California Environmental Protection Agency

Air Resources Board

Discussion of Potential Changes to ARB Test Method 435 and Corresponding Amendments to the Asbestos Airborne Toxic Control Measures

June 10, 2008 Workshop

Operations Planning & Assessment Section
Quality Management Branch
Monitoring and Laboratory Division

Emissions Evaluations Section
Emissions Assessment Branch
Stationary Source Division

Workshop Agenda

- Introduction
- Potential Revisions to Method 435 (M435)
- Corresponding Potential Revisions to Asbestos Airborne Toxic Control Measures (ATCMs)
- Revision Schedule/Next Workshop

Workshop Agenda

- Introduction
  - Workshop agenda
  - **Revision Schedule**
  - Summary of 1st workshop on 1/24/08
  - Additional topics considered for revision
- Potential Revisions to Method 435 (M435)
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M435 Revision Schedule

- January 24, 2008 Workshop (1st)
  - Rationale & identification of areas of M435 examined for revision
- **June 10, 2008 Workshop(2nd)**
  - **More focused proposed revisions to M435**
  - **Additional topics considered for revision**
- Fall 2008 Workshop (3rd)
- 2009 Board Hearing

Workshop Agenda

- Introduction
  - Workshop agenda
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Workshop One: M435 Interlaboratory Study Conclusions

- Laboratories use different sample processing equipment and protocols.
  - Result in varying particle size distribution of processed samples
- Finer particle size distribution is one factor resulting in lower % asbestos reported.
- Fiber identification criteria are not uniform among laboratories leading to differences in the % asbestos reported.

Topics Discussed in Workshop One

- Sample Processing
  - Crushing: equipment
  - Pulverization: equipment, particle sizes
- Sample Analysis
  - Use of reticles, mechanical stage
  - Magnification, point counting
  - Asbestos identification
- Laboratory Accreditation

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Workshop Two Activities

- Continue discussion from 1/24/08 Workshop with more focused, proposed revisions
- Introduce three new topics:
  - Field sampling
  - Addition of transmission electron microscope (TEM) analysis to M435
  - Modifications to ATCMs to reflect changes to M435

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What are the Asbestos ATCMs?

- Asbestos ATCM for Construction, Grading, Quarrying, and Surface Mining Operations (CCR Section 93105)
  - Requires the implementation of dust mitigation measures where asbestos is known or likely to exist
- Asbestos ATCM for Surfacing Applications (CCR Section 93106)
  - Restricts the asbestos content of material used in surfacing applications such as unpaved roads, parking lots, driveways, and walkways

Asbestos ATCM Applicability

- Any property that is entirely or partially located in a geographic ultramafic rock unit
- Any property that is not located in a geographic ultramafic rock unit, but has naturally-occurring asbestos, serpentine, or ultramafic rock
- Aggregate material that contains at least 10% of materials from ultramafic area or other areas determined to have at least 0.25% asbestos per M435

Asbestos ATCM Applicability

- Surfacing ATCM
  - If testing per M435, applicable at the Limit of Detection = 0.25%
- Construction ATCM
  - If testing, applicable upon detection of asbestos
- Intent of both ATCMs
  - Applicable where asbestos is likely to occur (e.g., mapped ultramafic area)
  - Applicable when testing has detected asbestos (e.g., M435)

Current Test Method 435 Protocol

Geologic Sample → Dry, crush to <3/8" nominal diameter, reduce to 1 pint aliquot → Pulverize majority to <75 µm diameter

↓

Analyze using Polarized Light Microscopy (PLM)

↓

400-point count rules
Determine % Asbestos

Questions?

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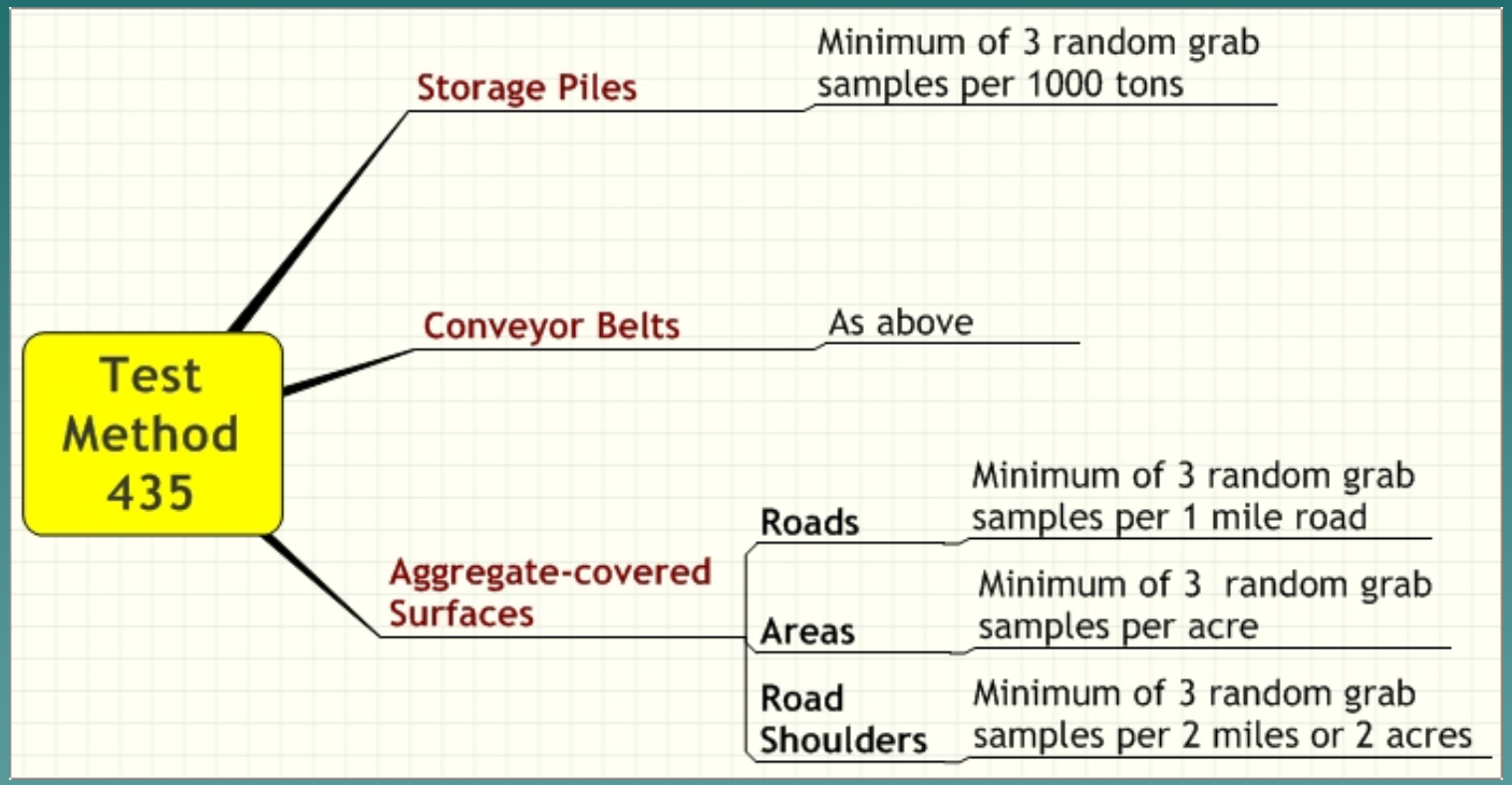
Sampling Objective

