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Ceiling Dust and Hail Storms

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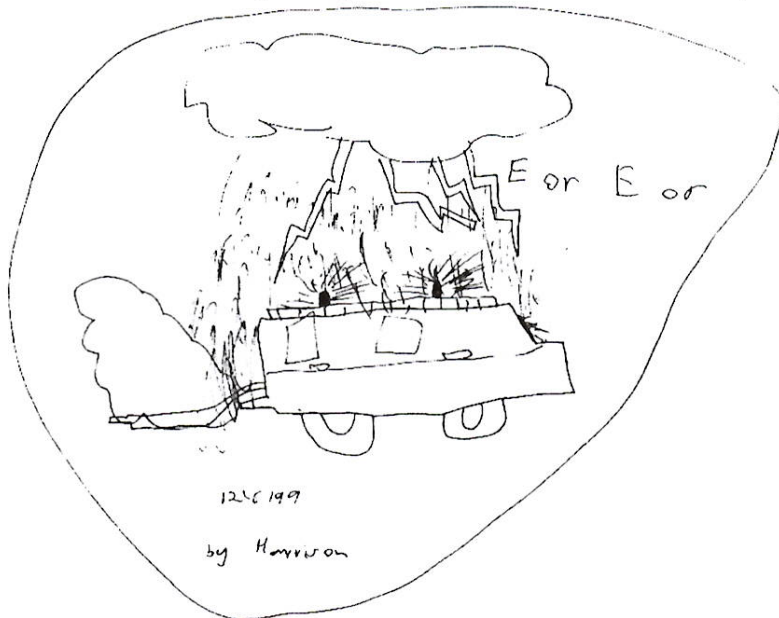
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Editorial

On the night of the fourteenth of April, 1999, as everyone in Sydney knows, there was a hailstorm that damaged twenty thousand houses - nearly all had damaged roofs, and therefore damaged ceilings. From the next day onwards, the Lead Advisory Service received a massive influx of calls on the subject of the health effects of the ceiling void dust that was now getting into homes as a result of the hail. Our networking capabilities were

working overtime as we endeavored to find the information people needed to work out the best course of action. There were people having asthma attacks and other respiratory problems in their homes as well as thousand of contractors moving in for repair work and unaware of the dangers in the ceiling dust. Then came the problem that some insurance companies refused to pay for the absolutely necessary ceiling dust removal prior to the demolition of ceilings to be replaced.

Thankyou to the forty five people to whom I sent the drafts of the three major articles in this newsletter, and especially the two dozen people who rushed their comments and responses back to me. Thanks also to all the staff of the Lead Advisory Service (David, Susy, Helen and Elizabeth) who have given up their holidays to help rush this edition of LEAD Action News to the businesses helping in the recovery for the hail victims in Eastern Sydney. Thanks again to the volunteers of The LEAD Group, Margaret Johnston and Charis Picardo for their great typing and to Michael Marshall for computer support.



"Firetruck on the night of the hail" by Harrison, aged 8

Thirty Thought-Starters on CEILING VOID DUST in Homes

By Elizabeth O'Brien, Coordinator, The LEAD Group Inc., and Manager, Lead Advisory Service (LAS)

1. **Q (QUESTION): Where does the dust in ceiling voids come from?** A (ANSWER): There are numerous ways for dust to get into ceiling voids, including:

- ◆ Air pollution comes through gaps in tiles and tin roofs and moves in through any other entry point under eaves, etc. Any residue from any source of air pollution can enter the roof void, for example, from vehicle and air traffic emissions, industrial activities such as mining, smelting, paint-, plastic-, metal-manufacturing or recycling, coal-, wood- or oil-burning, incineration, cremation, fires, dust storms, aerial spraying, paint removal from auto repairers or large structures such as bridges.
- ◆ Combustion particles come through gaps in chimneys or vents from the living space, some of which have been vented into the ceiling void (instead of to the outside) for example, coal gas (town gas) burners used up until the 1950s (See "Ceiling Dust Removalist Case Study").
- ◆ Combustion particles from, for instance, cigarette smoking, gas stoves, oil or kerosene heaters, can move into the void through ceiling fan extraction vents, ceiling roses and wall vents.
- ◆ Paint removal dust particles, plaster dust, brick dust etc can enter the void from renovations or demolition in the building or in a neighbouring building. Insulation purposely placed in the void can add to the dust load especially if it degrades easily eg cellulose fibre.
- ◆ Degradation of the roofing material eg asbestos cement, slate, fibreglass, galvanized iron, can add to the ceiling void dust load.
- ◆ Decaying biological matter such as nests, bodies and faeces of the 64 pests found (according to Dr Cullen ex-WorkCover NSW) in ceilings eg birds, rats, mice, possums, insects etc can be present as dust, fur or feathers. Moulds and lichens can also grow in ceilings or on roof tiles, leaving spores.
- ◆ Residues of pesticides used to control the above could have been purposely sprayed or laid in

the ceiling void.

- ◆ Debris left in the void by workers, eg sawdust, roof paint chips, building materials, lead washers used on corrugated roofs, PVC cabling, wire; or by accident, eg roof tile fragments from hail damage, charcoal from fires.

2. **Q: What is in ceiling void dust?** A: A large range of contaminants arising from the above activities can be present, including:

- ◆ **Heavy metals** - lead, mercury, cadmium, arsenic, antimony, beryllium, chromium, selenium, barium, molybdenum, nickel, thallium, vanadium
- ◆ **Radioactive metals** - plutonium, uranium, thorium, potassium-40
- ◆ **Other metals** - zinc, copper, iron, aluminium, sodium, calcium, silicon, magnesium, titanium, potassium, manganese, phosphorus, tin
- ◆ **Fibres** - asbestos, fibreglass, synthetic mineral fibres, cellulose, wool, rockwool
- ◆ **Organic compounds** - DDT, organochlorines, termiticides, dioxins, PAHs (poly aromatic hydro-carbons), nitro-PAHs
- ◆ **Biological matter** - animal faeces, carcasses, feathers, fur, plant spores, bacteria, lice, cockroaches and other insects, fungi
- ◆ **Fallout of other persistent hazardous air pollutants** - components of cigarette smoke, diesel emissions, woodsmoke, sulphur, ash from incinerators and coal- or coke-burning.

3. **Q: What are the usual amounts of these contaminants in ceiling dust?** A: There is insufficient data to allow anything but general statements to be made. Most ceiling dust studies have been done to determine the contribution that a lead or copper smelter, lead mine, or paint manufacturers makes to the lead in the ceiling dust, but some testing has also been done in Sydney, Port Kembla and Adelaide to determine the effect of

vehicle traffic. Most studies have only assessed the lead in ceiling dusts (exceptions are noted in the tables below) as lead is the most studied toxic substance. This is not necessarily a bad thing, as lead is widely regarded as a good "marker" contaminant ie if you measure the lead in air, water, dust, soil, sediment, wastewater, waste oil, solid waste, blood etc and find it to be at a high level, chances are that other contaminants will be present.

4. Q: Why is lead a good "marker" contaminant? A: Measuring the lead in a contaminated substance is useful because:-

- ◆ Firstly, lead itself is toxic and therefore knowing the lead content immediately tells you something about the potential risk involved.

