the extent that asbestos fibers become airborne and are inhaled. Asbestos is more likely to release fibers when it is friable. The term friable means the material can be easily reduced to a dust or powder with hand pressure only. If friable forms of asbestos are disturbed and become airborne, an inhalation hazard may result. In non-friable materials like floor tile and laboratory bench tops, the asbestos fibers are tightly bound in a matrix which limits the potential for a fiber release unless the material is rendered friable through mechanical means (i.e. abraded, sanded or sawed).

Generally, adverse health effects from asbestos are the result of long-term exposure to high concentrations of airborne fibers. According to the EPA, airborne asbestos levels in buildings are typically much lower than those identified in industrial work places where asbestos related health effects have been observed.

If exposed to asbestos, several factors may influence whether harmful health effects will occur. These factors include:

- Dose – how much asbestos one is exposed to
- Duration – how long one is exposed to asbestos fibers
- Whether or not you smoke

C. Health Effects of Asbestos

Asbestos has been determined to be a cancer and lung disease hazard. There are no warning signs that asbestos is causing problems in your body since there are no acute or short-term symptoms. Asbestos-related diseases have a latency period of 20-40 years before seeing any symptoms. The three most common asbestos related diseases are:

1. **Asbestosis** – Asbestosis is a serious, progressive, long term non-cancer disease of the lungs.
2. **Lung Cancer** – Lung cancer causes the largest number of deaths related to asbestos exposure.
3. **Mesothelioma** – Mesothelioma is a rare form of cancer that is found in the thin lining (membrane) of the lung, chest, abdomen, and heart and nearly all cases are linked to asbestos exposure.

Exposure to asbestos increases your risk of developing lung disease. **That risk is made worse by smoking.** Smoking increases the risk of lung cancer 50-90 times more than exposure to asbestos alone.

III. Administrative Procedures:

EH&S maintains a database (MMS) for tracking asbestos-containing building materials on campus. The asbestos content of every building material on campus is not accounted for in the management system. The MMS is updated with laboratory data regarding asbestos content from previous projects and sampling events. Prior to impacting building materials for a project, O&M-trained staff are responsible for determining if the building materials to be impacted are asbestos-containing. The O&M staff have two options for determining if a building material contains asbestos.

1. Assume the building material(s) to be impacted are asbestos-containing and follow all procedures set forth in this O&M program. EH&S is available as a resource to help determine the appropriate course of action on a case by case basis.
2. Contact EH&S to request information about the material from the MMS or asbestos sampling if necessary. EH&S will conduct sampling for laboratory analysis and provide a follow-up email outlining the sample results and any necessary follow up actions.

EH&S will be responsible for coordinating disposal, manifesting, and billing each speedtype for the asbestos waste generated as ouotlined in Section G below.

A. Building Surveillance

The EH&S Asbestos and Lead group have a constant presence in campus buildings during inspections and other day to day activities. Asbestos and Lead staff are certified as EPA Asbestos Building Inspectors and are trained to recognize, document, and mitigate asbestos hazards. However, it is important to note, Facilities Management and Housing Maintenance staff who have been trained as a part of this O&M Program have a responsibility and are expected to report any ACM (or suspect ACM) which has been damaged or has the potential of becoming damaged to the Asbestos and Lead group. All sampling and inspection data is managed by the Asbestos and Lead group and housed in the MMS. Additional inspection and sampling is conducted in-house by the Asbestos and Lead group on an as needed basis.

B. Authorized O&M Activities

To minimize potential asbestos exposure to maintenance personnel and building occupants, EH&S has developed Stanbdard Operating Procedures for Authorized O&M Activities which will disturb ACM.

Authorized Activities are specific to this program and must:

- be specific to small scale short duration tasks which will impact asbestos
- be approved by EH&S
- have a current Negative Exposure Assessment

All Authorized Activities have written procedures outlining approved work methods, type of ACM, required engineering controls, and appropriate PPE. EH&S has developed maximum quantities of particular types of ACM that can be removed or disturbed under this program. Any asbestos work scheduled to be conducted by CU Boulder personnel who will exceed these limits must be conducted by a GAC or with direct approval from EH&S.

Material Type	Maximum Quantity
Floor tile and Mastic	≤25 ft^2
Caulking	≤10 ft
Window Glazing	≤10 ft
CMU Sealant	≤3ft^2
Transite (disturbance)*	<25ft^2
Drywall /Plaster (disturbance)*	≤25ft^2
Anchoring into ACM	≤25ft^2
Roofing	<25ft^2
Ceiling tile	≤8ft^2
Fire Doors	1 each
Adhesives	≤25ft^2
*Disturbance not wholesale removal	

A list of Authorized O&M Activities and corresponding work procedures can be found in Appendix D.

A review of the current Authorized Activities will be conducted at the initial O&M training and at the annual refresher training thereafter. The review will include discussion about work procedures (i.e. pros, cons, feasibility etc.) and any proposed changes or updates. O&M-trained staff are responsible for informing EH&S of new work procedures (not currently addressed as an Authorized Activity) which will impact asbestos-containing materials. EH&S will determine whether the task is authorized under this O&M program and be responsible for developing a written work procedure.

C. Engineering Controls

All operations and maintenance projects require, at a minimum, a regulated area to be established prior to starting work. The regulated area is intended to restrict access to the work area to authorized personnel only. The regulated area shall be demarcated in any manner that minimizes the number of persons within the area and protects persons outside the area from exposure to airborne asbestos. Regulated areas are established by:

1. Hanging signs/caution tape to warn of asbestos/construction hazards
2. Closing windows and doors to work area
3. Establishing one exit/entrance
4. Designating a staging area for waste/equipment and PPE
5. Cover fixed objects with polyethylene sheeting

O&M staff are responsible for using experience and training to determine if additional engineering controls (e.g. HVAC barriers or secondary containment) are necessary to reduce the potential for air migration from the work area. Employees should consider location inside the building, occupants inside building, condition of material(s) being disturbed, quantity of material being disturbed, and proximity to HVAC equipment to determine the need for additional engineering controls. EH&S is available to review work area, procedures and engineering controls.

HVAC Barriers

HVAC barriers are required for O&M projects which have the potential of creating dust that may become difficult to control at the source using a HEPA vacuum or wet methods. The purpose of an HVAC barrier is to limit the potential of dust and debris from entering HVAC ductwork and migrating into adjacent areas. After establishing a regulated area, HVAC barriers are to be constructed of one or more layers of polyethylene sheeting sealed over all supply and return air diffusers.