- The purpose of geologic sampling is to determine whether asbestos minerals occur at the site under consideration.

Current M435 Sampling Method



Note: Not specific to Construction ATCM

Current Field Sampling Requirements: Who is Qualified?

For areas within ultramafic rock units

- For the purpose of seeking an exemption: The APCO may provide an exemption . . . if a **registered geologist** has conducted a **geologic evaluation** of the property . . . and determined that no serpentine or ultramafic rock is likely to be found in the area to be disturbed.

  -Section 93105 (c)(1) – Construction ATCM

  -Section 93106 (f)(7) – Surfacing ATCM

Current Field Sampling Requirements: Who is Qualified?

For areas outside ultramafic rock units:

- "However, the ATCM does allow the districts to request a **geologic evaluation** on property outside of a geographic ultramafic rock unit."

  -Section VII.A.1. Guidance Document for Surfacing ATCM

Proposed Field Sampling Requirements: Who is Qualified?

For areas outside ultramafic rock units:

- The geologic evaluation of a site requires a registered geologist

Current Sampling Strategy

- Random sampling
  - 3 “grab samples” composited into one laboratory sample

Proposed Field Sampling Strategies

Requires an initial geologic assessment to decide which strategy is appropriate:

- **Targeted Sampling**
  - Appropriate when asbestos is more likely to be present at one location than at another due to its geologic occurrence
- Random Sampling
  - Appropriate when sampling personnel has concluded that asbestos is no more likely to occur in one area than another

Current Field Sampling: Sample Number & Volume

- 3 grab samples = 1 composited sample
  - per acre of area, or mile of road, or 1000 tons of aggregate
- 3 grab samples = 1 composited sample
  - per 2 acres or 2 miles of aggregate-covered road shoulder
- Minimum volume of composited sample = 1 pint

  Composited samples are analyzed following M435

Proposed Field Sampling Strategies: Sample Number and Volume

Current	Proposed
Minimum of three field samples per acre/1000 tons/mile	Same
Composited	Composited (random) **Separate (targeted)** **-to test specific features, e.g., veins or fracture fillings**
Minimum composited sample volume = 1 pint	**Minimum field sample volume = 0.5 liter (~1.1 pint)** Minimum composited sample volume = **1.5 L (~3.3 pints)**

Current Field Sampling: Depth of Samples

- Sample depth is currently not addressed by M435 sampling protocol

Proposed Field Sampling Strategies: Depth of Samples

- Surface to depth expected to be disturbed
- Separate samples when distinct changes in soil horizons (e.g., A, B, Cr) or lithology are observed

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Sample Processing: Key Elements of Proposed Protocol