- ◆ Secondly, at the points at which lead is most likely to be dispersed into the environment (ie during the mining and smelting of base metal ores and during the life of certain uses of lead (eg in petrol, paints, plastics and chemicals) lead always occurs in combination with other toxic substances. Examples are:-

- Base metal ores such as silver, lead, zinc and copper ores all contain lead and typically also contain mercury, cadmium, arsenic, thallium, beryllium, antimony, selenium, etc.

- In cities or wherever there is leaded petrol in use or previously in use, there will also be fallout of emissions from diesel vehicles, gas vehicles, jet-fuelled planes and non-leaded petrol vehicles (eg Nitro-PAHs, fine particulates).

- As well as containing lead, paints can contain chromium, asbestos, DDT, mercury, arsenic, barium, etc - all these contaminants become fallout when paint is sanded, burned, chipped or chalking.

- Particulate pollution from combustion processes other than in vehicles and smelters, will nearly always contain lead because lead is found in so many fuels eg, coal, wood, waste (as used in incinerators), crude oil, waste oil (the lead content will be higher if the oil is from an engine run on leaded petrol).

5. Q: How does ceiling void dust get into the living spaces of homes? A: See the factsheet *Lead Safe: Lead in Ceiling Dust* by the Lead Reference Centre (LRC - within the NSW EPA) which mentions, among other things, water damage to

ceilings which may cause ceilings to crack or collapse.

6. Q: What is a "safe" or "acceptable" level of lead in ceiling dust? A: Jason Bawden-Smith, lead assessor of JBS Environmental, answers this question with the following statement on his analysis reports:

"Ceiling Dust Biohazard Levels (parts per million)

Low biohazard	<300 ppm	[300 mg/kg
(milligrams	per	kilogram)]
Moderate biohazard	300 - 2000	ppm
High biohazard	2000 +	ppm

"Ceiling dust only poses a health risk to occupants, especially pre-school children, if the lead dust is accessible, that is:

- Enters the living areas through holes or cracks in the ceiling;
- When disturbed during removal or other work activities;

- If the roof void is used as a room or attic.

"Health risk is also related to the amount of dust present."

To give some idea of how much lead needs to enter the living areas of a house for there to be a contamination problem, another lead assessor (Graeme Waller of Graeme Waller and Associates) informed a ceiling dust removalist that just 2 tablespoons of ceiling dust with a concentration of 2,800 ppm (2,800 mg/kg) would contaminate a room and just 2 cups of the same dust would contaminate a whole house. Graeme uses an "acceptance criteria" of 1 mg of lead per square metre of floor - anything above this is "contaminated". A third lead assessor, Fred Salome of CTI Consultants, also prefers the United States standards that have been set for floor wipes inside a home. If the ceiling void is going to become a floor (for instance in an attic room) then the dust should be vacuumed to give any chance of complying with the clearance level of 1mg of lead per square metre. According to Fred, if the ceiling dust is going to be disturbed (eg when a ceiling is demolished) then the dust should be vacuumed because ceiling dust is always contaminated, and testing it is an unnecessary expense. The NSW EPA's publication *Significant Risk of Harm from Contaminated Land* (released April 1999) advises that an appropriate

expert be consulted in relation to dust on contaminated land.

7. **Q: Does it make a difference that the lead in ceiling dust is always found in combination with other contaminants?** A: "Yes" it is significant that lead is always found with other contaminants in ceiling dust because some contaminants are synergistic ie the effect of the two together is greater than the sum of the effects of each on its own. Mercury and lead are synergistic for example. In a study by Schubert, Riley and Tyler ("*Combined Effects in Toxicology – a Rapid Systematic Testing*

Procedure: Cadmium, Mercury, and Lead", Journal of Toxicology and Environmental Health, 4: 763-774, 1978) male rats were injected with an LD1 (lethal dose for one) of lead ie, the amount of lead that, when injected into 100 male rats would, on its own, normally kill only one of the rats. When an LD1 of lead was injected in combination with an LD1 of mercury, **all** of the rats died. This is called the LD100 (lethal dose for 100). Thus LD1 lead + LD1 mercury = LD100 lead with mercury.

8. **Q: How much lead is in ceiling void dust in Sydney?** A: See tables below:

Levels of Heavy Metals in Sydney Ceiling Dusts, that have been reported to The LEAD Group's advisory service between June 1995 and June 1999

Suburb or Area of Sydney	Ceiling Dust Lead Levels mg/kg
Annandale	2,800 - 3,300
Balmain	3,400 - 20,000
Beverly Hills	194
Botany	841
Cabarita	3029 (as tested by JBS, same house was 2200 as tested by Woodward-Clyde)
Darling Point	2,280
Earlwood (childcare centre)	1,500 with a loading of 740 mg/m ²
Eastern Sydney hail area	1,620 (reported by resident) 500 – 5,000 (for 80 houses, reported by lead assessor)
Erskineville	4,000
Five Dock	1,900
Inner Sydney	1,000 – 2,000 (reported by lead assessor)
Kensington	1250
Middle Cove	390
Milperra	200
Mosman	1,142
Rosebery	883
Rozelle	12,000 (half a ton of dust)
Russell Lea	1,353
Surry Hills	1,117
Sydenham: Sydney Aircraft Noise Insulation Project (SANIP)	2,000 (average) in homes tested by environmental consultant
	Other Relevant Dust Levels (mg/kg)
Dulwich Hill	55 cadmium, 57,000 zinc in ceiling dust
Manly	2,500 lead in demolition dust on leaves in neighbour's garden
Woolloomooloo Fingerwharf	10,000 lead in wall void dust

Published Results for Heavy Metals in Sydney Ceiling Dusts

Reference:	No. of buildngs	Area of Sydney	Age of buildings	Lead concentration range in mg/kg
Bawden-Smith (1992)	49	Balmain	1986 to 1842	Range 500 – 5300, mean 2,300
Whicker et al (1997)	11	Campbelltown	1995 to 1917	Range 165 – 2490, mean 822
Woodward-Clyde (1999)	4	Concord	Not stated	Range 893 - 6,890

References to the table of ceiling dust results:

Bawden-Smith, Jason (1992) *Environmental Lead Contamination - The Mort Bay [section of Balmain] Pilot Study*, Masters Thesis, Applied Science in Environmental Studies, University of NSW, Sydney, Australia.

Whicker, C.L.; Hayes, W., Khoo, C.S. and Bhathal, R.S. (1997) *Heavy Metals in Ceiling Dust of Some Sydney Houses, New South Wales, Australia*, in "Journal and Proceedings of the Royal Society of NSW", Sydney, Australia, Vol.130 Parts 3-4, 65-78.

Woodward-Clyde (1999) *Remediation Action Plan, Dulux Cabarita*, Sydney, Australia]

Notes: The Woodward-Clyde report noted that homes assessed in the area had a ceiling dust lead loading of around 35 mg/m². The Whicker study also published ceiling dust levels of copper (range 57 - 517 mg/kg, mean 150 mg/kg) and zinc (range 97 - 3664 mg/kg, mean 1027 mg/kg).

