

Case Study of Measuring Asbestos at 1% Level in Plaster (task exposure assessment)

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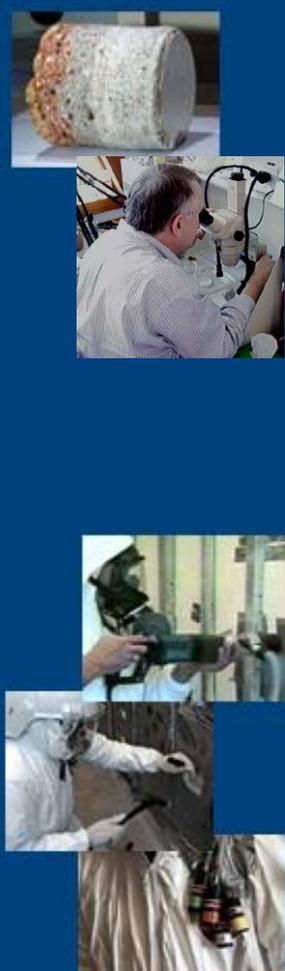
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In Plaster*

*Roger Morse
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Introduction

- Laboratories analyzing bulk samples by PLM routinely report samples containing $< 1\%$ as either “trace” or “none detected”.
- These results are widely interpreted as meaning “no asbestos present”, and few industrial hygienists have performed employee exposure assessments or implemented exposure controls for work with plasters or other building materials containing these low levels of asbestos.



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Our study looked at....

- The potential of low concentration asbestos-containing plasters to liberate fibers during routine maintenance operations.
- The effectiveness of several practical control methodologies for minimizing the release of asbestos fibers from these plasters.



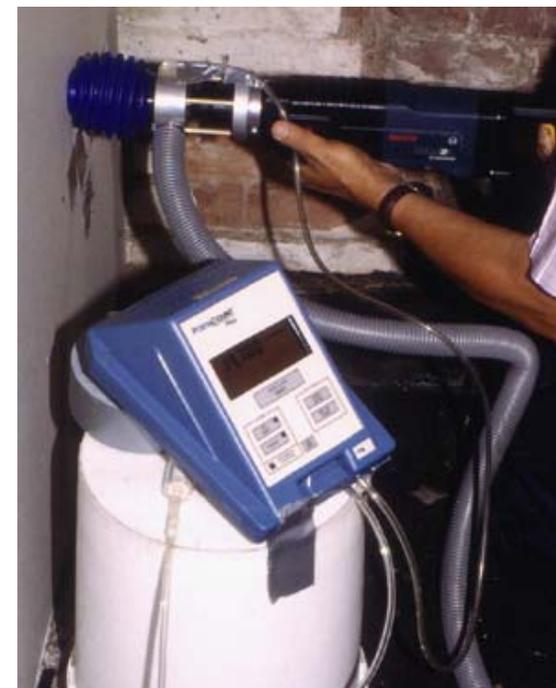
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Task/Control Screening

- Identified 4 common operations and maintenance tasks that intrude upon plaster walls
 - fastening materials with screws,
 - drilling holes for anchor placement,
 - coring holes in walls, and
 - chiseling off sections of plaster for small electrical installations.
- We screened a variety of locally exhausted tools using visual observation (video tape) and real-time measurements of dust generated from use on 1/2 inch thickness gypsum board.



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Plaster Test Location

- Based upon preliminary screening, the most successful tool/control combinations were tested on a plaster wall containing ~0.5% asbestos.
- Walls consisted of two-layer plaster system (base and finish coats only) applied directly over terra cotta blocking.
 - base coat approximately 3/4 to 1 inch thick and contained 0.5% chrysotile asbestos (range 0.4-0.6%),
 - finish coat (1/16 to 1/8 inch thick) contained < 0.1% asbestos.
- Asbestos concentration determinations made by Chatfield method.



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Task/Exposure Evaluations

- Duration for each activity assessment (typically 1 - 2 hours) determined by target level of sensitivity, anticipated nuisance dust levels, and sampling pump flow rates.
- After each test run, walls and flooring of enclosure HEPA vacuumed, and room air purged for > 10 min (minimum ten room air volume changes).