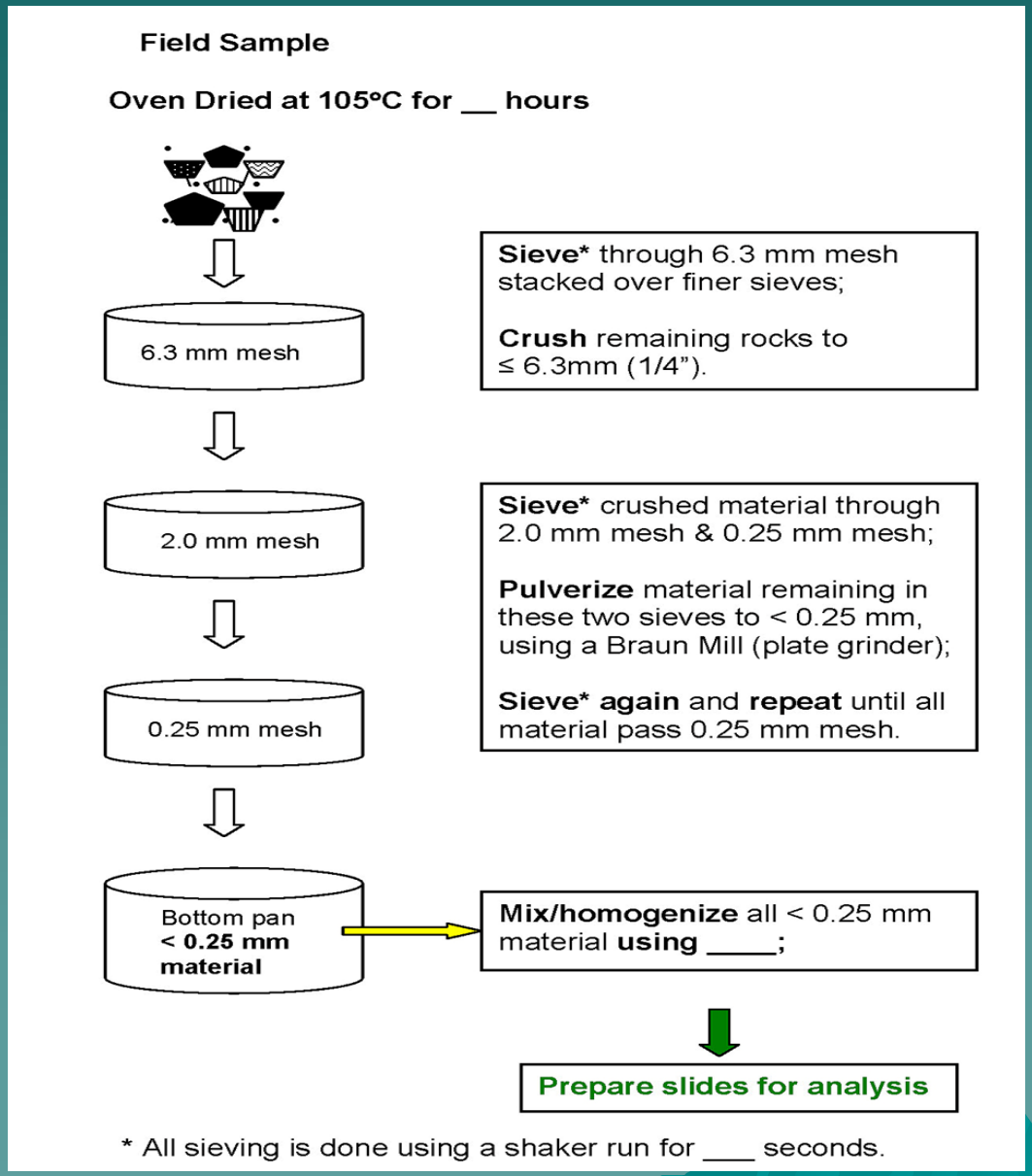
Currently written in M435:

- Use of Braun mill (plate grinder)
  - allows calibration of pulverization process
  - can process larger volume more quickly
- Entire field sample processed

Proposed processing for M435 samples:

- Pre-sieving procedure to remove fine fractions early in the process
  - avoids over-pulverization of material

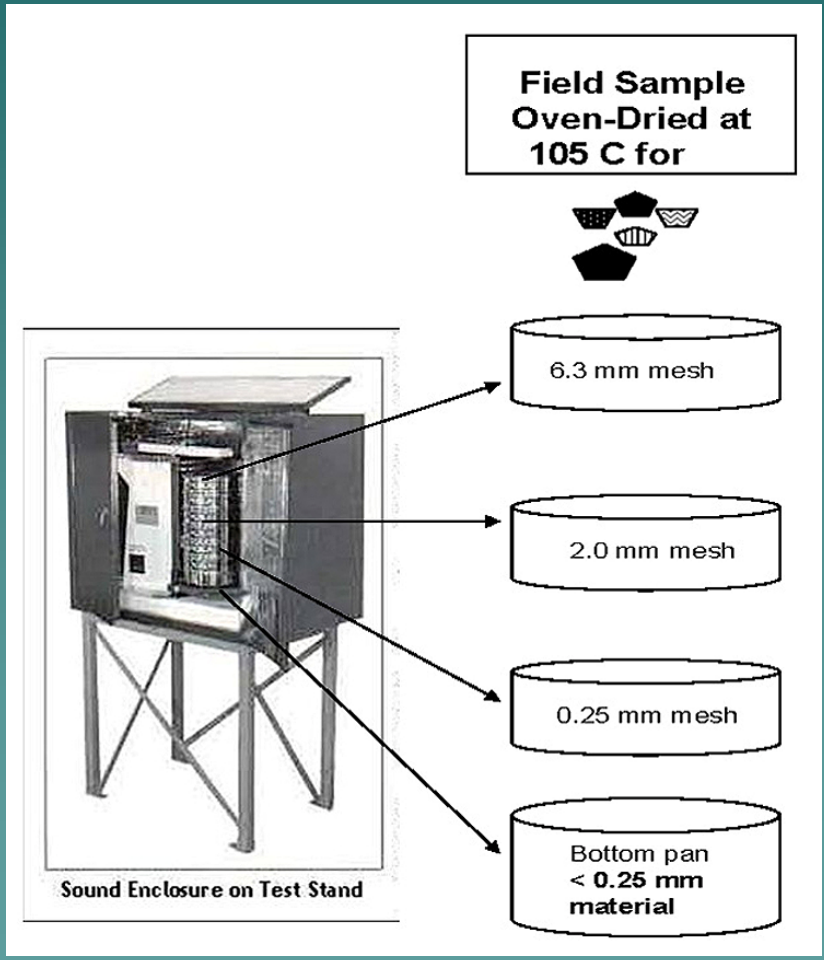
Summary: Proposed Sample Processing



Proposed Sample Processing: Standardize Drying Procedure

- Drying of samples at 105 C
- Drying time to be determined depending on sample volume

Proposed Sample Processing: Pre-sieving of Field Sample



- Pour field sample into 6.3 mm sieve stacked over finer sieves (i.e., 2 mm, 0.25 mm) and bottom pan.
- Run shaker for ___ minutes.
- All sieving must be done using a shaker.

