Environmental Health Conditions in California's Portable Classrooms

Air Resources Board
July 24, 2003

California Environmental Protection Agency
Air Resources Board

Overview

- Background
- Purpose
- Study Design
- Results
- Recommendations
- Next Steps

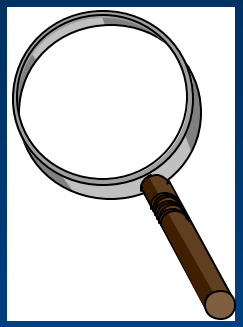
Background

- **Mandated by:**
  - **Governor's Budget, FY 2000-2001**
  - **Assembly Bill 2872 (Shelley, 2000), Health & Safety Code § 39619.6**
- **Initial concerns: ventilation, formaldehyde, mold**
- **Conducted jointly by ARB and DHS**
- **Field work - Research Triangle Institute**

Public Outreach

- Website
- List serve
- Public input
  - 4 workshops both pre- and post-study
  - 30-day public review of draft report
- Meetings with school districts, manufacturers, and state agencies

Purpose of Study



- Identify the extent of any potentially unhealthful environmental conditions in portable classrooms in California's public schools
- Recommend preventive actions and remedies, in consultation with stakeholders

Two - Phase Study Design

- **Phase I, Mail Survey (Spring - Summer)**
  - 1,181 classrooms in 426 schools
  - Limited sampling of formaldehyde

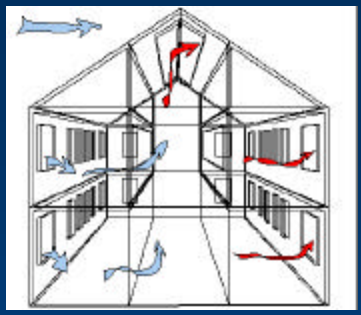
- **Phase II, Field Study (Fall - Winter)**
  - 201 classrooms in 67 schools
  - Many indoor and outdoor pollutants measured
  - Indoor conditions and ventilation measured and inspected
- **2 portables & 1 traditional per school**
- **Representative samples**

Study Results

(For both portable and traditional classrooms, unless specified otherwise)