9. Q: Is ceiling void dust a health risk and who could determine this? A: Looking at the above list of what can be in ceiling dust and at the table showing what has been measured to be in ceiling dusts in Sydney, the precautionary principle would indicate that we must assume ceiling void dust is a health risk until proven otherwise, especially considering the following points:-

◆ In particular, lead assessors and the Senior Environmental Health Officer at South Eastern Sydney Public Health Unit concur that **ceiling dust, if disturbed or falling into living spaces, is a health risk, due to the lead alone**. The risk is that current or future resident young children will pick up the lead dust off the floor and other surfaces and their hand-to-mouth activity will provide the pathway for lead poisoning. For adults, the more usual pathway for lead poisoning is inhalation, so it is safe to assume that there is a lead health risk for any adult breathing in large amounts of ceiling dust, such as roofers or ceiling repairers who do not use respiratory protection. The lead health risk to these workers would easily be determined by blood lead testing, which could be carried out by individual workers, organised by employers, done through GP's or at the Workers Health Centre, or carried out as a research project by WorkCover Authority NSW (though this is unlikely with the WorkCover redundancy program in full swing).

◆ It would seem that the most pressing research need to answer the health risk question in relation to other health risks from ceiling dust in Sydney is to look at the particulates issue (especially fine particulates (PM10) and ultra-fine particulates (PM2.5)). Ceiling dust is variously described as "like talcum powder" or "like flour" or, "you'd be amazed at the haze inside ceiling voids on a windy day!" The Whicker study referred to above, found that around 20% of the mass of ceiling dusts around Campbelltown was in the particle range of less than 53 microns [which is approximately the width of a human hair]. The lead concentration in this particle range was higher than for larger particles. According to a new brochure from The Australian Lung Foundation, called *Wood Smoke, Air Pollution and Your Health*:

"When you breathe in high levels of air-borne particles from burning wood, motor vehicle exhausts or industrial emissions, your health can be seriously affected. People who already suffer from conditions such as asthma, chronic bronchitis, emphysema or heart disease are especially at risk. So are the very young and very old. Each year in Australia, lung disease and ill-health resulting from air pollution, lead to 9 million lost days of work or social activity, and cause about 1000 preventable deaths."

◆ Increased cancer risks due to cadmium and arsenic as have been found around the Boolaroo

lead smelter, should also be investigated.

◆ The possibility of asbestos fibres from in situ or since-removed asbestos cement roofs would seem to be a special health risk from some ceiling dusts. Asbestos is not a cumulative poison and even a single exposure should be avoided if at all possible.

As for which government agency is most appropriate for answering the question of whether ceiling dust is a health risk, this would be either the federal or state health or occupational health and safety agencies. See the "Ceiling Dust Removalist Case Study" for the clear answer from WorkCover NSW that exposure to ceiling dust (either by breathing it in, ingesting it or absorbing it through the skin) should be avoided. Anyone who observes a worker who has failed to protect himself from ceiling dust exposure is entitled to report the incident to WorkCover NSW (phone 131 050). Public Health Regulations may have something to say about ceiling dust. The National Occupational Health and Safety Commission (NOHSC - previously Worksafe) can write a standard or code of practice for, say, handling ceiling dust, but NOHSC cannot ensure that the code is followed. It would be up to the state agency to take it up.

10. Q: Is ceiling void dust an environmental problem and who controls this? A: When ceiling dust is permitted to escape from the void and enter the living space, or the outside of the building, there will then be opportunities for it to contaminate air, soil, street-dusts, sewage and stormwater. Councils have a mandate to control pollution of air, soil and stormwater, but council staff need evidence that it's happening (eg be called out and attend the site at the time) and evidence that the dust etc being dropped in gutters etc is contaminated. It is a violation of the Clean Waters Act to pollute waters at all, or to put something in a position where it might pollute stormwater. The NSW Environment Protection Authority (EPA) controls licences for waste facilities and the EPA has licensed the Australian Refined Alloys (ARA) secondary lead smelter in Alexandria (phone 9516 5099) to accept ceiling dust waste, as the lead in the dust can be recycled. Building debris needs to be separated out from the dust as it harms the ARA equipment.

11. Q: When should ceiling void dust remain undisturbed? A: The factsheet *Lead Safe: Lead in Ceiling Dust* advises "The dust in your roof void does not pose a risk if ceilings, cornices and ceiling roses are in good repair. In fact, the dust is better left

untouched if there is no leakage into living spaces."

12. Q: When should ceiling void dust be removed? A: The same factsheet, *Lead Safe: Lead in Ceiling Dust* advises "Some home maintenance or renovation activities may disturb dust and increase the risk of contaminating your living areas. These include:

- ◆ Demolishing ceilings or cavity walls...
- ◆ Installing insulation or new electrical wiring
- ◆ Working in the ceiling cavity for any reason...

"Water damage may cause ceilings to crack or collapse..."

"Assume dust in pre-1970 houses contains lead unless tests prove otherwise..."

"Have lead dust removed from your house..."

"Do-it-yourself ceiling dust removal is not recommended - it's dirty and dangerous and requires special equipment. Hire a professional."

13. Q: Is there any government requirement that ceiling dust must be removed? A: No, there is only the above advice from the NSW Environment Protection Authority and in the following circumstances:-

◆ For houses in the Sydney Noise Insulation Project (SANIP) area, the project management (federal government agency) took advice from the environmental consultancy DASCHEM (Melbourne) that required that ceiling dust was removed in **every** house prior to house demolition and prior to installation of insulation. "All other building work resulting in penetrations to ceilings and/or walls is to be carried out after the dust removal had been completed", according to the *Procedures Used in the Sydney Aircraft Noise Insulation Project* (these specifications are only for the purpose of SANIP though the ceiling dust contractors who worked on SANIP tend to still use them).

◆ "With the introduction of the Integrated Development Assessment Legislation in 1998, all NSW councils were obliged to review their standard conditions for DA's [Development Applications]", so in the case of work to be carried out which

requires a DA, for instance, in the Southern Sydney Regional Organisation of Councils (SSROC) area, member councils are "strongly encouraged to adopt the conditions [Reference: *SSROC - Standard Environmental Conditions for Development Applications*] in as near to the current form as possible to encourage cross-regional consistency." The "Instructions for Use" section of the reference quoted above and below warns: "Under no circumstances should any of these conditions be placed on a DA without consideration as to whether they apply to the development proposed." Relevant SSROC standard conditions for residential properties (and all other properties) undergoing demolition/remediation include:-

▪ **"13 Demolition and disposal of materials incorporating lead paint** Prior to demolition of buildings constructed before 1970, the applicant shall submit a Work plan prepared in accordance with Australian Standard *AS2601 - 1991, Demolition of structure* by a person with suitable expertise and experience. The Work Plan should outline the identification of any hazardous materials, including surfaces coated with lead paint, method of demolition, the precautions to be employed to minimise any dust nuisance and the disposal methods for hazardous materials.... "Hazardous dust must not be allowed to escape from the site. The use of fine mesh dust proof screens or other measures is recommended. Any existing accumulations of dust (eg; ceiling voids and wall cavities) must be removed by the use of an industrial vacuum fitted with a high efficiency particulate air (HEPA) filter. All dusty surfaces and dust created from work is to be suppressed by a fine water spray. Water must not be allowed to enter the street and stormwater systems. Demolition is not to be performed during high winds, which may cause dust to spread beyond the site boundaries. "All contractors and employees directly involved in the removal of hazardous dusts and substances shall wear protective equipment conforming to Australian Standard *AS1716 Respiratory Protective Devices* and shall adopt work practices in accordance with the requirements of WorkSafe's *Control of Inorganic Lead at Work* (NOHSC: 102(1994) and NOHSC: 2015(1994)). "All lead-contaminated materials are to be disposed of in accordance with the EPA's requirements.

▪ **"14 Lead contaminated material post-removal requirements** Following demolition activities, soil must be tested by a person with suitable expertise, to ensure the soil lead levels are below acceptable health criteria for residential

areas. Full certification is to be provided to Council prior to final inspection."