Proposed Sample Processing: Pre-sieving of Field Sample

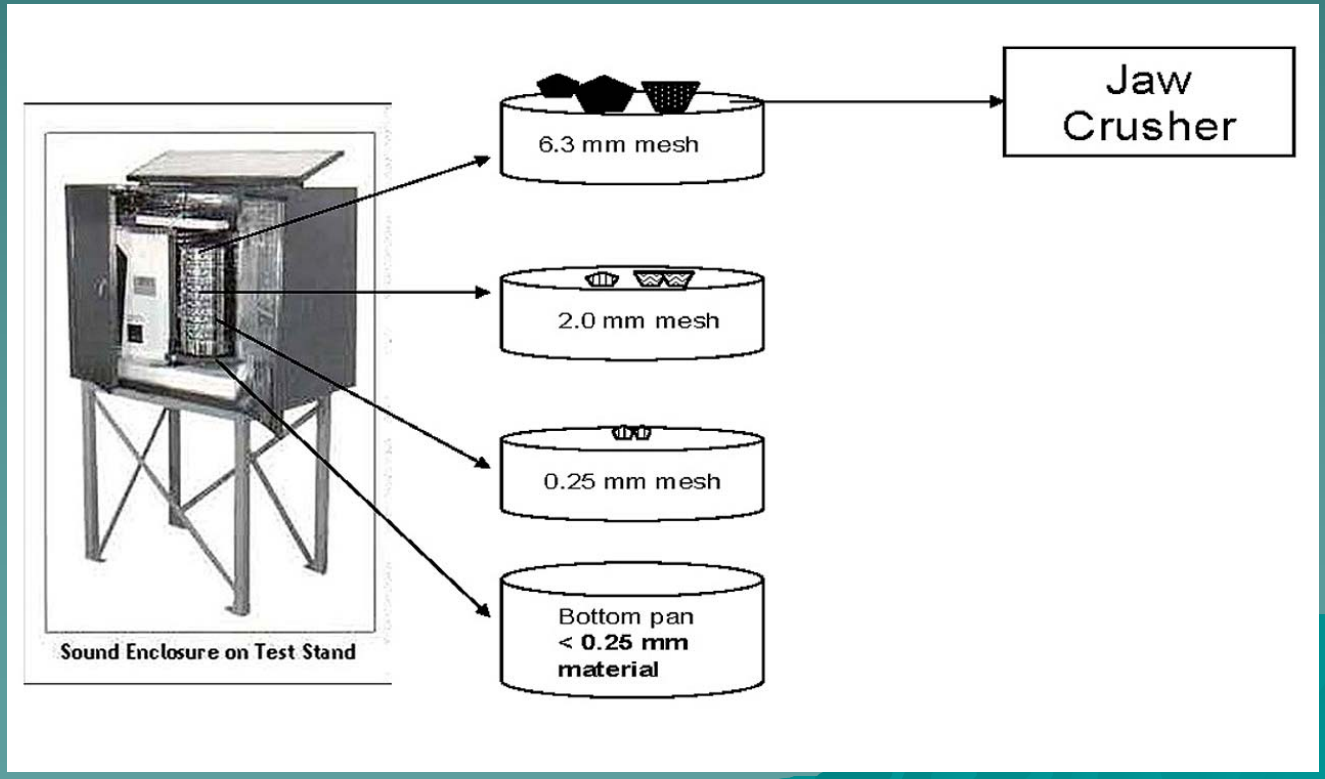
- Separates fine particles that do not need further pulverization

Stacked sieves & shaker

Sound Enclosure on Test Stand

Proposed Sample Processing: Crushing of Coarse Fraction

- Crush material remaining on 6.3 mm sieve to <6.3 mm (1/4 inch) using a Jaw rock crusher
- Sieve material through 2 mm & 0.25 mm mesh

