Conclusions

The researchers conclude that dryer lint can provide a nonintrusive, easy, and economical way to screen for possible lead exposure in the home. They list several advantages and disadvantages of the proposed method. The chief advantage is that the method is simple compared with present methods. Also, the researchers don't recommend using the method to replace, but rather to complement, current approaches.

Individuals can collect the lint samples in their own homes, and they can then be analyzed simply and inexpensively by a laboratory. The collection requires no special equipment and the samples require no special handling. If a potential problem arises, more sophisticated methods may be called for. Disadvantages come from the fact that dryer lint is heterogeneous and, most important, will only indicate individual exposure if families sort laundry by individual, something they don't normally do. Alos, different articles of clothing might contain more lead than others, based on the nature of exposure.

For more information, contact Peter Mahaffy, Department of Chemistry, The King's University College, 9125 50th Street, Edmonton, AB, T6B 2H3. Tel: (403) 465-8343; Fax: (403) 465-3534.

Table 2 — Lead Levels in Dryer Lint (μg/g)

Sample Population	Number	Arithmetic Mean	Geometric Mean	95% Confidence Interval	Range
Control	53	23.8	20.2	17-24	6-110
Communal Laundry	22	21.4	18.5	15-24	6-55
Radiator Shop					
Secondary Workers	12	63.1	41.5	23-76	9-218
Primary Workers	18	349.0	379.8	272-531	11-1, 593

Source: Mahaffy et al.

Table 3 — Blood Lead Levels Among Radiators Workers and Families

Subject	Description	Exposure	Number of Samples	Lead Range (μg/g)	Blood Lead (μg/dL)
1	Adult Male	Radiator Mechanic	2	710-1,569	52
2	Adult Male	Radiator Mechanic	4	120-371	35
3	Adult Female	Wife of Subject 2	4	120-371	4
4	Four-year-old	Child of Subject 2	4	120-371	18
5	Seven-year-old	Child of Subject 2	4	120-371	12
6	Adult Male	Radiator Mechanic	2	216-329	18
7	Adult Female	Wife of Subject 6	2	216-329	7

Source: Mahaffy et al.

Tools and Techniques

Using Building Cavities as Ducts Presents Numerous Pitfalls

Many buildings use structural cavities as part of the air distribution system (ADS). However, as many IEQ professionals have pointed out — and as some case studies have shown — this can have negative impacts on the indoor environment, as well as on energy costs. At the ASHRAE annual meeting in Toronto, James B. Cummings and Charles R. Withers Jr. of the Florida Solar Energy Center (Cocoa, Florida) discussed the prevalence of such use and outlined the potential problems associated with it. According to their paper, "Building Cavities Used as Ducts: Air Leakage Characteristics and Impacts in Light Commercial Buildings," more than 50% of air leakage from the duct system in Florida residences takes place in building cavities. However, recent additions to the Florida Energy Code have reduced this use of

building cavities in new construction. They also relate that a recent study of 70 small commercial buildings found that 33 of them (47%) use building cavities as part of the ADS. Table 4 lists the buildings and the cavities they use as ducts. The most common types of cavities that support this use are:

- Enclosed air handler support platforms
- Mechanical closets
- Mechanical rooms
- Ceiling spaces
- Wall cavities
- Chases
- "Other" building areas

Impact of Leaks

The problem, according to the authors, is that these areas are usually very leaky and can have impacts, ranging from negligible to serious, on building air infiltration rate, indoor relative

Table 4 — Building Cavities Used as Ducts or Plenums (Number of occurrences in parentheses)

Building Description	Wall Cavity	Ceiling Spaces	Chases	AH Platform	Mechanical Room	Mechanical Closet	Other
Research office		X			X		
Auditorium	X (2)						
Church sanctuary	X						
Video productions		X		X (6)	X		
Training office					X		
HVAC supply house						X	
Sports center		X			X		
Manufactured classroom	X (2)						
Manufactured office	X (7)						
School		X					
Pizza restaurant						X	
Health clinic						X (3)	
Sports complex				X (2)			
Sail manufacturer				X			
HVAC contractor				X			
Realty office				X			
Interior decorator						X	
Realty office				X		X	
Safety classroom							X
Government office							X
Gas company office				X			
Tax service						X	
Metal building contractor						X	
Realty office						X (2)	
Plastic fabrication				X			
Amusement park				X (2)			
Hardware store				X (2)			
Manufactured office	X						
Chinese restaurant		X					
Police station		X			X		
High school			X (4)		X (2)		
Hotel		X					
Hotel	X						

Source: Cummings and Withers

humidity, building pressure with respect to outdoors, heating and cooling system performance, occupant comfort, energy use, and IAQ. The relative importance of the leaks depends on two factors: the amount of air that is leaking and where that air is coming from.

In their report, the authors focus on return-side leaks, because the building cavities are almost always used as return air ducts. They explain that the amount of leakage depends on two main variables: the size of the holes in the distribution system and the pressure differentials that exist across the holes. Return systems are almost always very leaky and, consequently, if large pressure differentials exist, then the air leaks will be very large. The impact that these leaks have on indoor conditions also depends on two variables: the amount of air entering the system and where that air comes from. The second is crucial because it determines the thermal condition of the air. For example, if the air comes from within the conditioned space, it will have a negligible impact on the system. However, if the air comes from outside the conditioned space — such as a vented attic — it can have a very large impact on the indoor conditions.

Recommendations

Recognizing the pitfalls involved in using buildings cavities as return ducts, the authors make three recommendations for designers to consider:

- Use only cavities that are located inside the conditioned space. This is to prevent the ducts from drawing air from outside the air and thermal boundaries. There also shouldn't be substantial leaks from the ducts to rooms or other cavities that may, in turn, draw air from unconditioned spaces.
- Ensure that plenum depressurization can be maintained at 1 pascal or less with regard to unconditioned adjacent spaces. This will result in few negative consequences. Ceiling spaces would meet this criterion. Other spaces could be designed to comply.
- Ensure that construction and maintenance practices maintain air tightness in the ducts, although this is more difficult to achieve. Construction practices for building cavities aren't comparable to standards for ducts. However, even if these cavities are airtight when constructed, subsequent workers often cut holes for such things as plumbing and electrical access. Unless these holes are later sealed, they will compromise the air tightness of the system.

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Case Study

*(In each issue, **IEQS** presents a case study on an indoor air investigation in a particular building. The information in the cases comes from various sources, including published material, reports in the public record, and, in some cases, reports supplied by the consultants involved in the case. **IEQS** presents a variety of approaches to investigation and mitigation implemented by consultants with a broad range of experience, philosophies, and expertise. Inclusion of a particular case study in the newsletter does not imply **IEQS**'s endorsement of the investigative procedures, analysis, or mitigation techniques employed in the case. **IEQS** invites readers to submit comments, suggestions, and questions concerning the case. At the discretion of the editors, correspondence may be presented in a future issue.)*

Unplanned Airflows Can Cause Perplexing Problems in Buildings

Even the best plans can go astray. Experience has shown us that unplanned airflow in buildings can provide pollutant pathways and degrade IAQ, sometimes despite the best efforts of those managing the building. Terry Brennan of Camroden Associates (Westmoreland, New York) says the results of the unplanned airflow can occur under various conditions: continually, periodically, or when dynamic systems change from stable to unstable operations.

According to Brennan, a building is a distributed-resistance airflow network. For the most part, air movement through HVAC components and throughout the building is planned and a part of the system design. However, unexpected factors — leaks in the building envelope, pipe chases,