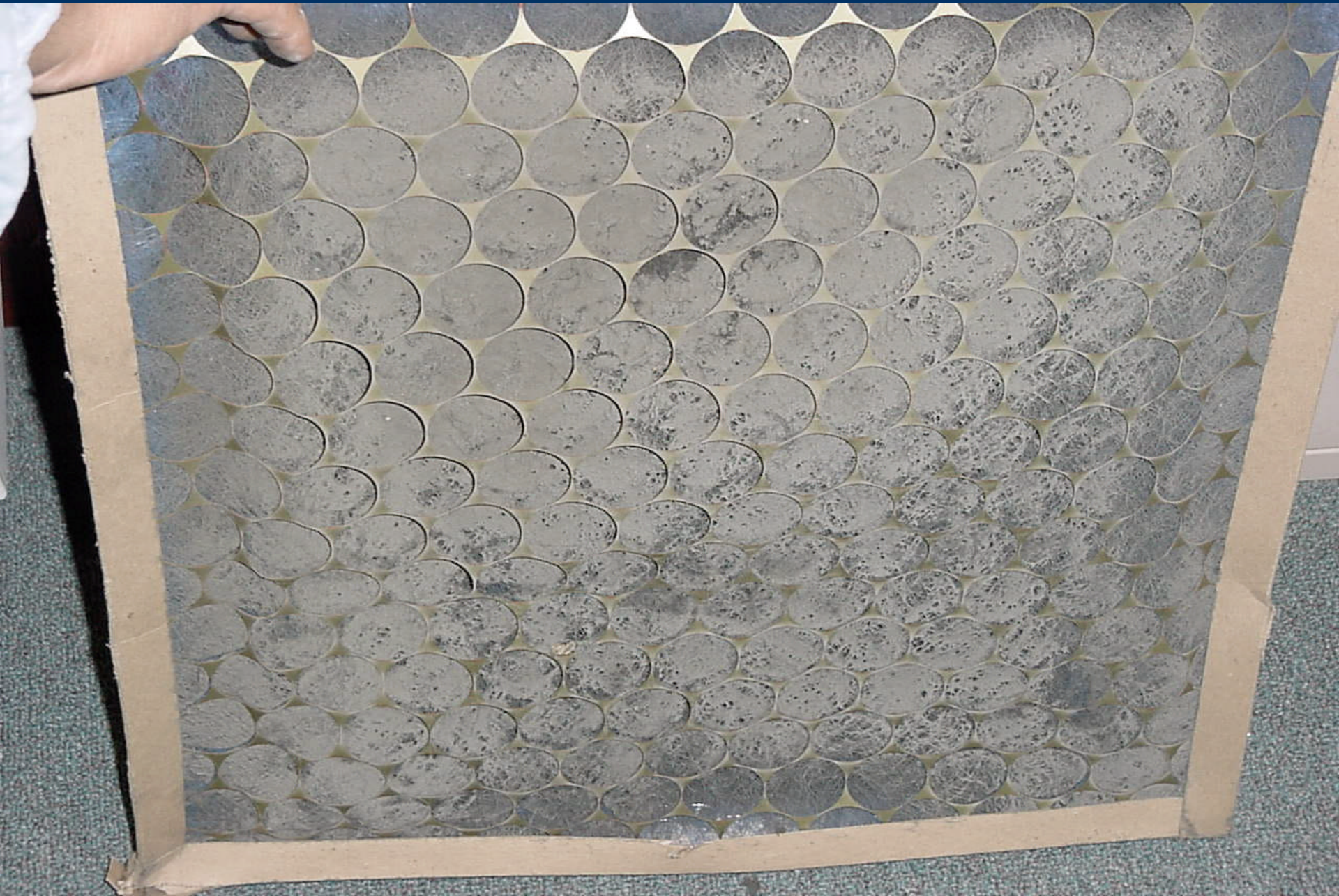
- Ventilation
- Temperature and Humidity
- Noise
- Air Pollutants
- Floor Dust Contaminants
- Moisture and Mold
- Lighting

Ventilation



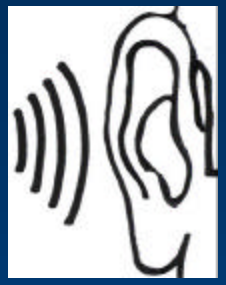
- Inadequate over 40% of the time
- Seriously deficient about 10% of the time
- Teachers often turned off ventilation system due to excessive noise (Port = 60%, Trad = 23%)
- Inspectors frequently found ventilation system problems, especially in portables

Example: Dirty Air Filter



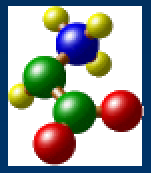
Temperature and Humidity

- Temperature and humidity often outside acceptable standards ranges
- Some classrooms clearly outside acceptable standards ranges



Noise

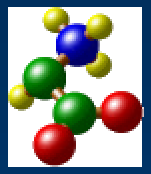
- All rooms exceeded the background acoustics guideline of 35 decibels (ANSI, WHO)
- Many rooms exceeded community nuisance standard of 55 decibels (Port = 50%, Trad = 38%)
- “Best Practices” goal is 45 decibels



Air Pollutants: Aldehydes

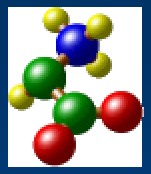
- Formaldehyde levels
  - Higher levels in warmer months, rooms w/ higher humidity, and in newer portables
  - Portables higher than traditionals
- Formaldehyde health concerns
  - 4% exceeded 27 ppb for acute irritant effects
  - All classrooms exceeded ten-in-a-million risk for excess cancer
- Other aldehydes also higher indoors