Secondary Containment

At times, O&M projects may be completed in areas that are dusty and the work activities may cause the dust to become airborne. Although this dust is not necessarily airborne asbestos fibers, it is important to control and limit the potential from migrating out of the work area. Work activities which may create excessively dusty atmospheres must be conducted inside a secondary containment. A secondary containment is a system of airtight barriers made out of polyethylene sheeting used to limit the potential of air migration out of the work area. A secondary containment must be constructed inside a regulated area and also may require installation of HVAC barriers.

O&M personnel are responsible for determining what level of engineering control is required for the work they are conducting. EH&S is available to help assist in the determination of the most suitable engineering control for each specific project.

D. O&M Workflow

1. O&M-trained employees are assigned a work order that may potentially disturb asbestos containing materials.
2. Employee or Project Manager is responsible for contacting EH&S to determine if building material(s) to be impacted contains asbestos.

a) If materials do not contain asbestos, project can be conducted using safe work practices and appropriate dust control measures.
b) If materials do contain asbestos and the quantity to be disturbed is less than material specific O&M limit, trained staff can conduct the work following the Authorized Activity requirements outlined in this O&M program
c) If asbestos data is not available, O&M-trained staff have two options:
    i. Assume the material contains asbestos, ensure the quantity to be disturbed is less than material specific O&M limit and proceed following the Authorized Activity requirements outlined in this O&M program.
    ii. A work order should submitted by the shop supervisor through the MMS to request asbestos sampling. EH&S will conduct sampling for laboratory analysis and provide an asbestos hazard communication report outlining the sample results and any necessary follow up actions.

E. Prohibited Practices

The following work practices shall not be used for any work that disturbs asbestos-containing materials, regardless of measured levels of asbestos exposure or the results of initial exposure assessments:

- Dry sanding
- High-speed abrasive disc saws that are not equipped with point of cut ventilator or enclosures with HEPA filtered exhaust air
- Compressed air used to remove or clean dust and debris from materials containing asbestos
- Dry sweeping, shoveling, or other dry clean-up of dust and debris containing ACM and PACM
- Employee rotation as a means of reducing employee exposure to asbestos
- Removal or disturbance of thermal system insulation or surfacing material will not be performed by University of Colorado employees

F. Routine Maintenance and Cleaning

It is important to minimize the disturbance of asbestos-containing materials and the subsequent release of asbestos fibers. This can be accomplished by staying out of physical contact with materials that contain, or are presumed to contain, asbestos.

Dust and debris in an area containing visibly deteriorated ACM shall not be dusted or swept dry, or vacuumed without using a HEPA filtered vacuum. This cleaning shall only be carried out by workers who have, at a minimum, Asbestos Operations and Maintenance training.

Workers cleaning HEPA vacuums used in O&M activities should follow manufacturer's instructions including:

- Conduct cleaning activities outdoors away from high use areas
- Workers conducting cleaning activities should wear PPE (e.g. respiratory protection)
- When removing bag and filter, lightly mist with water to suppress dust
- If feasible, use another HEPA vacuum to clean the interior surfaces
- At a minimum, wet wipe all interior surfaces

The manufacturer's instructions will provide directions on how and when to change the bag and filters of HEPA vacuum used in O&M activities. Additionally, EH&S has developed an SOP outlining HEPA Vacuum maintenance requirements. This SOP can be found in Apppendix K.

G. Waste Storage and Disposal

O&M-trained staff are responsible for collecting all asbestos waste and asbestos-contaminated materials (i.e. clothing, PPE, etc.) in sealed, labeled, impermeable bags or other closed, labeled, impermeable containers. All waste must be adequately wet inside the waste bag. Asbestos waste generated from O&M activities must be delivered to the Waste Storage facility located at 3536 Marine street. All waste must be delivered to the specified storage area immediately following the scheduled O&M work or at the end of the work shift, whichever comes first. Asbestos waste must not be stored in vehicles, offices or any other areas not intended for asbestos waste storage. O&M-trained staff are responsible for accurately documenting the work that was completed. Each waste bag must have an O&M Asbestos Waste Sticker Applied with the following information.

- Date work was completed
- Name of O&M-trained staff responsible for work
- Building
- Room #'s
- Work Order #
- Material(s) Removed
- Quantity of Material Removed

Following application of the O&M waste sticker, each waste bag must be placed and sealed in a second waste bag to ensure no leakage and that the Waste sticker remains with the waste. EH&S will be responsible for coordinating disposal, manifesting, and billing each speedtype for the asbestos waste generated on an as needed basis.

H. Documentation of Abated ACM

O&M-trained employees are responsible for providing EH&S documentation for projects that have removed an entire material type from a functional space. For example, the floor tile and mastic from an entire room have been abated and no

longer exist in that room. EH&S will then be responsible for updating the MMS to reflect the abatement information.

IV. Employee Training

There are various levels of required training for personnel who will work with or around asbestos-containing building materials. The level and extent of training is dependent upon the type of work employees will be responsible for conducting with asbestos-containing materials. EH&S can guide and assist in training types and the subsequent requirements. Documentation of training activities must be provided to the EH&S Asbestos and Lead office and to the employee's supervisor.

A. Awareness Training

The OSHA asbestos standards for General Industry (29 CFR 1910.1001) and the Construction Industry (29 CFR 1926.1101) require employers to provide asbestos awareness training to employees who may encounter or potentially disturb ACM or PACM. The general industry standard applies to manufacturing, brake or clutch servicing, and building custodial or housekeeping work. The construction standard applies to building maintenance and construction work and also to housekeeping activities performed after maintenance or construction work. Asbestos awareness training is required within 30 days of initial assignment and on an annual basis thereafter. This training is provided by EH&S as part of the annual Core traning curriculum. The Asbestos Awareness training covers:

- Types of asbestos and characteristics
- Health effects associated with asbestos exposure
- Relationship between smoking and asbestos in producing lung cancer
- Information on smoking cessation programs
- University's policy regarding asbestos management
- Locations where asbestos materials are commonly found
- How to recognize signs of damage and deterioration of ACM and PACM
- Proper response to fiber release episodes
- Standard requirements related to housekeeping

B. Operation and Maintenance (Class III) Training

The OSHA asbestos standard for the Construction Industry (29 CFR 1926.1101(k)(9)) requires employers to provide Class III asbestos training to employees who are likely to be exposed to asbestos in excess of the PEL. EH&S has developed a Class III asbestos training curriculum in compliance with the OSHA asbestos standards, specific to the university's O&M program. The training curriculum is developed around the pre-approved Authorized Activity SOPs and the type of work conducted by personnel on the Boulder campus. CU Boulder employees entered into this O&M program must complete the O&M training at the next training and prior to disturbing any ACM or PACM. The O&M Training is offered by EH&S on a quartery basis. All employees enrolled in the O&M program

must have an annual refresher thereafter. The O&M training is in addition to the initial Asbestos Awareness training covered in the Core Training curriulum.