14. Q: What are the occupational health and safety protocols for ceiling dust extraction? A: These vary from government agency to government agency:-

◆ As mentioned above, if ceiling dust is to be removed as a result of a DA involving demolition in which a council officer determines that a condition such as SSROC's Standard Condition 13 is required, then respiratory devices would be worn and work practices from WorkSafe's *Control of Inorganic Lead at Work* would be adopted.

◆ According to the *Procedures Used in the Sydney Aircraft Noise Insulation Project [SANIP]* (which specifications are only for the purpose of SANIP), in addition to the respiratory device being worn (after the worker is trained in its use), the following specifications are used during ceiling dust removal:-

▪ All employees directly involved in the removal shall wear disposable overalls fitted with hoods and must at all times keep their suits fully on and in good condition;

▪ Personal monitoring of all employees directly involved with the removal conforming to AS3640 Workplace Atmospheres – method for sampling and Gravimetric Determination of Inspirable Dust;

▪ The entire ceiling space and bagged wastes are to be sprayed with a PVA solution applied by an airless spray prior to removal from the ceiling space:

▪ Personal decontamination procedures are to be followed and will involve spraying down of disposable suits with the PVA solution in the ceiling space, and washing hands and face with clean water outside the building with all waste water directed to sewer;

▪ All employees involved in dust removal shall adopt good hygiene practices and ensure hands and faces are thoroughly washed before leaving the site and prior to smoking or eating;

▪ All employees entering the ceiling space within 1 hour of dust removal shall wear

approved respiratory protection conforming to AS1716;

15. Q: What special equipment is needed to safely remove ceiling dust? A: The advice from the NSW EPA, SSROC, SANIP, Illawarra Public Health Unit, North Lake Macquarie Environmental Health Centre and Broken Hill Environmental Lead Centre is consistent in recommending the use of industrial HEPA vacuum equipment.

16. Q: What are the potential health risks to people carrying out ceiling dust removal? A: The NSW EPA's factsheet, *Lead Safe: Lead in Ceiling Dust* warns "Watch out for electrical wires and take care not to fall through the ceiling. See the answer to Q 9 above and the *Ceiling Dust Removalist Case Study* for the advice of WorkCover NSW.

17. Q: What are the potential health risks to people working in ceiling voids or cutting into ceilings if the dust is not first removed? A: Much the same as the health risks to the ceiling dust removalist.

18. Q: What are the potential health risks to residents when ceiling dust is removed? A: Adults would presumably only have a one-off exposure to dust in the air on the day if they were present during dust removal or soon after and before the dust had settled. People living with constant exposure to ceiling dust due to holes in the ceiling, may have a more significant exposure. Young children on the other hand, are at risk of ingesting the dust that settles after removal, due to their hand to mouth activity and close contact with the floor.

19. Q: What are the government requirements regarding disposal of ceiling dust? A: The NSW EPA Pollution Line officer I spoke to on 29.4.99 said "There's no problem legally with putting leaded building and demolition waste in the municipal waste bin -- so a contractor could not be fined for putting ceiling dust in the householder's rubbish bin -- it is solid waste class 1 -- which is what most of the landfills that accept domestic garbage are categorized as. If the householder doesn't want the dust or debris in their bin then it should be included in the quote for the job that the contractor takes it to a landfill -- it is charged by weight." One ceiling dust removalist, John Mercer of Australian Lead Services, said he was shocked to hear that the waste dust could be put in the garbage. He said a better policy is needed.

20. Q: Can the lead in ceiling dust be

recycled? A: Yes, the ARA secondary smelter in Alexandria is licensed to accept ceiling dust in order to recycle the lead out of it. **Sydney ceiling dusts have a mineable level of lead in them.**

21. Q: When and why did the ceiling dust extraction industry begin? A: As far as I know, the first ceiling dust removal project took place in Port Pirie, South Australia in the early 1990's due to the high levels of heavy metal in the dust resulting from the lead smelter. In Sydney, the first ceiling dust removalist probably set up his business in 1995, having designed and built his own truck mounted vacuum equipment. The industry began purely in response to the demand from householders who were made aware of lead in houses through media reports. Various extraction companies have come into the field from a range of related industries such as installation of thermal insulation, air-conditioner ducting, or noise insulation, cleaning and attic-conversions.

22. Q: How big is the ceiling dust extraction industry in Sydney? A: There are now more than twenty companies who do ceiling dust removal in Sydney.

23. Q: How many houses have had their ceiling dust extracted? A: A conservative estimate would be 5000, over half of which were paid for by the Federal Government in the SANIP.

24. Q: What are the government requirements regarding licensing of ceiling dust contractors? A: None.

25. Q: What do you need to do to set yourself up as a ceiling dust removalist? A: At this point in time (June 1999) - nothing but have a telephone number, an able bodied worker and an industrial vacuum cleaner. If you deal with cluey clients, they will want you to convince them that you are looking after your own health, the health of residents and the environment, have a truck-mounted HEPA vacuum cleaner, and do follow-up clearance testing of the floors inside the house. John Mercer of Australian Lead Services said "non-HEPAs should be completely outlawed" He's heard from lead assessors and others in the field that only companies who use HEPA filters will get referral work.

26. Q: How would licensing of ceiling dust removalists help the home-owner? A: Householders are faced with the problem of determining whether a ceiling dust removalist is going to do a decent job and not leave a whole lot of

dust in the ceiling void or leave their home more contaminated than it was (in the living area). Licenses would ensure that at least the contractor could have their license taken away if they consistently did a bad job. With the usual requirement that licensed contractors be insured, the householder would have some way of claiming the cost of clean-up and testing, if the job was botched.

27. Q: Could ceiling dust removalists be licensed by the EPA, WorkCover, or Department of Fair Trading (DoFT)? A: I asked DoFT's Home Building Unit Manager this question and was advised by Michael Carroll, for the Director General, that ceiling dust removal work "does not require to be licensed under the Home Building Act 1989", administered by DoFT. DoFT "would not propose recommending any changes to the Legislation in that regard", for example to necessitate licensing of ceiling dust contractors. Failing the setting up of licensing of ceiling dust removalists, DoFT may still have a role to play in "professionalising" the industry, for instance, ensuring contractors have insurance and work to certain standards. WorkCover could license them, along with lead paint removalists, lead soil removalists and lead contaminated carpet cleaners, but no steps have yet been taken to do so. Regulations would need to be developed, as they were to allow licensing of asbestos contractors. Gary Rhyder from WorkCover NSW has commented "... with the move away from prescriptive legislation to performance based legislation employers must adopt a risk management approach to safety. This approach requires employers to develop specific procedures to address risks, and I am advised that this approach would continue to be preferred by WorkCover." One ceiling dust contractor who used to be an inspector for the equivalent body to WorkCover in New Zealand, said that the approach in New Zealand is not so much "leave it up to the contractor and step in when they do something wrong", but more, "let's train the contractor and tell them how to do it right in the first place." The EPA is very disinclined to license contractors but the Lead Reference Centre (the lead policy and lead education section of the NSW EPA) is keen to work with DoFT and TAFE (Technical and Further Education) to develop training and other requirements for ceiling dust contractors.