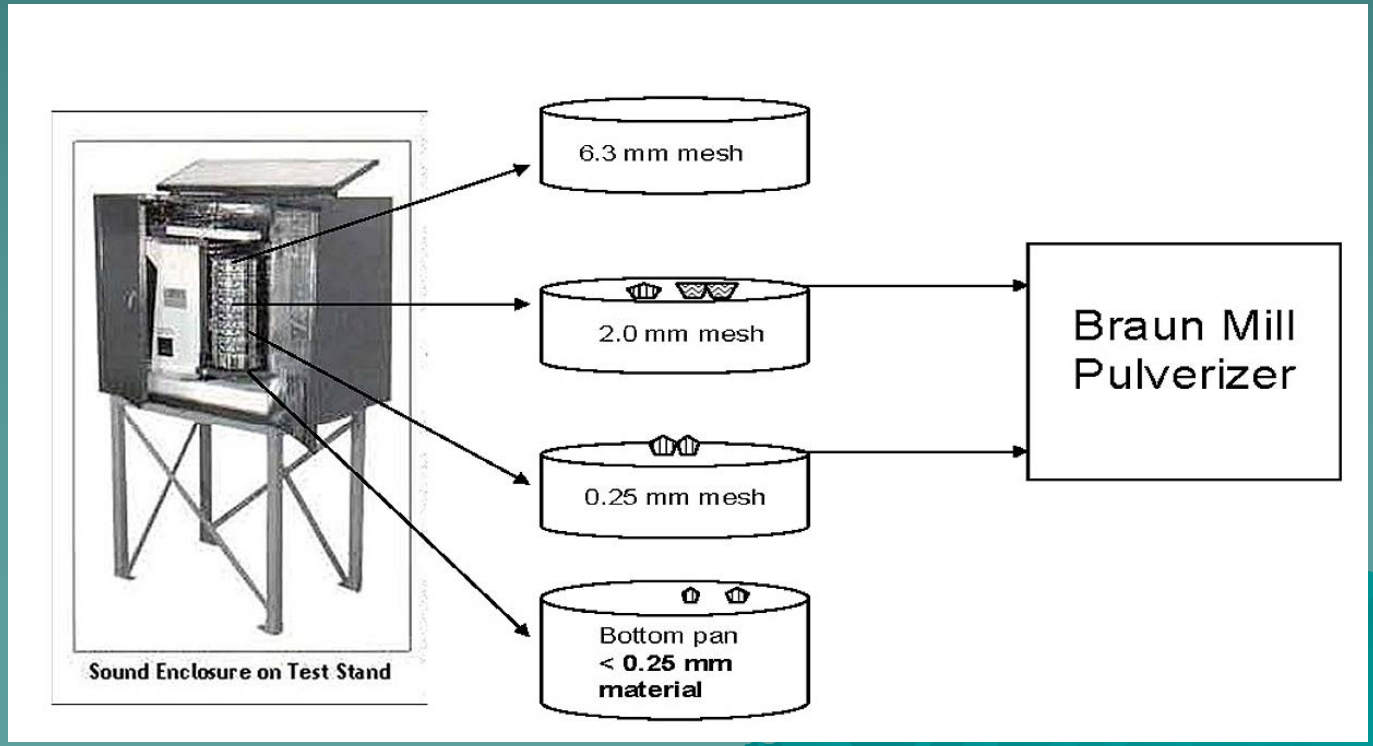


Proposed Sample Processing: Crushing of Coarse Fraction

- Crushing of large samples to 6.3 mm (1/4”) nominal size
  - Needed to reduce size of rock for use in Braun Mill pulverizer
  - Use Jaw rock crusher

Proposed Sample Processing: Pulverization of Field Sample

- Pulverize material remaining on 2 mm & 0.25 mm sieves to <0.25 mm using a Braun Mill
- Repeat pulverization and sieving until all material pass through 0.25 mm sieve



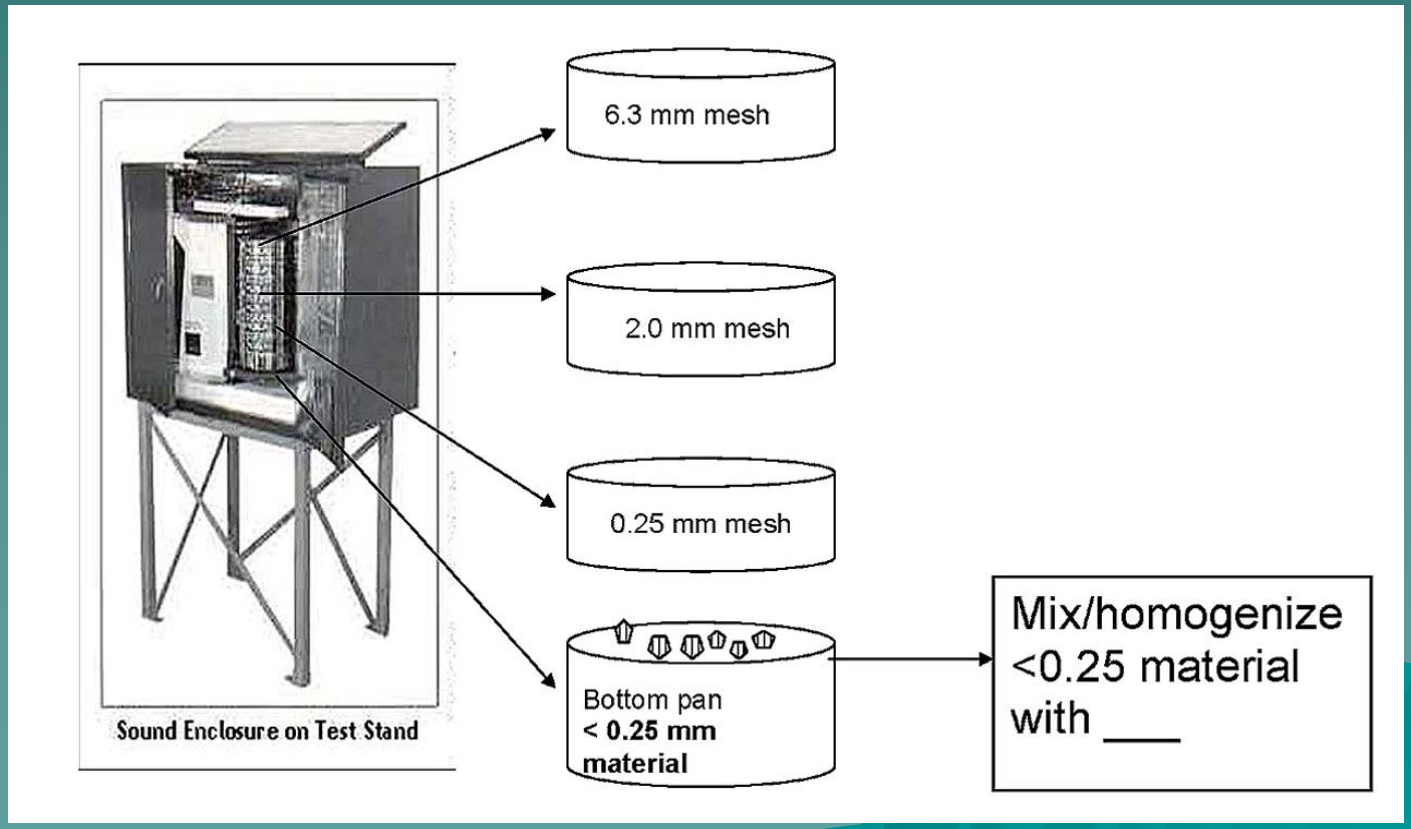
Proposed Sample Processing: Sample Pulverization

- Calibrate so that majority of powder is >75 um and 100% <250 um

Braun Mill (Plate Grinder)