The Asbestos O&M training provided by EH&S covers general Asbestos Awareness and:

- Methods of recognizing asbestos
- The proper methods of handling ACM or PACM
- The use of respiratory protection and EH&S Respiratory Protection program.
- Additional personal protection measures and good work practices.
- Guidelines, requirements, and frequency of the medical surveillance program
- CU Boulder-specific O&M work practices and procedures, including hands-on demonstration
- Overview of the EH&S Negative Exposure Assessment Policy
- Review of authorized work procedures and necessary changes or updates
- Waste storage and disposal procedures

V. Medical Surveillance

Medical examinations and consultations are required for all employees who are engaged in asbestos work for a combined total of 30 or more days per year or are exposed at or above the permissible exposure limit or excursion limit, and for employees who wear negative pressure respirators. Days when fewer than sixty minutes of O&M asbestos work are completed are not included in the 30-day count. Monitoring and tracking these quantities of work for all employees enrolled in the O&M program is difficult. EH&S recommends that all employees enrolled in the O&M program be enrolled in the medical surveillance program.

The medical examination must be conducted under the supervision of a licensed physician prior to disturbance of any ACM or PACM and repeated at least annually thereafter. The examination must be provided at no cost to the employee. The medical examination must be scheduled with one of the university's approved occupational health providers (https://www.cu.edu/risk). If the examining physician determines that any of the examinations should be provided more frequently than specified, affected employees will be examined at the frequencies specified by the physician.

Medical examinations include a medical and work history, with special emphasis directed to the pulmonary, cardiovascular, and gastrointestinal systems. Along with a pulmonary function test, any examinations or tests deemed necessary by the examining physician will be included.

The employee's supervisor (or appointee designated by the department) must maintain a copy of the physician's clearance for asbestos work and respirator use.

EH&S must have a copy of the physician's clearance respirator use at the time of fit testing.

A. Information Provided to the Physician

The following information must be provided to the physician by the employee's supervisor prior to the physical.

- A description of the affected employee's duties as they relate to the employee's exposure
- The employee's representative exposure level or anticipated exposure level
- A description of any personal protection equipment to be used by the employee
- Any information from previous medical examinations of the affected employee that is not otherwise available to the examining physician

Each new CU Boulder employee enrolled in the O&M program must complete the OSHA Initial Medical Questionnaire prior to scheduling a medical examination and before disturbance of any ACM or PACM. The Initial Medical Questionnaire can be found in the Medical Surveillance section of the MMS Library. CU Boulder employees enrolled in the O&M program must complete a Periodic Medical Questionnaire prior to their annual medical re-examination.

B. Physician's Written Opinion

The examining physician provides a written statement consisting of the physician's opinion whether the employee has any detected medical conditions that would place the employee at an increased risk of material health impairment from exposure to asbestos. The physicians report will also include:

- Any recommended limitations on the employee, or on the use of personal protective equipment such as respirators
- A statement that the employee has been informed by the physician of the results of the medical examination, and any medical conditions that may result from asbestos exposure
- A statement that the employee has been informed by the physician of the increased risk of lung cancer attributable to the combined effect of smoking and asbestos exposure

The physician will not reveal in the written opinion given to the employer, specific findings or diagnoses unrelated to occupational exposure to asbestos. The affected employee will provide a copy of the physician's written opinion to the supervisor within 30 days from its receipt. The employee is responsible for providing a copy of the physician's written opinion to the supervisor and to EH&S at the time of fit testing and Respiratory Protection Training.

C. Record Keeping

EH&S is responsible for maintaining employee O&M training documentation and fit testing records. Supervisors are responsible for maintaining medical surveillance documentation and the physician's written opinion. The employee is responsible for providing EH&S with a copy of the physician's written opinion at the time of Fit Testing.

VI. Negative Exposure Assessments (NEA)

EH&S has developed an NEA protocol for O&M-trained employees who will perform tasks which will disturb ACM. The purpose of the NEA is to demonstrate that employee exposures for specific tasks will be consistently below the PELs or ELs. Each NEA is specific to employees enrolled in the O&M program. The training and experience of these employees are no more extensive than that of other O&M staff authorized to perform this work.

An NEA determination will be based on:

- Objective data demonstrating that the specific job task cannot release airborne asbestos fibers in concentrations exceeding the TWA and excursion limit under those work conditions having the greatest potential for releasing asbestos fibers
- Air sample data collected for comparison to the PEL and EL within 12 months of the Authorized Activity and show that under the conditions prevailing and which will prevail in the current workplace there is a high degree of certainty that employee exposures will not exceed the TWA and excursion limit. Sample data must be obtained under workplace conditions "closely resembling" the processes, type of material, control methods, work practices, and environmental conditions outlined in the work procedure.

EH&S will conduct negative exposure assessment monitoring for Authorized Activities on an annual basis and manage the data associated with this sampling. Analytical results and data regarding air monitoring will be managed by EH&S and provided in writing to all O&M-trained staff. If periodic monitoring reveals that employee exposures, as indicated by statistically reliable measurements, are below the permissible exposure limit and excursion limit, EH&S may choose to discontinue exposure monitoring.

VII. Personal Protective Equipment (PPE)

A. Respiratory Protection

Respiratory protection must be worn for all work involving disturbance of ACM or PACM unless an NEA has been performed and demonstrates that employee

exposure during the specific operation is expected to be consistently below the PEL and EL. The NEA must be performed by EH&S and be specific to the work practices outlined in this O&M program. Before respirators can be worn, employees must be enrolled in the University of Colorado Respiratory Protection program. Enrollment in the Respiratory Protection Program includes:

- Completion of an initial and annual respirator medical questionnaire
- Initial and annual respirator medical evaluation by a licensed physician
- Initial and annual respiratory Protection Training
- Fit testing (prior to respirator use, as needed and at a minimum annually)

All CU Boulder employees enrolled in the university's O&M Program and Respiratory Protection Program must have a fit test conducted by EH&S prior to respirator use. Additional fit tests are required annually at a minimum and on an as needed basis if required. EH&S provides respiratory protection training and fit testing at no cost to the employee or department. Additional information regarding the EH&S Respiratory Protection Program, fit testing and training can be found at ehs.colorado.edu.

Any filters which are expired or in need of being discarded, must be disposed of as ACM waste.

B. Protective Clothing

Employees must wear protective clothing when conducting O&M activities which are likely to create exposures at or above the OSHA PEL or EL. Protective clothing is considered a disposable coverall (e.g. Tyvek) made from a synthetic fabric which will not allow asbestos fibers to pass through. This type clothing prevents a worker's regular clothing from being contaminated with asbestos fibers. Protective clothing is not required if an NEA has been performed and demonstrates that employee exposure during the specific operation is expected to be consistently below the PEL and EL. The NEA must be performed by EH&S and be specific to the work practices outlined in this O&M program.