28. Q: What do government departments do when they need to employ ceiling dust contractors? A: In the absence of a licensing system, but with the need to set minimum standards for ceiling dust removal work, various government

departments have responded by putting out tenders and then creating a list of approved contractors for example:

◆ The Sydney Aircraft Noise Insulation Project (SANIP), a federal government project, has resulted in one ceiling dust removal company being on a list of approved contractors for SANIP work and 5 other ceiling dust removal companies being sub-contracted by approved contractors on the SANIP list.

◆ The Broken Hill Environmental Lead Centre project (part of the NSW Health Department) has approved of 3 companies to carry out lead removal work in the lead mining town of Broken Hill but most of the ceiling dust work is sub-contracted by the three companies, to Nobac Cleaning Pty Ltd.

◆ The Hunter Region office of the NSW Department of Public Works and Services (Hunter DPWS) has accredited 6 companies to carry out ceiling dust removal work around the lead zinc smelter in Boolaroo, in a remediation program being managed by the North Lake Macquarie Environmental Health Centre (part of the NSW Health Department). Hunter DPWS specifies in the contracts, the procedures to be used for the ceiling dedusting.

Other government departments are still overcoming the problem, for example:

◆ The NSW Roads and Traffic Authority (RTA) manages the issue of dust escaping from for instance houses being demolished to build motorways, by following the NSW Government's Environmental Management Systems Guidelines. The environmental management plan would then be site-specific and the RTA undertakes to use best environmental practice.

◆ The federal Department of Community Services (DoCS) has asked directors of childcare centres to undertake a lead audit to determine the need for lead remediation activities such as ceiling dust removal, but it is left up to the childcare centre management to determine an appropriate contractor.

◆ The Illawarra Public Health Unit (part of the NSW Health Department) investigated having HEPA vacs available for people to borrow to carry out their own ceiling dust removal work around the copper smelter in Port Kembla. The fact-sheet *Lead*

Safe: Lead in Ceiling Dust by NSW EPA, advises "Do-it-yourself ceiling dust removal is not recommended - it's dirty and dangerous and requires special equipment. Hire a professional." The Illawarra Public Health Unit (PHU) later decided to allow residents to borrow the industrial HEPA vacs for dust removal only inside the house and they "recommend" hiring a professional for removal of ceiling dust.

◆ The NSW Department of Housing carried out a lead project in Glebe housing estate including ceiling dust removal, and will be carrying out such work following the hail damage in south eastern Sydney, but no contractors have yet been approved in this process.

◆ Another NSW government department in charge of renovating Sydney train stations has done what the public does: - ring up the Lead Advisory Service for referral to contractors on the list developed by the service.

29. Q: Is Standards Australia currently writing or planning to write a standard on ceiling dust removal, including WHEN to remove dust and how to test it? A: Standards Australia is not currently writing a standard and there is no committee set up to do so. A letter was sent on 7th June 1999 to ask if a standard was planned but to date a reply has not been received.

30. Q: Is there an industry association for ceiling dust removalists and what does it say about standards and licensing? A: One industry association which presently has some ceiling dust contractors as members is called ALARA - Association of Lead Assessors and Remediators of Australia. This fledgling organisation has only 6

member companies, half of which do ceiling dust removal (which remember, is more than lead removal), the remainder concentrating on lead remediation or assessment. At the moment (end of June 1999), unfortunately the phone number for ALARA has been going to a private residence where the tenants know nothing about ALARA, so people interested in calling ALARA might be best to call the originator of the idea for ALARA, Jason Bawden-Smith on 9665 6250. Also, probably just as many ceiling dust contractors belong to the Master Builders Association (MBA). The same offer as has been made to major insurance companies - that the Lead Reference Centre and Lead Advisory Service could provide a speaker at a meeting about ceiling dust - has been made to MBA and there has been interest shown by the Master Builders (Eastern Sydney region), but a meeting has not yet been organised. Alternatively, as ceiling dust is not just a lead issue, the two dozen ceiling dust contractors who have been identified by the Lead Advisory Service, may well be interested in forming an association of ceiling dust contractors. There is general support among the ceiling dust contractors I have spoken to, and among lead assessors, for the concept of a strong association which assists in the development of standards for ceiling dust removal, clearance testing, etc. The association could set it's own criteria for membership such that membership of the association could replace a licensing system, such as it does for lead paint removalists who are members of Master Painters Australia. This would require strong leadership and a lot of work for the first members, but would at least provide some guidance for the public and government agencies that need it. A post-out offering membership to all relevant contractors and asking questions about their work practices and equipment would be the first requirement for such an association to gain credibility as **the** industry body.

Tribute to Vacuum Designer

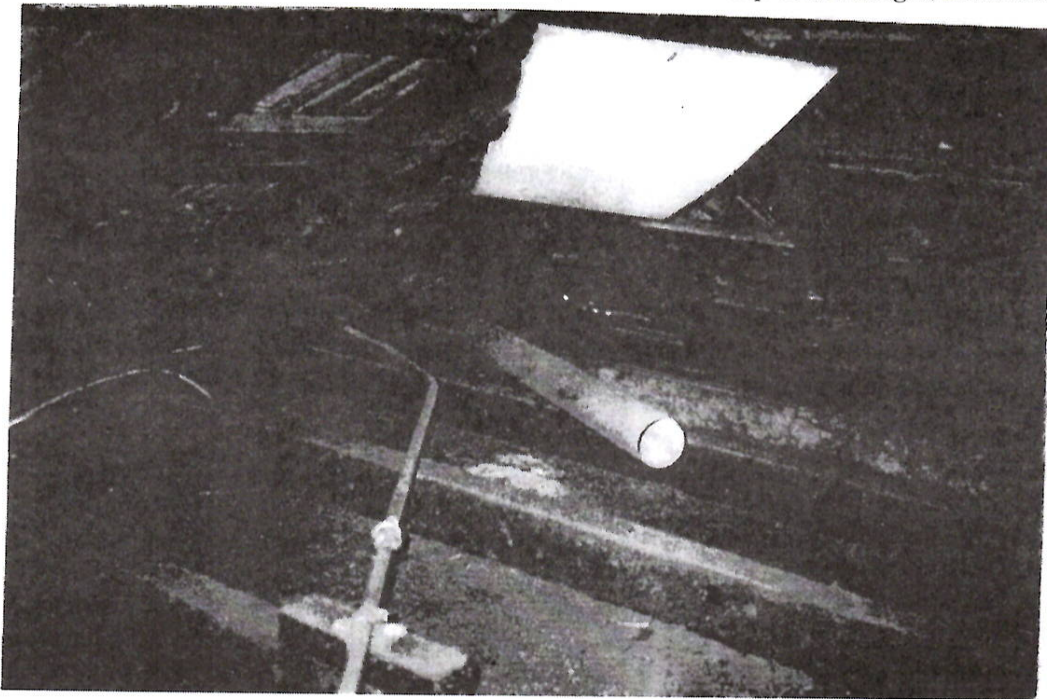
By Elizabeth O'Brien, Coordinator, The LEAD Group Inc., and Manager, Lead Advisory Service (LAS)

It is with much sadness that I heard the news that Arnold Plooy of Safe-T-Vac recently fell from a roof and is now a paraplegic. Arnold is the founder and vacuum cleaner designer and builder who has provided the most support for The LEAD Group for over half a decade in The LEAD Group's campaigns to have, firstly, paint removal contractors and then, ceiling dust removal contractors use HEPA filtered vacuum equipment. He organised for Safe-T-Vac to become the first and until recently the only company in NSW from which the householder could hire an industrial HEPA vacuum cleaner for use in cleaning

up lead paint dust after renovations. Arnold has the creative genius and practical understanding to be able to custom design and build anything from back pack vacs to truck mounted vacuum extraction units to the contractor's requirements, and he has done so on many occasions, thus making an incredible contribution to improved air quality for both workers and residents. Thankfully, Safe-T-Vac is still going strong as Arnold continues to work from hospital on design and has engineers still building his fantastic cleaning machines.