Aldehyde sources include new cabinets, bookcases, pressed wood materials



Air Pollutants: Volatile Organic Compounds (VOCs)

- Indoor levels were similar to or less than those in other indoor environments
- Guidelines for acute (immediate) health risks were not exceeded
- Excess cancer risks:
  - Benzene exceeds ten-in-a-million risk
  - Chloroform exceeds one-in a million risk
  - However, outdoor air was the major source



Air Pollutants: Particles

- Highest particle counts were found in portables, especially PM2.5 size
- Likely sources included:
  - motor vehicles (over half the rooms within 50 ft. of vehicle traffic or parking area)
  - carpets and rugs (more frequent in portables)

Major source of small particles: vehicle traffic near air intakes

Floor Dust: Metals

- Dust contaminants are mainly a concern for younger children (increased floor contact and exposure)
- Lead levels were elevated
  - Most likely from tracked-in soil or lead paint chips
- Arsenic levels were elevated
  - Natural soil levels are a major source
  - Other possible sources include fertilizer contaminants and wood preservatives

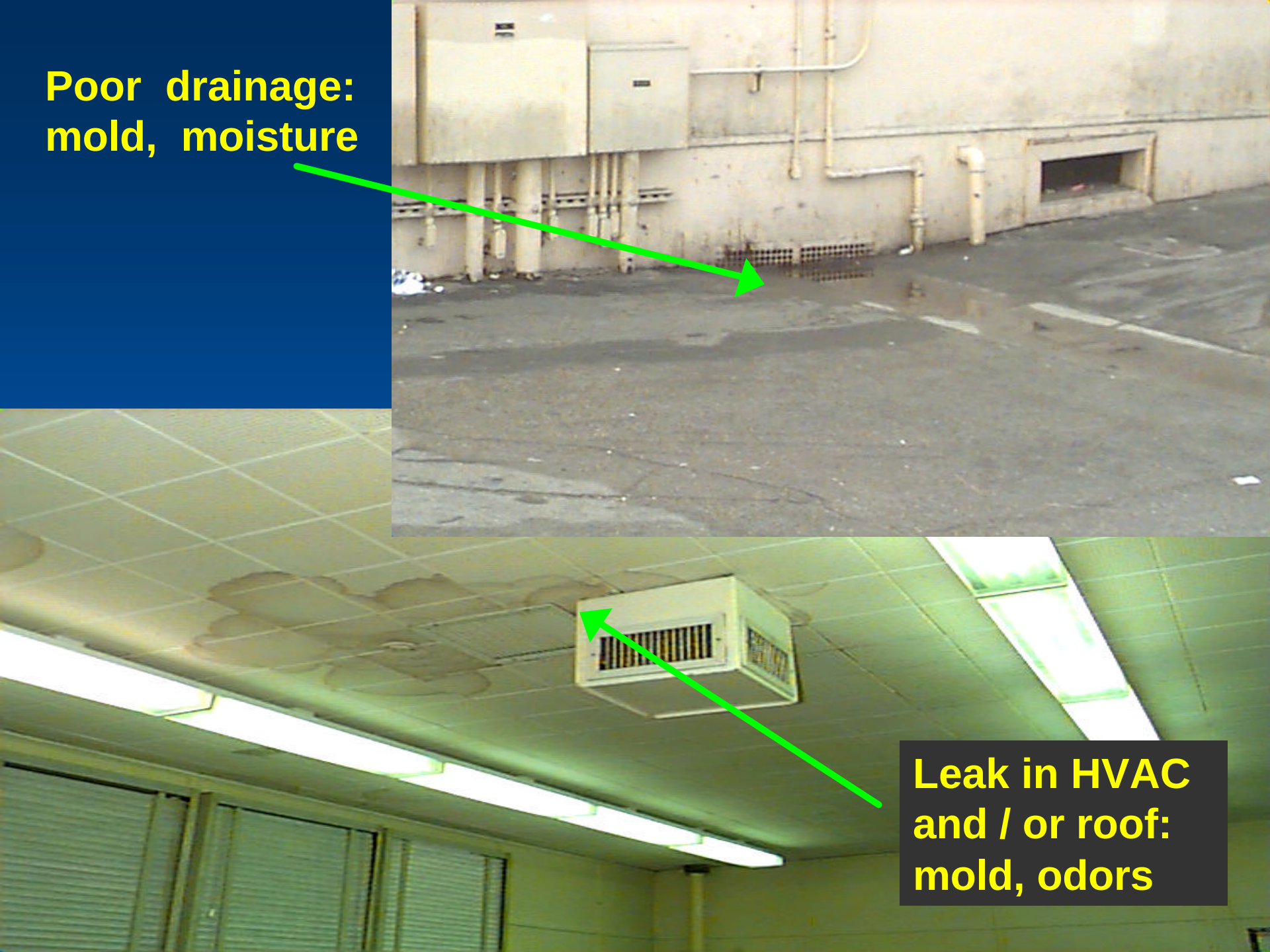
Peeling paint: potential lead exposure

Floor Dust

- Pesticides found in all samples
  - 6 pesticides found in over 80% of the samples
  - 4 more pesticides in over 50% of samples
- Polycyclic Aromatic Hydrocarbons (PAHs)
  - Most were found in over 80% of rooms
  - Levels low, but highest in portables
- Allergens
  - Cat and dog allergens common; cockroach & dust mite allergens infrequent
  - All levels were low

Moisture and Mold

- Mail survey indicated widespread problems:
  - 63% of teachers reported musty odors
  - 43% reported current or previous floods / leaks
  - 9% reported visible mold
- Field observations
  - 30% of all rooms had water stains on ceilings
  - 17% of all rooms had excess moisture measured in walls, floor, or ceiling
  - 3% of portables had visible mold on ceiling (none in traditionals)


Poor drainage: mold, moisture
Leak in HVAC and / or roof: mold, odors