Appendix A

Restorative Floor Work Standard Operating Procedure

University of Colorado Boulder Environmental Health & Safety (EH&S) has developed this Standard Operating Procedure (SOP) for employees on the Floor Care Crew who must strip and wax floor systems that contain or are assumed to contain asbestos. This SOP is intended for personnel who have OSHA Class IV training and will contact, but not disturb, asbestos-containing flooring. All vinyl floor tiles, regardless of size, color, or age, should be assumed to contain asbestos. EH&S must be contacted immediately if asbestos-containing floor systems are damaged or if the restorative floor work cannot be conducted following these specific procedures.

Preparation and Stabilization of Work Area

a. Establish a controlled area, restricting access to the work area to authorized personnel using caution tape, cones, or other barriers.
b. Pre-clean work area using a HEPA vacuum and/or wet rag to remove gross dust and debris.

Work Methods

a. In general, stripping of floor wax should be conducted as infrequently as possible.
b. Sanders, grinding, or any other activity that could render the asbestos materials friable is prohibited.
c. Floors must be stripped while wet and remain adequately wet throughout the stripping process.
d. Buffing must be conducted at speeds less than 300 revolutions per minute.
e. Buffers must be equipped with the least abrasive pad possible to strip the wax from the flooring. Buffers should not be used on unwaxed or unfinished tile floors.
f. Black scrubbing pads (i.e. most abrasive) cannot be used on floor systems that contain or are assumed to contain asbestos (e.g. vinyl tiles). Black scrubbing pads can only be used on ceramic tile, natural stone, terrazzo, and cement.
g. Do not over-strip floors. Care should be taken to avoid stripping through the old surface coat and down to raw tile.
h. Use a wet vacuum equipped with a HEPA filter to pick up liquids resulting from floor maintenance activities.
i. High-speed burnishing of floors can only be conducted when there is sufficient existing floor finish.

Waste Disposal and Handling

a. Asbestos-containing floor systems will not be impacted when following this procedure. Slurry and debris collected using HEPA vacuums do not need to be disposed of as asbestos-containing waste.

Appendix B

Anchoring Within Asbestos-Containing Wall/Ceiling Systems
Standard Operating Procedure

Maximum Quantity = ≤ 25ft^2

University of Colorado Boulder Environmental Health & Safety (EH&S) has developed this Standard Operating Procedure (SOP) for employees who place anchors into asbestos-containing walls systems. Workers shall wear appropriate personal protective equipment (PPE) until this procedure has a Negative Exposure Assessment (NEA) showing that workers will not be exposed to asbestos at or above the permissible exposure limit (PEL) and excursion limit (EL). Contact EH&S if the removal of these materials cannot be completed following these specific procedures.

Preparation and Stabilization of Work Area

a. Establish a regulated area, restricting access to the work area to authorized personnel using caution tape, cones, or other barriers.
b. Determine the level of engineering controls required, regulated area, critical barriers, or containment.
    i. Use experience, training, and surrounding environment to determine the level of engineering controls
    ii. Things to consider: Location inside building, occupants inside building, condition of material being disturbed, quantity of material being disturbed, time needed to complete the job, movement of air through the building, etc…
c. Pre-clean work area using a HEPA vacuum and/or wet rag to remove gross dust and debris. Dry sweeping is prohibited.
d. Place a drop cloth under the work area to capture dust and debris, which may fall to the floor.

Work Methods

a. Cutting, drilling, or ram-setting devices shall be outfitted with a shroud that is attached to a HEPA vacuum to capture dust and debris as it is generated or by utilizing an assistant to hold a HEPA vacuum at the point of generation.
b. Utilize silicone, foam, shaving cream, or an adhesive to suppress visible dust during disturbance activities.
c. Following completion of work, immediately HEPA vacuum any dust or debris that fell to the drop cloth.
d. All tools and equipment must be decontaminated using a HEPA vacuum or wet rag(s).
e. The drop cloth must be cleaned using a HEPA vacuum before moving or disposal.
f. Any PPE used during activity will be disposed of as asbestos waste.
g. Dry sweeping is prohibited and be sure not to step on any debris which has fallen onto drop cloth.

h. All asbestos waste must be brought immediately to the EH&S asbestos waste storage area.
i. Asbestos waste shall not be stored overnight inside the building or vehicle.

Waste Disposal and Handling

a. All asbestos waste must be properly bagged and labeled as outlined in the O&M program.
b. Waste, including vacuum waste and debris from other materials associated with anchoring, must be brought to the EH&S asbestos waste storage area and catalogued as outlined in the O&M program.

Appendix C

Component Removal of Transite Panels Standard Operating Procedure

Maximum Quantity = ≤ 25ft²

University of Colorado Boulder Environmental Health & Safety (EH&S) has instituted this Standard Operating Procedure (SOP) for its employees who are removing or disturbing asbestos-containing transite (cement board) panels by component removal methods. Workers shall wear appropriate personal protective equipment (PPE) until this procedure has a Negative Exposure Assessment (NEA) showing that workers will not be exposed to asbestos at above the permissible exposure limit (PEL) and excursion limit (EL). Contact EH&S if these materials cannot be removed following these specific procedures.

Preparation and Stabilization of Work Area

a. Establish a regulated area, restricting access to the work area to authorized personnel using caution tape, cones, or other barriers.
b. Determine the level of engineering controls required, regulated area, critical barriers, or secondary containment.
    i. Use experience, training, and surrounding environment to determine level of engineering controls.
    ii. Things to consider: Location inside building, occupants inside building, condition of material being disturbed, quantity of material being disturbed, time needed to complete the job, movement of air through the building, etc…
c. Pre-clean work area using a HEPA vacuum or wet rag to remove gross dust and debris. Dry sweeping is prohibited.
d. Place a drop cloth under the work area to capture dust and debris that may fall to the floor.

Work Methods

a. The use of sanders, chippers, buffers, or other activities that will render ACM or PACM friable is prohibited. Dry sweeping is prohibited.
b. Utilize a drop cloth to catch any dust and debris that may fall to the ground during removal.
c. Cutting or drilling devices shall be outfitted with a shroud that is attached to a HEPA vacuum to capture dust and debris as it is generated.
d. Suppress visible dust during disturbance activities by misting the work area and asbestos materials with amended water.
e. Bag all panels before lowering to the ground.
f. Following removal, immediately HEPA vacuum any dust and/or debris that fell to the drop cloth.
g. All tools and equipment must be decontaminated using a HEPA vacuum or wet rag.

h. The drop cloth must be cleaned using a HEPA vacuum before moving or disposal.
i. All disposable PPE must be removed as asbestos-containing waste.
j. All asbestos waste must be brought to the EH&S asbestos waste storage area.
k. Asbestos waste shall not be stored overnight inside the building.