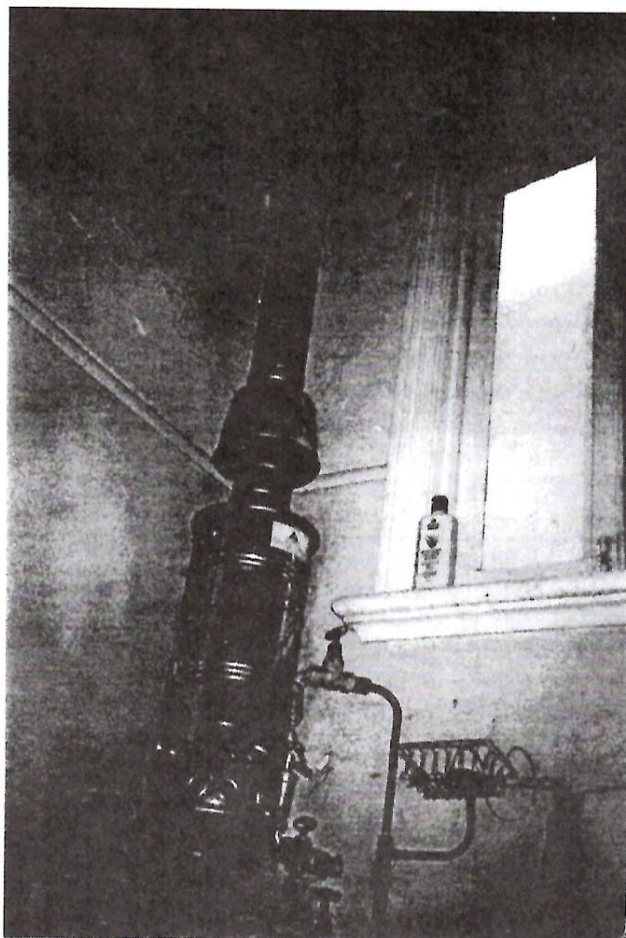
Ceiling Dust Removalist Case Study

By Elizabeth O'Brien, Coordinator, The LEAD Group Inc, Manager, Lead Advisory Service (NSW)



On 6th May 1998, a ceiling dust contractor to whom The LEAD Group's information and referral service had been referring callers since 1996, rang up to say that Channel 7 was doing an item on ceiling dust that night and he would like to come and show us some information he had gathered.

Photo below, shows the coal gas burner with flue going to the ceiling. Photo above, shows the flue vented into the ceiling void.



Later the same day, he brought in some photos showing evidence that he felt proved the reason why some houses older than 40 years had masses of dust in the ceiling void. He had removed 150 kilograms of dust from one house in Maroubra (south east Sydney) yet the house next door from the same era had a lot less dust in the void. The photos showed a coal gas burner in the bathroom of the "high dust house" with a flue pipe (approximately four inches in diameter) which, amazingly, had been vented into the ceiling void, rather than to the outside.

Apparently sometime in the 1950s coal gas was no longer supplied, but the burner remained along with the flue pipe to the ceiling void. His observation of a coal gas burner still in place allowed the ceiling dust contractor to finally work out why he had seen so many 4 inch diameter holes covered up in various ways (sometimes with a brick placed over them, sometimes plastered etc) leading from the bathroom or kitchen into the ceiling void in a number of homes with a heavy dust load in the ceiling. He thoughtfully collected a sample of the dust that was sitting in the flue pipe, and a further sample of dust from the ceiling void itself, to allow comparison of the levels of various elements after having them analysed at a reputable laboratory. See the Report of Analysis of Flue Dust and Ceiling Cavity Dust (next page):

Report of Analysis of Flue Dust and Ceiling Cavity Dust

Sample Description : Ceiling cavity dust x 2 (submitted)

Date Received : 23/1/98

Date of Report : 5/2/98

Request : Multi - element analysis

Results: [NB mg/kg = milligrams per kilogram, which is the same as parts per million (ppm) or micrograms per gram (ug/g)]

	"Normal" ranges for soil	FLUE DUST SAMPLE	CEILING CAVITY DUST SAMPLE
Iron (mg/kg)		52900	105000
Silicon (mg/kg)		24300	87900
Aluminium (mg/kg)		5510	36300
Zinc (mg/kg)	1 - 900	112000	31000
Calcium (mg/kg)		3950	15600
Sulphur (mg/kg)		45400	12700
Sodium (mg/kg)		1390	8350
Potassium (mg/kg)		1060	8300
Magnesium (mg/kg)		6780	4530
Lead (mg/kg)	2 - 300	6434	1381
Phosphorus (mg/kg)		133	1160
Manganese (mg/kg)	20 - 10,000	151	639
Barium (mg/kg)		474	464
Copper (mg/kg)	2 - 250	36000	411
Tin (mg/kg)	1 - 200	3560	123
Vanadium (mg/kg)	3 - 500	29	100
Chromium (mg/kg)	5 - 1500	65	38
Antimony (mg/kg)	0.2 - 10	24	25
Cadmium (mg/kg)	< 2	7	22
Molybdenum (mg/kg)	0.1 - 40	9	5
Arsenic (mg/kg)	0.1 - 40	50	< 0.5
Beryllium (mg/kg)		< 0.5	< 0.5
Bismuth (mg/kg)		< 0.5	< 0.5
Cobalt (mg/kg)	1 - 65	< 0.5	< 0.5
Nickel (mg/kg)	2 - 750	516	< 0.5
Selenium (mg/kg)	0.1 - 5	< 0.5	< 0.5
Thallium (mg/kg)	0.1 - 0.8	3	< 0.5

COMMENT: The normal ranges listed are taken from "Heavy Metals in Soils", Alloway, 1990.

[The results are listed in order (from highest to lowest concentration) of the elements in ceiling dust.]

Simple Observations about the Results

1. Over two-thirds of each dust sample contained elements which were not analysed

The total mass of elements in the dust is 300747 mg/kg for the flue dust sample and 310269 mg/kg for the ceiling dust sample. Though the bulk of the

samples most probably consisted of anion group (carbonates, chlorides, hydroxides etc) and inert carbon which were not quantified, it is interesting to ask what **other** elements would be found in the remaining 70% and 69% of the flue dust and ceiling dust respectively.

2. Dust is a Potential Health Hazard if Toxics are Present at Higher than "Normal" Soil Ranges

In the absence of any government body in Australia having set an acceptable level for various contaminants in ceiling dust, the next best thing is to compare results to soil contamination standards. Knowing that the upper limit (ie 300 mg/kg) of the soil range that is given as "normal" for lead, is also "the level for further investigation" of the NSW EPA, I will assume that to exceed the "normal" level for other elements also warrants further investigation. The elements in the above analysis report for which a "normal" soil range is given and which exceed "normal" are:

- ◆ **for flue dust:** thallium, arsenic, cadmium, antimony, tin, copper, lead and zinc.
- ◆ **for ceiling dust:** cadmium, antimony, lead and zinc.