Mold in wallboard

Lighting

- About 1/3 of rooms do not meet professional guideline of 50 foot-candles for low-contrast materials
- A small percentage of rooms do not meet guideline of 30 foot-candles for high-contrast materials

Conclusions

- The majority of schools require improvement in one or more areas:
  - Fresh-air ventilation and noise
  - Sources of contaminants
  - Moisture intrusion
  - Maintenance, repair, or cleaning practices
- Solutions available but require collaborative efforts
- Need to shift from remediation to prevention

Recommendations

- Group 1
  - High Priority Action
  - High Benefit
  - Relatively Low Cost
- Group 2
  - Priority Action
  - Longer Term Effort
  - or Higher Costs

Recommendations

Group 1: High Benefit, Relatively Low Cost

1. Meet existing state regulations
   - Cal / OSHA workplace regulations
2. Conduct health & safety self-assessments
   - LAUSD checklist
3. Require Indoor Environmental Quality Management Plans
   - EPA's Tools for Schools Program

Recommendations
Group 1: High Benefit, Relatively Low Cost (contd.)

4. Follow "Best Practices" for new schools
   - Collaborative for High Performance Schools (CHPS); Tools for Schools
5. Expand State design review
   - Division of the State Architect
6. Assure proper siting of classrooms
7. Limit HVAC noise to 45 decibels

Recommendations

Group 2: Longer term, or Higher Cost

8. Assure stable, long-term funding for construction & preventive maintenance
9. Develop focused training
10. Implement Integrated Pest Management
11. Retire older portables
12. Require full new building commissioning

Recommendations

Group 2: Longer term, or Higher Cost (contd.)

13. Improve school facility database
14. Convene task force on noise
15. Develop chemical exposure guidelines or standards for classrooms
16. Redesign portables from ground up

Next Steps for ARB

- Send report to Governor & Legislature
- Work with stakeholders
- Participate in State Relocatables Working Group
- Develop formaldehyde ATCM for composite wood products

THANK YOU