Proposed Sample Processing: Homogenization of Pulverized Sample

- Mix/homogenize <0.25 mm material
- Use for slide preparations



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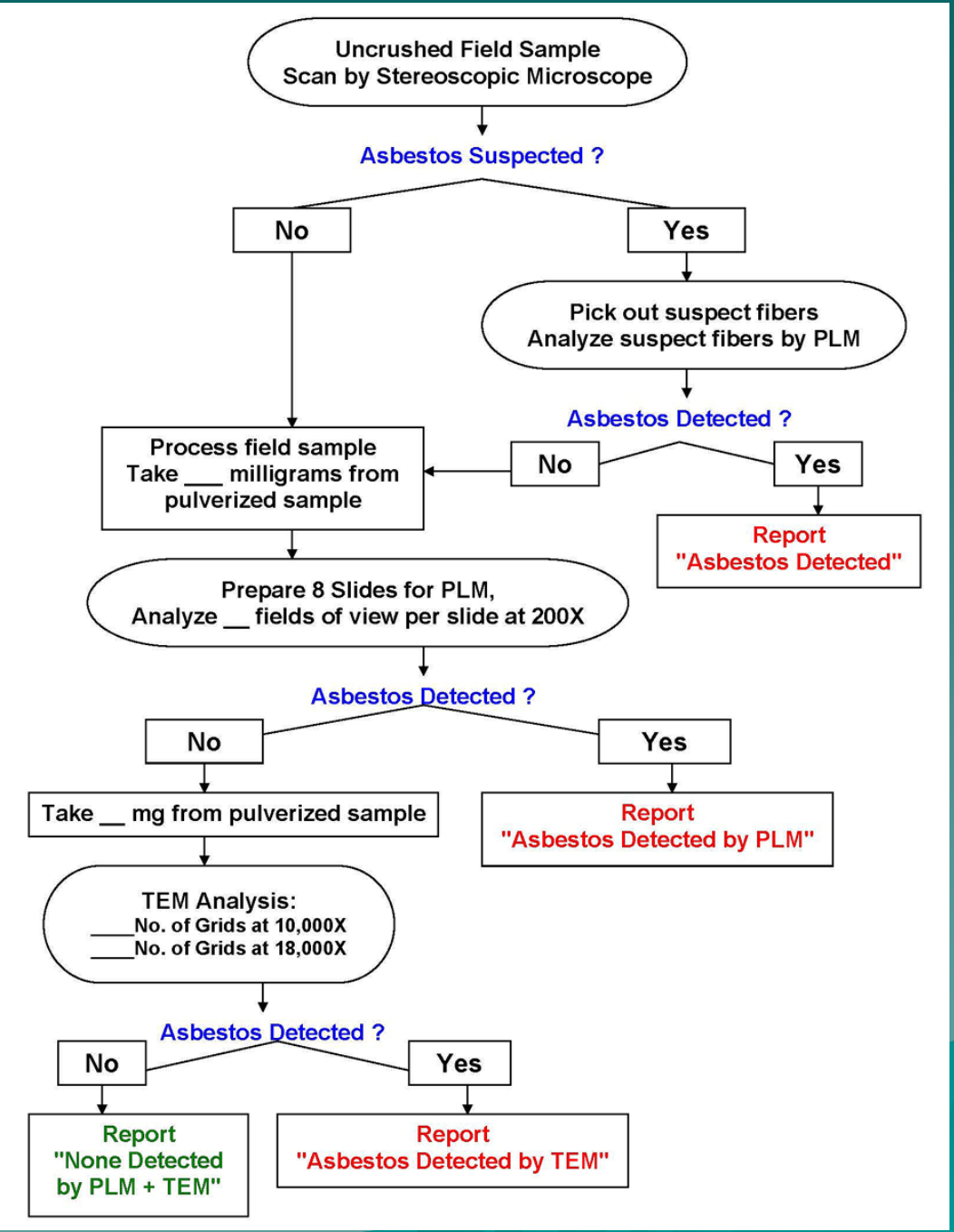
Proposed Analysis Objective

- Asbestos detection will be the object of sample analysis.

Proposed Stereoscopic Scan, PLM, and TEM Analyses

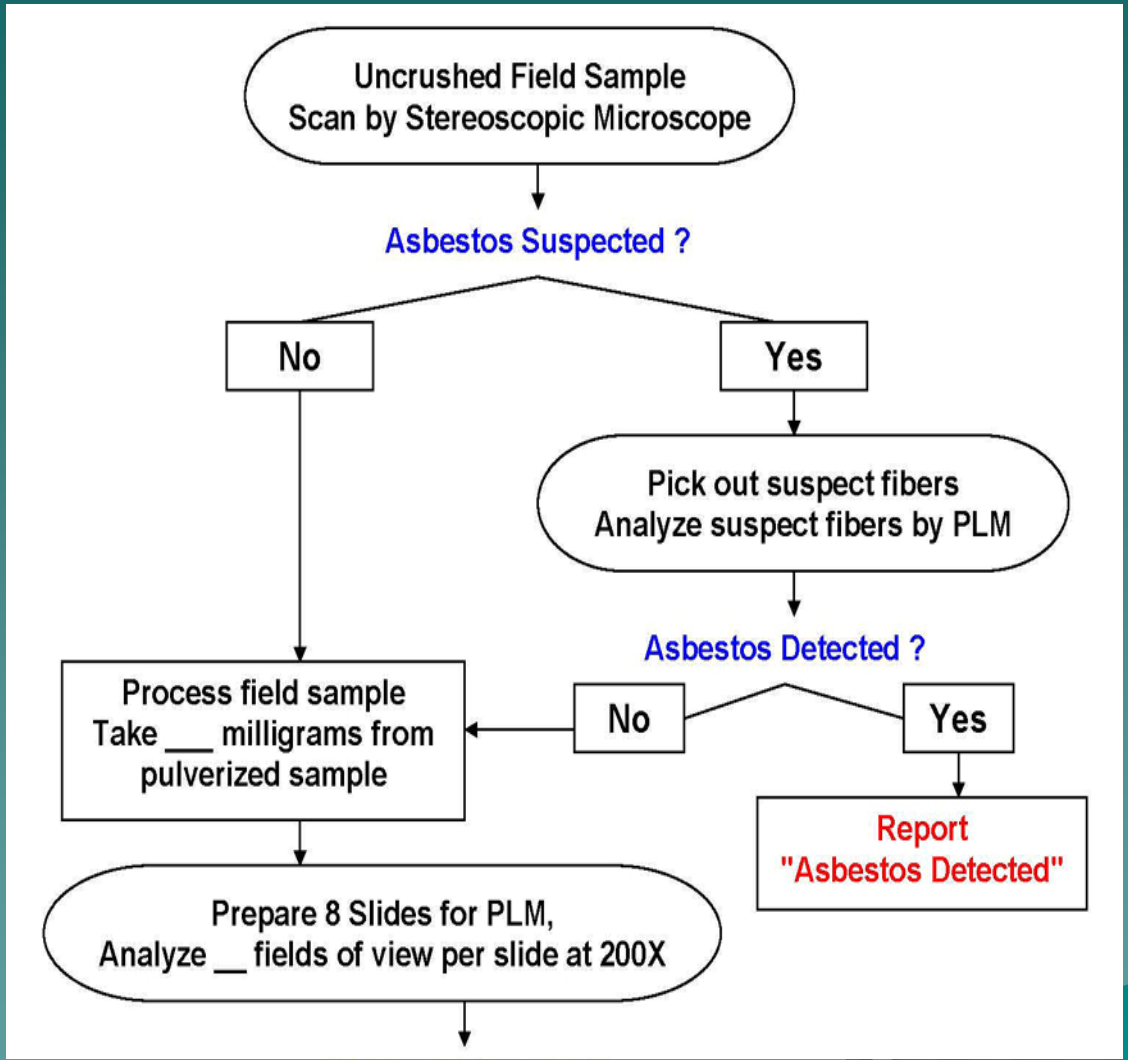
- Stereoscopic scan of unprocessed samples
  - Suspect fibers analyzed by PLM
- PLM analysis of processed samples
  - Evaluates a larger sample mass than TEM
- TEM analysis when asbestos is not detected by PLM
  - Higher magnification than PLM; smaller sample mass
  - Energy-dispersive spectra for elemental composition of particles
  - Diffraction patterns for mineralogy