Waste Disposal and Handling

a. All asbestos waste must be properly bagged and labeled as outlined in the O&M program.
b. Waste must be brought to the EH&S asbestos waste storage area and catalogued as outlined in the O&M program.

Appendix D

Disturbance of Asbestos-Containing Friable/Non-Friable Light Heat Shields Standard Operating Procedure

Maximum Quantity = ≤ 3ft^2

University of Colorado Boulder Environmental Health & Safety (EH&S) has instituted this Standard Operating Procedure (SOP) for its employees who impact friable/non-friable light heat shields during routine Operations and Maintenance (O&M) activity. These procedures have been proven through a Negative Exposure Assessment (NEA) not to expose workers impacting friable/non-friable light heat shields to levels of asbestos above the permissible exposure limit (PEL). Contact EH&S if these materials cannot be removed following these specific procedures.

Preparation and Stabilization of Work Area

a. Establish a regulated area, restricting access to the work area to authorized personnel using caution tape, cones, or other barriers.
b. Determine the level of engineering controls required, regulated area, critical barriers, or secondary containment.
    i. Use experience, training, and surrounding environment to determine level of engineering controls.
    ii. Things to consider: Location inside building, occupants inside building, condition of material being disturbed, quantity of material being disturbed, time needed to complete the job, movement of air through the building, etc…
c. Pre-clean work area using a HEPA vacuum or wet rag to remove gross dust and debris. Dry sweeping is prohibited.

Work Methods

a. The use of sanders, chippers, buffers, or other activity that will render ACM or PACM friable is prohibited. Dry sweeping is prohibited.
b. Utilize a drop cloth under the work area to capture dust and debris that may fall to the floor.
c. Suppress visible dust during disturbance activities by misting the work area and asbestos materials with a 1% soap water solution (amended water) using a spray bottle or a garden sprayer.
d. Secure heat shield material to the housing using tape.
e. Carefully remove the housing from the building making sure no asbestos materials will be dislodged from the housing.
f. Following removal, immediately HEPA vacuum any dust or debris that fell to the drop cloth.
g. All tools and equipment must be decontaminated using a HEPA vacuum before moving or disposal.

h. All Personal Protective Equipment must be disposed of as asbestos waste.
i. All asbestos waste must be brought to the EH&S Waste Storage Area.
j. Asbestos waste must not be stored overnight inside the building or a vehicle.

Waste Disposal and Handling

a. All asbestos waste must be properly bagged and labeled as outlined in the O&M program.
b. Waste must be brought to the EH&S asbestos waste storage area and catalogued as outlined in the O&M program.

Appendix E

Removal of Asbestos-Containing Floor Tile and Mastic Standard Operating Procedure

Maximum Quantity = ≤ 25ft^2

University of Colorado Boulder Environmental Health & Safety (EH&S) has developed this Standard Operating Procedure (SOP) for employees who remove or impact asbestos-containing floor tile and mastic. Workers shall wear appropriate personal protection equipment (PPE) until this procedure has a Negative Exposure Assessment (NEA) showing that workers will not be exposed to asbestos at above the permissible exposure limit (PEL) and excursion limit (EL). Contact EH&S if the removal of these materials cannot be removed following these specific procedures.

Preparation and Stabilization of Work Area

a. Establish a regulated area, restricting access to the work area to authorized personnel using caution tape, cones, or other barriers.
b. Determine the level of engineering controls required, regulated area, critical barriers, or secondary containment.
    i. Use experience, training, and surrounding environment to determine level of engineering controls
    ii. Things to consider: Location inside building, occupants inside building, condition of material being disturbed, quantity of material being disturbed, time needed to complete the job, movement of air through the building, etc…
c. Pre-clean work area using a HEPA vacuum and/or wet rag to remove gross dust and debris. Dry sweeping is prohibited.

Work Methods

a. Mechanical methods such as sanders, chippers, buffers, or other activities that will render asbestos materials friable are prohibited. Dry sweeping is prohibited.
b. Asbestos-containing mastic must be removed from the subfloor using hand methods only. A solvent can be used to loosen the mastic and make it more pliable.
c. Tile shall be removed using non-mechanical methods (e.g. hand spudding, prying, heat gun, dry ice, etc.) that will release adhered floor tiles from the tile mastic with minimal breakage.
d. The work area and asbestos-containing materials shall be misted with a 1% soap water solution using a spray bottle or a garden sprayer. Floor must be kept wet during removal process and until ACM is waste properly bagged.
e. The work area must be cleaned immediately following ACM removal using a HEPA vacuum and left free of any visible dust and debris.
f. All floor tiles remaining after the removal process must be secured to the floor to ensure they are not inadvertently disturbed.

g. All loosened/removed materials (e.g. floor tile, mastic, wood subfloor, etc.) must be immediately removed and placed in a 6 millimeter polyethylene bag for disposal as ACM waste.
h. Following removal, immediately HEPA vacuum any dust or debris generated in the work area.
i. All tools and equipment must be decontaminated using a HEPA vacuum and/or wet rag.
j. PPE must be disposed of as asbestos waste.
k. All asbestos waste must be brought immediately to the EH&S asbestos waste storage area.
l. Asbestos waste shall not be stored overnight inside the building or vehicle.

Waste Disposal and Handling

a. All asbestos waste must be properly bagged and labeled as outlined in the O&M program.
b. Waste must be brought to the EH&S asbestos waste storage area and catalogued as outlined in the O&M program.

Appendix F

Removal or Disturbance of Asbestos-Containing Drywall
Standard Operating Procedure

Maximum Quantity = ≤ 25ft^2

University of Colorado Boulder Environmental Health & Safety (EH&S) has developed this Standard Operating Procedure (SOP) for employees who remove or disturb asbestos-containing drywall. Workers shall wear appropriate personal protective equipment (PPE) until this procedure has a Negative Exposure Assessment (NEA) showing that workers will not be exposed to asbestos at above the permissible exposure limit (PEL) and excursion limit (EL). Contact EH&S if these materials cannot be removed following these specific procedures.

Preparation and Stabilization of Work Area

a. Establish a regulated area, restricting access to the work area to authorized personnel using caution tape, cones, or other barriers.
b. Determine the level of engineering controls required, regulated area, critical barriers, or containment.
    i. Use experience, training, and surrounding environment to determine level of engineering controls
    ii. Things to consider: Location inside building, occupants inside building, condition of material being disturbed, quantity of material being disturbed, time needed to complete the job, movement of air through the building, etc…
c. Pre-clean work area using a HEPA vacuum and/or wet rag to remove gross dust and debris. Dry sweeping is prohibited.
d. Place a drop cloth under the work area to capture dust and debris that may fall to the floor.