3. Which Contaminants of Ceiling Voids Might come Mainly from Coal Gas Emissions?

It would seem a reasonable hypothesis that for those elements for which the concentration in the flue dust is greater than the concentration in the ceiling cavity in general, that the flue pipe was probably a major contributor of that element to the dust in the cavity. To test this, a researcher would as a minimum, need to determine whether the particular element could have originated in the flue pipe but then escaped from the ceiling void due to being in a fine particulate or gaseous form etc. isotopic fingerprint research methods could be used on those elements with different isotopes which originate in different ore bodies, for example, lead. Such research as carried out by Prof Brian Gulson, a CSIRO researcher in Sydney, has in the past been used to determine for instance whether the lead in a person's blood stream mainly came from petrol or from ore dust in Broken Hill.

So the elements which are higher in the flue dust than in the cavity dust and therefore may have come mainly from the coal gas burner emissions are: **arsenic, chromium, copper, lead, magnesium, nickel, sulphur, tin, thallium and zinc**. It is vital to note that in some cases the flue dust sample concentration is vastly greater than the cavity dust sample, eg 1000 times for nickel (which therefore may have come solely from the flue pipe) whereas for others the concentration between the two dust samples varies much less, eg less than 5 times for lead (which we know to have numerous other sources).

4. Which Contaminants of Ceiling Voids Probably come Mainly from Other Sources?

The elements which are lower in the flue dust than in the cavity dust and therefore may have come mainly from sources other than the coal gas burner emissions are: **aluminium, calcium, cadmium, iron,**

potassium, manganese, sodium, phosphorus, silicon and vanadium.

I tried to get some idea of whether the third and fourth points above might form a reasonable hypothesis by asking WorkCover NSW what the emissions from coal gas burning were likely to contain and I was referred to Pollution Line (NSW EPA) as the issue was more an environmental health issue. Pollution Line said the major work on coal gas would have been for a contaminated sites issue - at the storage depots for coal gas. Pollution Line pointed out that I could refer to a textbook on contaminated sites but this would not necessarily tell me what was in the emissions from burning coal gas: "The best source of information on what is in coal gas burner emissions seems to be the analysis report you already have."

I decided to ask the ACTU for a Material Safety Data Sheet (MSDS) on coal gas but I learned that the MSDS is required to comment on the toxicity of ingredients, not the toxicity of contaminants of a chemical in the workplace. This left me with a worker (the ceiling dust removalist) obviously being exposed to a hazardous dust in the workplace (the roof voids of houses) but with insufficient information to help him know what to protect himself from, and how.

I was not only concerned about his lead levels - I had advised him since 1996 to regularly check his blood lead level and to wear a respirator while on the job. Now it seemed he also needed to check the levels of other heavy metals in his body and there was the issue of his persistent cough which concerned me gravely. I never had a conversation with him without wondering about the effects of his work on his respiratory health.

On behalf of ceiling dust removalists in general, I thought it best to get some decent advice from WorkCover. I was put through to Occupational Medicine and received some useful tips from Dr Cullen (see below). I passed on the advice via the ceiling dust removalist's secretary and have often wondered since how he was going and how feasible it is to wear a respirator when you are coughing so persistently.

Every time I have ever asked one of the ceiling dust contractors that ring up the Lead Advisory Service, what their blood lead level is, I get an answer that is uninterpretable eg "it's okay - I can't remember the figure". The only way anyone will prove to me that ceiling dust contractors are not being affected by their exposure to ceiling dust is for me to be presented with a survey of contractors that finds a clean bill of health for both heavy metals and

respiratory function. It's time WorkCover stepped in here - to help out a fledgling industry and prevent these contractors being 'statistics' in a few years time. Good occupational health and safety practice involves controlling a hazard as close as possible to the source, not just putting a respirator on the worker. What about all those workers who are exposed to ceiling dust but don't know enough about it to wear a respirator?

The huge advantage of WorkCover licensing asbestos contractors is that licensing entails workers having insurance and being trained for the work they do. There is no training course available anywhere for ceiling dust removalists and no standard to guide their work protocols.

The Workers Health Centre at Granville, Sydney strongly supports the idea of a research project into the occupational health aspects of ceiling dust as well as a doctor education program so doctors who see workers who might be being exposed to ceiling dust at least know to ask them about their exposure. The GP can then refer the exposed workers to WorkCover and / or the Workers Health Centre (phone 02 9897 2466).

WorkCover Advice for Ceiling Dust Removalists

By Elizabeth O'Brien, Coordinator, The LEAD Group, and Manager, Lead Advisory Service (NSW)

In May 1998, I asked Dr Cullen, Occupational Medicine Section of WorkCover NSW for advice for ceiling dust contractors. In June 1999 I wanted to check whether any of the advice I had written down from the call, might have changed and was told that Dr Cullen was no longer at WorkCover. John Devine of the PPE Unit of WorkCover provided some extra information on respirators (marked by a frame) and Dr Kenyon read the notes I had made from Dr Cullen's advice and made some deletions and also changed some points (which I have marked with an asterisk) in the following advice. Comments in square brackets are mine.

"The ceiling dust contractor has to:-

- ◆ wear a dust respirator all the time (the respirator only works if there is no beard or moustache) and a cloth cap (cotton engineer's beret) on his head, for the dust;
- ◆ Wear gloves and a boiler-suit, as some of the components of ceiling dust may be absorbed through the skin;
- ◆ Wash his clothes separately *
- ◆ Have a shower at the end of the day; include washing the face and * hair;

"The ceiling dust contractor can come into WorkCover to talk to an occupational hygienist, as he has various health risks if exposed to the dust:-

- ◆ Ceiling dust can contain the remains of up to 64 pests known to live in roof voids, including birds that can cause pigeon fancier's lung.
- ◆ Ceiling dust is likely to contain fungus that also produces bronchial hyperactivity. Once you [PTO]

Advice about personal protection from WorkCover PPE Unit

WorkCover NSW and its predecessors have operated an approval system for respirators for the last 30 years. Not all of the respirators available in hardware stores are approved, and not all of them meet the requirements of the Australian Standard.

The PPE Unit of WorkCover is willing and able to offer advice regarding the selection, care and use of respirators, including which ones have been tested and approved. Londonderry: Phone (02) 4724 4900, Fax (02) 4724 4999.

Another authoritative source of information regarding respirators is the Australian Standard AS/NZS 1716-1994. "The Selection, Care and Use of Respirators". It is quite possible to have a device that meets the requirements of AS/NZS 1716, but not be protected adequately, because you have not selected the appropriate device.

"Thirty Thought-Starters on CEILING VOID DUST in Homes" mentions the use of disposable overalls, whereas the tips received from WorkCover Occupational Medicine Section says "boiler suit". In my opinion, a normal cotton boiler suit is not as satisfactory, as it has pockets and other places where contamination can collect, including direct hand holes which allow access through the boiler suit to trouser pockets underneath. Therefore the disposable protective clothing is a better solution.