Proposed Analysis Flowchart



Proposed Analysis Flowchart:

Low Mag. Sample Scan

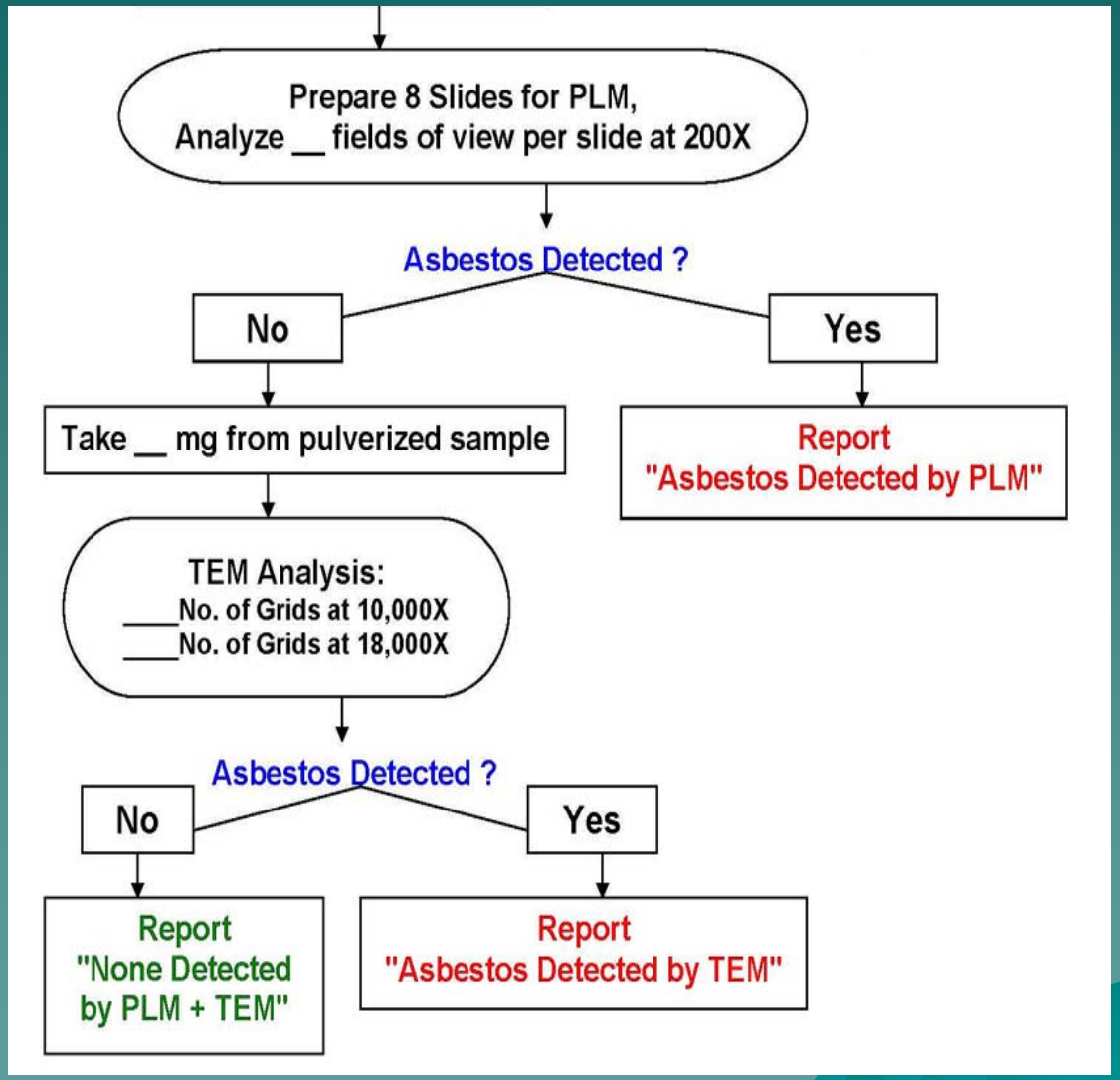


Proposed Analysis: Low Magnification Stereoscope

- Observe unprocessed sample with a stereo-scopic microscope to look for suspect fibers
- Prepare oil immersion slides of suspect fibers and analyze by PLM
- Report if asbestos detected