Work Methods

a. The use of sanders, chippers, buffers, or other equipment that will render materials friable is prohibited. Dry sweeping is prohibited.
b. Cutting or drilling devices shall be outfitted with a shroud that is attached to a HEPA vacuum to capture dust and debris as it is generated.
c. Suppress visible dust during disturbance activities by misting the work area and asbestos material with amended water.
d. Encapsulate exposed edges with caulking or paint immediately after drilling or cutting activities.
e. Following removal, immediately HEPA vacuum any dust or debris that fell to the drop cloth.
f. All tools and equipment must be decontaminated using a HEPA vacuum and/or wet rag.

g. The drop cloth must be cleaned using a HEPA vacuum before moving or disposal.
h. All asbestos waste must be brought immediately to the EH&S asbestos waste storage area.
i. Asbestos waste shall not be stored overnight inside the building.

Waste Disposal and Handling

a. All asbestos waste must be properly bagged and labeled as outlined in the O&M program.
b. Waste must be brought to the EH&S asbestos waste storage area and catalogued as outlined in the O&M program.

Appendix G

Disturbance of Asbestos-Containing Fire Doors Standard Operating Procedure

Maximum Quantity = 1 ea

University of Colorado Boulder Environmental Health & Safety (EH&S) has developed this Standard Operating Procedure (SOP) for employees who disturb asbestos-containing fire door insulation. Workers shall wear appropriate personal protective equipment (PPE) until this procedure has a Negative Exposure Assessment (NEA) showing that workers will not be exposed to asbestos at above the permissible exposure limit (PEL) and excursion limit (EL). Contact EH&S if these materials cannot be removed following these specific procedures.

Preparation and Stabilization of Work Area

a. Establish a regulated area, restricting access to the work area to authorized personnel using caution tape, cones, or other barriers.
b. Determine the level of engineering controls required, regulated area, critical barriers, or secondary containment.
    i. Use experience, training, and surrounding environment to determine level of engineering controls
    ii. Things to consider: Location inside building, occupants inside building, condition of material being disturbed, quantity of material being disturbed, time needed to complete the job, air movement through the building, etc…
c. Pre-clean work area using a HEPA vacuum and/or wet rag to remove gross dust and debris. Dry sweeping is prohibited.
d. Place a drop cloth under the work area to capture dust and debris that may fall to the floor.

Work Methods

a. Removing/Installing Hardware
    i. The use of sanders, chippers, buffers, or other equipment that will render materials friable is prohibited. Dry sweeping is prohibited.
    ii. As hardware or screws are being removed or installed, a HEPA vacuum shall be held in close proximity to the work zone to capture dust and debris.
    iii. Suppress visible dust during disturbance activities by misting the work area and asbestos materials with amended water.
    iv. Penetrations left after removing hardware must be filled to prevent asbestos containing material from being released.

b. Removing Entire Door
    i. Follow the above procedures if hardware is to be recycled before door is removed.

ii. Wrap the entire door in 6 millimeter polyethylene sheeting and tape to make a leak-tight seal.
iii. Unscrew the hinges of the fire door through the polyethylene sheeting while using a HEPA vacuum to collect any dust or debris generated during the removal.
iv. Following removal, immediately HEPA vacuum any dust or debris that fell to the drop cloth.
v. All tools and equipment must be decontaminated using a HEPA vacuum and/or wet rag.
vi. The drop cloth must be cleaned using a HEPA vacuum before moving or disposal.
vii. All asbestos waste must be brought immediately to the EH&S asbestos waste storage area.
viii. Asbestos waste must not be stored overnight inside the building or vehicle.

Waste Disposal and Handling

c. All asbestos waste must be properly bagged and labeled as outlined in the O&M program.
d. Waste must be brought to the EH&S asbestos waste storage area and catalogued as outlined in the O&M program.

Appendix H

Removal of Asbestos-Containing Ceiling Tiles Standard Operating Procedure

Maximum Quantity = 8ft^2

University of Colorado Boulder Environmental Health & Safety (EH&S) has developed this Standard Operating Procedure (SOP) for employees who must remove asbestos-containing ceiling tiles. Workers shall wear appropriate personal protective equipment (PPE) until this procedure has a Negative Exposure Assessment (NEA) showing that workers will not be exposed to asbestos at above the permissible exposure limit (PEL) and excursion limit (EL). Contact EH&S if the removal of these materials cannot be removed following these specific procedures.

Preparation and Stabilization of Work Area

a. Establish a regulated area, restricting access to the work area to authorized personnel using caution tape, cones, or other barriers.
b. Determine the level of engineering controls required, regulated area, critical barriers, or secondary containment.
    i. Use experience, training, and surrounding environment to determine level of engineering controls
    ii. Things to consider: Location inside building, occupants inside building, condition of material being disturbed, quantity of material being disturbed, time needed to complete the job, movement of air through the building, etc…
c. Pre-clean work area using a HEPA vacuum and/or wet rag to remove gross dust and debris. Dry sweeping is prohibited.
d. Lay a drop cloth under the work area large enough to capture dust or debris that may fall to the floor.

Work Methods

a. Suppress visible dust during removal by misting the work area and ceiling tile with amended water. Ceiling tile must not be saturated to ensure the tile's structural rigidity is not compromised.
b. As the tile is being removed, continually mist work area with amended water and use a HEPA vacuum to collect any dust and debris that is generated.
c. Following removal, immediately HEPA vacuum any dust or debris that fell to the drop cloth and wet wipe lay-in panel track (if applicable).
d. All tools and equipment must be decontaminated using a HEPA vacuum and/or wet rag.
e. The drop cloth must be cleaned using a HEPA vacuum before moving or disposal.
f. All asbestos waste must be brought immediately to the EH&S asbestos waste storage area.
g. All disposable PPE must be disposed of as asbestos-containing waste.
h. Asbestos waste must not be stored overnight inside the building or a vehicle.

Waste Disposal and Handling

a. All asbestos waste must be properly bagged and labeled as outlined in the O&M program.
b. Waste must be brought to the EH&S asbestos waste storage area and catalogued as outlined in the O&M program.

Appendix I

Preparation and Painting of Asbestos-Containing Materials
Standard Operating Procedure

University of Colorado Boulder Environmental Health & Safety (EH&S) has developed this Standard Operating Procedure (SOP) for employees who are preparing and painting building materials that contain asbestos or lead-based paint. Please contact EH&S if this work cannot be completed following these specific procedures.