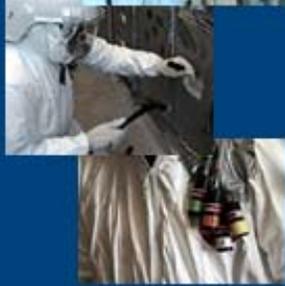
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Exposure Monitoring

- Personal (breathing zone) asbestos fiber air samples collected and analyzed by NIOSH Method 7400. TEM was used to verify presence of asbestos on samples.
- Total air volumes collected adjusted according to dust (and hence overloading) generated by task, and ranged from ~ 60 L for uncontrolled dusty tasks to ~ 1400 L for well-controlled low dust tasks.



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Exposure Monitoring

- **Difficulty sampling this environment**
 - Target fiber densities 100 – 1300 f/mm
 - Do not exceed 0.5 mg total dust
 - Some of our fiber densities were in the 12 – 20 f/mm range...
- **Some laboratories initially screened for use in this analysis did not report filter overloading with dust and failed to detect any fibers.**



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Setting Screws

Task - Continuously fastening metal studs to plaster wall with sheet rock screws.



No control

Mean	Std Deviation	Range
0.0157 (n=4)	0.013	0.010 – 0.018

Control – Duct tape used as barrier over plaster

Mean	Std Deviation	Range
0.006 (n=3)	0.0023	0.0032 – 0.0073

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Hole Drilling

Task - Continuously drilling holes through plaster and substrate. Plaster debris dry swept (no control).

No control

Mean	Std Deviation	Range
0.22 (n=5)	0.05	0.15 – 0.27

Control – Local exhaust through rubber bellows surrounding drill bit

Mean	Std Deviation	Range
0.008 (n=7)	0.004	0.003 – 0.015



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Manual Chiseling

Task – Removing 8” by 8” section of plaster from substrate with hammer and chisel over 30 min. Plaster debris dry swept.



No control

Mean	Std Deviation	Range
0.30 (n=8)	0.21	0.11 – 0.68

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Coring

Task – Continuously coring holes through plaster and substrate with 2” diameter hollow bit.

Control - Hollow bit is locally exhausted

Mean	Std Deviation	Range
0.068 (n=4)	0.031	0.04 – 0.11



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Results

- Maintenance/minor renovation activities on plaster walls containing less than 1% asbestos can generate personal exposures up to 0.7 fpcc for duration of work activity.
- Tools with local exhaust controls reduced exposures by at least 3-4 fold over similar uncontrolled operations, and by over an order of magnitude for drilling.



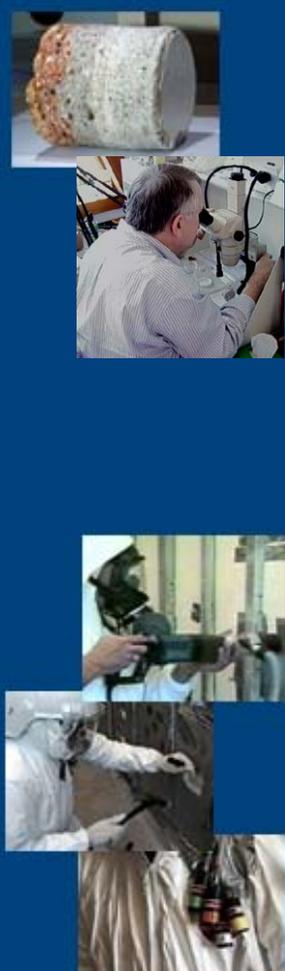
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Conclusions

- Routine operations and maintenance tasks with plaster surfaces have the potential to exceed the current OSHA PEL for asbestos even when the plaster contains $< 1\%$ asbestos. (For most of the operations evaluated here, a duration of 4 or more hours (continuously conducting the task) would be required to exceed the OSHA Standard.)
- Tools with local exhaust ventilation at the point of operation are highly effective at reducing fiber exposures.



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