Proposed Analysis Flowchart:

PLM and TEM Analyses

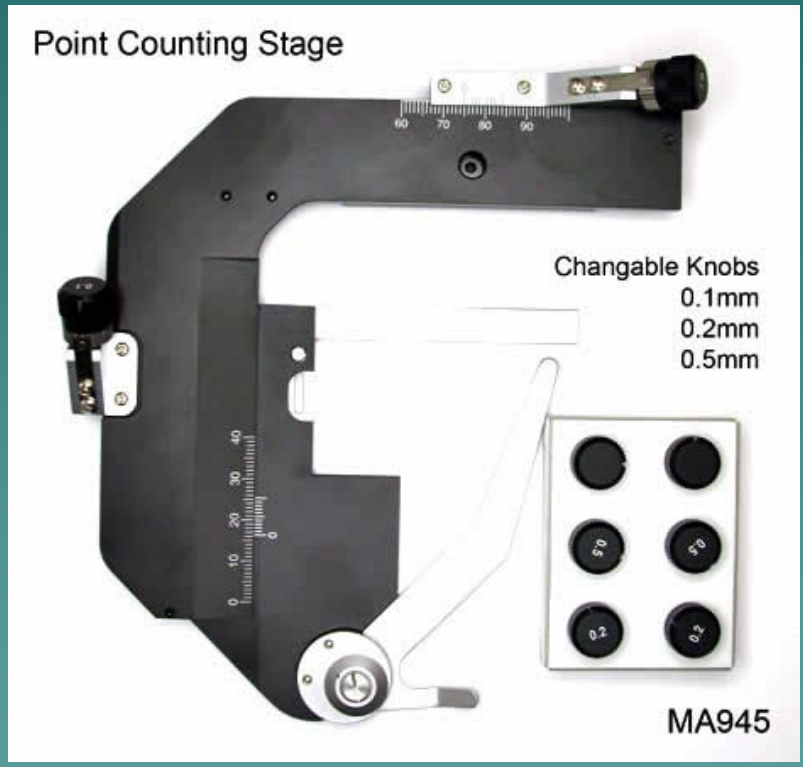


Proposed Analysis: Asbestos Detection by PLM

- Process entire field sample
- Weigh _?_ milligrams of powdered sample
- Prepare 8 slides for PLM analysis
- All of the weighed out material must be prepared on the slides
- Scan entire slides at 200X using _?_ number of non-overlapping fields of view evenly distributed throughout the slide
- Report if asbestos is detected

Proposed Analysis: Magnification & Mechanical Stage

- Magnification of 200X for asbestos identification
- Use of mechanical stage and point counting knobs for evenly spaced fields of view on entire slide



Proposed Analysis: Asbestos Detection by TEM

- Major issues to be resolved:
  - Sample preparation
  - Amount of material for TEM preparations
  - Analytical conditions: magnifications, number of grid openings analyzed
  - Use of energy-dispersive X-ray analysis
  - Use of selected area diffraction patterns and Kikuchi patterns
  - Calculation of asbestos concentrations

Suggest New References for Optical Analysis of Asbestos

- What references should laboratories use for identification of asbestos by PLM?
  - For proposed Table 3 - optical properties of asbestos fibers
  - For proposed Table 4 – central stop staining dispersion colors

Suggest New References for TEM Analysis

- What references should laboratories use for identification of asbestos by TEM?
  - For proposed Table 5 - asbestos characteristics observed with TEM
  - References for energy-dispersive X-ray spectra
  - References for diffraction patterns

Questions?

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  - Asbestos definition
  - Laboratory accreditation
  - Detection levels
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Asbestos Definition

- Clarify asbestos definition in the ATCMs
  - Define terms used in asbestos definition
  - Reference optical and chemical properties in M435
- Maintain consistency with the formal identification of asbestos as a Toxic Air Contaminant (TAC)

Current Asbestos Definition

- Asbestos - “asbestiform varieties of the following minerals: chrysotile (fibrous serpentine), crocidolite (fibrous riebeckite), amosite (fibrous cummingtonite—grunerite), fibrous tremolite, fibrous actinolite, and fibrous anthophyllite.”
  - Surfacing ATCM and Construction ATCM

Proposed Asbestos Definition

- Clarify asbestos definition by defining "asbestiform"
  - Consistent with health effects known at time of formal identification as TAC
  - Consistent with health effects known today

Proposed Asbestiform Definition

- Asbestiform – A term to describe a mineral determined to have:
  - Optical properties within specified range if using PLM
  - Chemical properties within specified range if using TEM
  - Fiber aspect ratio of 3:1 or greater
  - Width less than 3 µm (individual fiber)
  - No length criteria

Proposed Asbestiform Definition

- Asbestiform (asbestos) is any of "the six" minerals having various morphological and physical features including, but not limited to:
  - Acicular or needle-like crystal habit
  - Cleavage planes bounding fragments
  - Irregular shapes
    - Square terminations
    - Non-parallel or jagged sides

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Proposed ATCM Requirement: M435 Accreditation

- Add a provision that requires “M435 laboratory accreditation” when testing is done per M435

Proposed M435 Laboratory Accreditation

- NVLAP - National Voluntary Laboratory Accreditation Program
- NELAP/ELAP - National Environmental Laboratory Accreditation Program / California ELAP within the California Department of Public Health

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Restricted Material

- Current - set at 0.25% or greater asbestos content
- Proposed - will reflect the detection of asbestos as determined by M435

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M435 Revision Schedule

- January 24, 2008, Workshop (1st)
- June 10, 2008 Workshop (2nd)
  - Comments on proposed revisions to M435 and ATCMs
- **Fall 2008 Workshop (3rd)**
- 2009 Board Hearing

Workshop Three

- Time frame: Fall 2008
- Time of day: ?
- Possible venue: ?

California Environmental Protection Agency

Air Resources Board

June 10, 2008 Workshop

Thank you for your participation.
For questions and comments, please contact:

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