Preparation and Stabilization of Work Area

a. Establish a regulated area, restricting access to the work area to authorized personnel using caution tape, cones, or other barriers.
b. Determine the level of engineering controls required, regulated area, critical barriers, or containment.
    i. Use experience, training, and surrounding environment to determine level of engineering controls
    ii. Things to consider: Location inside building, occupants inside building, condition of material being disturbed, quantity of material being disturbed, time needed to complete the job, air movement through the building, etc…
c. Pre-clean work area using a HEPA vacuum and/or wet rag to remove gross dust and debris. Dry sweeping is prohibited.
d. Place a drop cloth under the work area to capture dust and debris which may fall to the floor.

Work Methods

a. The use of mechanical sanders, chippers, buffers, or other equipment that will render ACM or PACM friable is prohibited. Dry sweeping is prohibited.
b. Disturbance of an asbestos-containing textured surfacing material is prohibited. Textured materials are spray or trowel-applied on surfaces for acoustical, fireproofing, or other purpose (e.g. popcorn ceilings, orange peel, knock down etc.). This does not include drywall tape and joint compound.
c. All preparation work, scraping, and sanding shall be done with a HEPA vacuum and wet methods at the point of disturbance.
d. Suppress visible dust during disturbing activities by misting the work area and asbestos material continuously with amended water.
e. Once area is properly prepped, bag all debris, clean the work area, and clean all tools before starting to paint.

f. During the painting phase, disturbance should be minimal as paint acts as a protectant from further disturbance or damage to the material.

Waste Disposal and Handling

a. Generally, painting preparation generates dust and not bulk debris. If bulk ACM waste is created it should be bagged, labeled, and disposed of properly.
b. All dust and debris generated should be cleaned using the HEPA vacuum and/or a wet rag.
c. All HEPA vacuums used during O&M activities should be regularly cleaned with the bags and filter changed. Please reference the EH&S “HEPA Vacuum Maintenance” SOP, found within the O&M program and online in EH&S’s Material Management System.
d. All asbestos waste must be properly bagged, labeled, and stored as outlined in the O&M program.
e. Waste must be brought to the EH&S asbestos waste storage area and catalogued as outlined in the O&M program.

Appendix J

Removal of Ductwork with Asbestos-Containing Sealant
Standard Operating Procedure

Maximum Quantity = ≤3 ft^2

University of Colorado Boulder Environmental Health & Safety (EH&S) has developed this Standard Operating Procedure (SOP) for employees who remove ductwork with asbestos-containing sealant applied to the seams, joints, and penetrations. Workers shall wear appropriate personal protective equipment (PPE) until this procedure has a Negative Exposure Assessment (NEA) showing that workers will not be exposed to asbestos at above the permissible exposure limit (PEL) and excursion limit (EL). Contact EH&S if the removal of these materials cannot be removed following these specific procedures.

Preparation and Stabilization of Work Area

a. Establish a regulated area, restricting access to the work area to authorized personnel using caution tape, cones, or other barriers.
b. Determine the level of engineering controls required, regulated area, critical barriers, or secondary containment.
    i. Use experience, training, and surrounding environment to determine level of engineering controls
    ii. Things to consider: Location inside building, occupants inside building, condition of material being disturbed, quantity of material being disturbed, time needed to complete the job, movement through the building, etc…
c. Pre-clean work area using a HEPA vacuum or wet rag to remove gross dust and debris. Dry sweeping is prohibited.
d. Utilize drop cloths under the work area in a manner that will capture all dust and debris that may fall from the duct work during removal.
e. Ensure the mechanical system is de-energized and inactive before starting work.
f. Install a critical barrier over all HVAC openings that will not be removed.

Work Methods

a. The use of sanders, chippers, buffers, or other equipment that will render ACM or PACM friable is prohibited. Dry sweeping is prohibited.
b. A containment is not required if the removal of the ductwork does not render the asbestos material friable. If asbestos material is rendered friable, additional engineering controls and work methods will be required. Contact EH&S if material will be rendered friable.
c. Mist the work area and asbestos materials with amended water.
d. Before removing duct work, wrap and tape the ductwork with a layer of 6 millimeter polyethylene sheeting.

e. Cutting shall be done in a location that does not impact asbestos-containing materials and on a section of duct that is not wrapped in plastic.
f. When ductwork is separated from the system, a critical barrier shall be installed over the remaining ductwork.
g. The drop cloth must be cleaned using a HEPA vacuum before moving or disposal.
h. All tools and equipment must be decontaminated using a HEPA vacuum and/or wet rag.
i. Any PPE utilized must be disposed of as asbestos waste.
j. All asbestos waste must be brought immediately to the EH&S asbestos waste storage area.
k. Asbestos waste shall not be stored overnight inside the building or vehicle.

Waste Disposal and Handling

a. All asbestos waste must be properly bagged and labeled as outlined in the O&M program.
b. Waste must be brought to the EH&S asbestos waste storage area and catalogued as outlined in the O&M program.

Appendix K

Removal, Cleaning, and Disposal of HEPA Vacuum Filters
Standard Operating Procedure

University of Colorado Boulder Environmental Health & Safety (EH&S) has instituted this Standard Operating Procedure (SOP) for employees who are responsible for the use and maintenance of HEPA vacuums for asbestos Operations and Maintenance (O&M) work. This procedure has been proven through a Negative Exposure Assessment (NEA) not to expose workers maintaining HEPA vacuums to levels of asbestos above the permissible exposure limit (PEL) or excursion limit (EL). Contact EH&S if the maintenance of HEPA vacuums cannot occur following these specific procedures. Additional information regarding the specific HEPA vacuum and when to change the filter can be found in the manufacturer's instructions.

Preparation and Stabilization of Work Area

a. Workers should move the HEPA vacuum to an area outside of the building.
b. HEPA vacuum maintenance activities should be conducted in an area that is away from other people and in an area that is away from building doors, windows, or HVAC air intakes.
c. Establish a regulated area, restricting access to the work area to authorized personnel using caution tape, cones, or other barriers.
d. Restrict access to the work area using physical barriers or additional personnel to ensure unauthorized personnel are kept at a safe distance.
e. Workers responsible for maintaining HEPA vacuums should use appropriate respiratory protection while conducting maintenance and filter removal activities.

Work Methods

a. Pre-clean exterior of HEPA vacuum using an additional HEPA vacuum and/or a wet rag to remove gross dust and debris.
b. The vacuum should be opened and the HEPA filter, filter bag (if present), and any loose debris must be immediately placed in a 6 millimeter polyethylene bag for disposal as ACM waste.
c. The interior of the vacuum must be cleaned using an additional HEPA vacuum and a wet rag to remove dust and residual debris. If a wet rag is used for cleaning, the rag must be disposed of as asbestos waste as outlined above.
d. All asbestos waste must be brought immediately to the EH&S asbestos waste storage area.
e. Asbestos waste shall not be stored overnight inside the building or in a vehicle.

Waste Disposal and Handling

a. All asbestos waste must be properly bagged and labeled as outlined in the O&M program.
b. Waste must be brought to the EH&S asbestos waste storage area and catalogued as outlined in the O&M program.

Appendix L

Removal and Stabilization of Non-Friable Asbestos Window Caulking and Glazing Standard Operating Procedure

The following guidelines have been developed by University of Boulder Colorado Environmental Health & Safety (EH&S) for Facilities Maintenance employees working on projects that involve the removal and/or stabilization of non-friable asbestos-containing window caulking and glazing. The removal of asbestos caulking and glazing must be conducted using appropriate engineering controls and by personnel who are OSHA Class III asbestos-trained and in coordination with EH&S. The following guidelines must be followed for glazing and caulking that contains any amount of non-friable asbestos.

Training and Health and Safety Requirements

a. The employee must have a current Negative Exposure Assessment (NEA) for the removal of non-friable asbestos-containing window caulking or glazing. The NEA must be specific to the proposed removal methods and for comparable material(s).
b. Employees must use appropriate dust control methods to ensure building occupants are not impacted by the removal of ACM. Dust control methods can include, but are not limited to, use of HEPA vacuums, physical dust barriers, wet methods, and negative air machines. EH&S reserves the right to conduct visual inspection and air monitoring to document that building occupants are not being exposed to hazards associated with the removal of ACM.

Preparation and Stabilization of Work Area

a. Employees must pre-clean all work areas around the windows using a HEPA vacuum and a wet rag. Pre-cleaning must include the frames, sills, sashes, floors, and the soil/ground directly below the window.
b. Employees must place a drop cloth under the work area. The drop cloth must be large enough to extend outside the work area, secured to the building, and capable of catching all material and debris dislodged and released during the removal process.
c. Establish a regulated area by restricting access to the work area to authorized personnel. This can be done by using caution tape, cones, and/or other barriers.
d. All suspect building materials dislodged or released during the caulking removal process must be treated as asbestos-containing and will require cleaning by the contractor.

Work Methods

a. Employees must only use hand methods that will not render window caulking or any other ACM or PACM friable.
b. Employees must use a HEPA vacuum during all activities that will or have the potential to disturb ACM. The HEPA vacuum must be used to collect asbestos caulking/glazing as it is being removed with a HEPA vacuum.
c. Employees must use wet methods during removal of asbestos-containing window components.
d. Employees must ensure the window remains closed during the glazing and caulking removal. When feasible, all work must occur from outside the building. In situations where work must be conducted from the inside of the building, the contractor must install a physical barrier large enough to allow all work to be conducted inside the barrier.
e. Employees must collect all glazing, caulking, and any other debris in sealed, labeled, impermeable bags or another closed, labeled, impermeable container.
f. Any disposable personal protective equipment utilized must be disposed of as asbestos waste.
g. Employees must clean the work area around the window being removed. Cleaning should include the areas surrounding the removed window and the ground below. All visible debris and building materials must be considered asbestos-containing and treated as such.

Post-Abatement Inspection/Air Monitoring

a. Employees must clean all work areas using a HEPA vacuum. Contractor must visually inspect soils directly below all windows where work occurred and collect all material suspected of containing asbestos.
b. Employees must inspect all tools used in the removal process for cleanliness to ensure they are free of dust and debris.
c. An EH&S representative or industrial hygiene consultant shall conduct a visual inspection of the work area(s) to ensure they have been adequately cleaned.
d. EH&S reserves the right to require additional cleaning or sampling if deemed necessary.

Waste Disposal and Handling

a. Employees must dispose of waste generated during the project as asbestos-containing material and ensure proper transport and disposal.
b. An EH&S representative or industrial hygiene consultant shall conduct a visual inspection of the dumpster/waste storage area to ensure ACM waste is properly stored and prepared for transport.

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Removal of Tack Strips from Asbestos-Containing Flooring Systems

Standard Operating Procedure

University of Colorado Boulder Environmental Health & Safety (EH&S) has developed this Standard Operating Procedure (SOP) for employees who remove tack strips from an asbestos-containing flooring system. Workers shall wear appropriate personal protection equipment (PPE) until this procedure has a Negative Exposure Assessment (NEA) showing that workers will not be exposed to asbestos at above the permissible exposure limit (PEL) and excursion limit (EL). Contact EH&S if the removal of these materials cannot be removed following these specific procedures.

2. Preparation and Stabilization of Work Area

a. Establish a regulated area, restricting access to the work area to authorized personnel using caution tape, cones, or other barriers.
b. Determine the level of engineering controls required, regulated area, critical barriers, or secondary containment.
    iii. Use experience, training, and surrounding environment to determine level of engineering controls
    iv. Things to consider: Location inside building, occupants inside building, condition of material being disturbed, quantity of material being disturbed, time needed to complete the job, movement of air through the building, etc…
c. Pre-clean work area using a HEPA vacuum and/or wet rag to remove gross dust and debris. Dry sweeping is prohibited.

3. Work Methods

a. Mechanical methods such as saws of any type are prohibited. Dry sweeping is prohibited.
b. All areas where tack strips will be removed must be kept wet during work activities using a spray bottle or a garden sprayer. It may be necessary to wet areas more than once to prevent dust fibers from becoming airborne to the greatest extent feasible.
c. Tack strips shall be removed using non-mechanical methods (e.g. hand spudding, prying, etc.)
d. This job will require two employees to remove tack strips. One employee will pry up the strip while the other operates a HEPA vacuum at the point of dust generation (where the strip is being removed from the floor).

e. The work area must be cleaned immediately following ACM removal using a HEPA vacuum and left free of any visible dust and debris.
f. Any ACM flooring which remains after the removal process must be secured to the floor to ensure it is not inadvertently disturbed.
g. All removed tack strips must be immediately removed and placed in a 6 millimeter polyethylene bag for disposal as ACM waste.
h. Following removal, immediately HEPA vacuum any dust or debris generated in the work area.
i. All tools and equipment must be decontaminated using a HEPA vacuum and/or wet rag.
j. PPE must be disposed of as asbestos waste.
k. All asbestos waste must be brought immediately to the EH&S asbestos waste storage area.
l. Asbestos waste shall not be stored overnight inside the building or vehicle.

4. Waste Disposal and Handling

a. All asbestos waste must be properly bagged and labeled as outlined in the O&M program.
b. Waste must be brought to the EH&S asbestos waste storage area and catalogued as outlined in the O&M program.