- ◆ have bronchial hyperactivity it doesn't take much dust to produce symptoms [such as coughing and wheezing]. * Some fungi are chemical sensitisers but these fungi may not occur in ceiling dust.
 - ◆ * Dr Kenyon said the silica level in the ceiling dust would be of concern and exposure to silica is covered by other regulations [For example, according to the WorkCover factsheet *A Guide to Dust Hazards* (March 1995) "Regulation 95A of the *Construction Safety Act Regulations* which sets out procedures for dust control during building work and construction work. It includes a requirement that drilling, picking, scabbling, cutting and ripping equipment must be fitted with dust suppression or dust control devices when used on silica-containing materials.
 - ◆ Breathing lots of dust causes * industrial asthma, depending on what is in the dust, eg animal dander proteins. Ceiling dust may exacerbate asthma or precipitate an asthma attack.
 - ◆ A person may have one or both of 2 types of breathing problems * :-
 - **Restrictive:** * the vital capacity of the lungs is decreased by high exposure for long periods to, for instance silica or asbestos.
 - **Obstructive:** * trouble getting the air in:- e.g. asthma - broncho-constriction of the intermediate airways. An asthmatic reaction may occur instantly.
 - ◆ The risk of getting cancer from house dust is very low [though no evidence for this contention was provided].
- "If the contractor has reason to be concerned about his respiratory health, then he should:-
- ◆ Go to a GP. The GP can carry out a simple test on his respiratory function - * most doctors will do spirometry (measurement of lung function) - and refer him to a respiratory specialist if necessary.
 - ◆ Alternatively, the doctor at the Workers Health Centre at Granville, Sydney (phone 02 9897 2466) could see the worker or make the appropriate referral.
- "If the worker has only been in the ceiling dust industry for a short time, then his respiratory problems may be completely reversible or mostly reversible. After the use of maximum respiratory protection, any bronchial hyperactivity or asthma should come a long way back towards normal lung function.
- "If workers compensation is being paid for the contractor then he can claim occupational disease. If he is employed by his own company and is not privately insured, then he can claim lost work time for medical investigations. If he just owns and runs his own company and is not privately insured, then he can't claim anything."

Case study - child lead poisoned by ceiling dust

The following case study is reprinted from the WEEKLY SOUTHERN COURIER Tuesday, October 3, 1995. Story: Susan Mooney

A two-year-old Mascot boy has recorded a blood-lead level three times higher than the approved safe limit. The shock reading was taken during renovations to his family home, which included the removal of the ceilings.

Rosemary Ayoub and her son Jack were tested two weeks ago. The blood test confirmed her worst suspicions - Jack's lead levels were dangerously high: at 30 micrograms per decilitre, three times the recommended safe level.

According to Australia's national lead watchdog, The Lead Group, high concentrations of lead in children can lead to impaired brain function, kidney damage, problems with calcium absorption and generalised cell damage.

Mrs Ayoub knew most old paints contained lead and had been careful to remove any flakes. She also knew about lead in soil and had that tested. But she was unaware lead could be present in dust. The

Lead Group told Mrs Ayoub the dislodged lead dust in the ceiling had been the source of Jack's poisoning.

Since the diagnosis the Ayoub family's life has been turned upside down. Jack cannot live in the home until all traces of lead are removed. He has moved to his grandmother's home and only sees his father every third day. Meanwhile, his father has put his daytime job on hold and is working 12 hours a day to complete the renovations. Once they're finished the Ayoub's must decontaminate the whole house by washing every surface with sugar soap to remove all traces of lead dust and thoroughly clean sheets, towels, clothes and floor coverings.

A teacher, Mrs Ayoub said: "I've tried to give him such a good upbringing - healthy food, keeping him active. "I thank God that something made me test Jack. If we had stayed living there for even a few months longer I hate to think what [his reading] would've been."

For information about lead poisoning contact The LEAD Group on 02 9716 0132.

Cost to the Community for Elevated Blood Lead Levels in Children

By Michelle Calvert, Spokesperson, The LEAD Group

In 1993 the National Medical Health and Research Council set an Australian goal for ALL Australians to be below 10 micrograms per decilitre [$\mu\text{g}/\text{dL}$] of lead in the blood.

The table below sets out costs to the community for increases in blood lead levels - resulting in IQ point loss and therefore cost to the community for health and remedial education and lost earning potential.

BLOOD LEAD LEVEL (in $\mu\text{g}/\text{dL}$)	Change in IQ points (allowing only 2 IQ point loss per $10\mu\text{g}/\text{dL}$)	Cost of IQ change per child (allowing \$5,190 per IQ point lost)
1.5 $\mu\text{g}/\text{dL}$ to 2.5 $\mu\text{g}/\text{dL}$	0.3 to 0.5	\$1,557 to \$2,595
3 $\mu\text{g}/\text{dL}$ to 5 $\mu\text{g}/\text{dL}$	0.6 to 1.0	\$3,114 to \$5,190
4.5 $\mu\text{g}/\text{dL}$ to 7.5 $\mu\text{g}/\text{dL}$	0.9 to 1.5	\$4,671 to \$7,785
6 $\mu\text{g}/\text{dL}$ to 10 $\mu\text{g}/\text{dL}$	1.2 to 2.0	\$6,228 to \$10,380
8 $\mu\text{g}/\text{dL}$ to 12 $\mu\text{g}/\text{dL}$	1.6 to 2.4	\$8,304 to \$12,456
9 $\mu\text{g}/\text{dL}$ to 15 $\mu\text{g}/\text{dL}$	1.8 to 3	\$9,342 to \$15,570
12 $\mu\text{g}/\text{dL}$ to 20 $\mu\text{g}/\text{dL}$	2.4 to 4	\$12,456 to \$20,760
16 $\mu\text{g}/\text{dL}$ to 24 $\mu\text{g}/\text{dL}$	3.2 to 4.6	\$16,608 to \$24,912
18 $\mu\text{g}/\text{dL}$ to 30 $\mu\text{g}/\text{dL}$	3.6 to 6	\$18,684 to \$31,140
21 $\mu\text{g}/\text{dL}$ to 35 $\mu\text{g}/\text{dL}$	4.2 to 7	\$21,798 to \$36,300

(Source: Dr. Gul IZMIR, '1993 NSW EPA.)

The NSW EPA estimate for the number of preschoolers with blood lead levels above 10 micrograms per decilitre is between 36,600 and 221,620 in NSW ALONE.

Apart from the inestimable personal cost of lost intellectual potential, the cost to the Australian economy is CONSERVATIVELY equal to: 36,600 children x \$8,304 to 221,620 x \$12,456 for blood

lead level of $10\mu\text{g}/\text{dL}$ equals \$303,926,400 to \$2,760,498,720. This sum of between almost **\$304 million to \$2.8 billion** does not take into account the unknown number of older children and adults with elevated blood lead levels.

Higher blood lead levels mean more cost to the community.

The economic benefits of investing in lead prevention programs include:

- healthier and smarter children with reduced anti-social behaviour
- reduction in special education costs
- sending children to school "ready to learn"
- reduction in health care costs - avoids expensive chelation therapy and other associated health care expenditure
- employment opportunities created (as has occurred overseas) when a viable lead abatement industry is established
- because lead is not biodegradable its potential to harm is long lasting. Every building that is lead abated reduces the risk to future generations from lead poisoning.
- children are still dying from sniffing leaded

petrol in some Australian communities (leaded petrol was phased out in NZ in September 1996. It was banned in Japan in 1986, Canada in 1990, Austria 1993, USA 1995.)

- the latest estimate for the phase out of leaded petrol in Australia is 2010!

"If even minimal increases in lead levels in children contributes to a significant proportion of school failure and anti social behaviour and ultimately impairs productivity in adulthood, as the current information suggests, then a greater commitment than has hitherto been made is required to confront this public health issue."

Drs. Alperstein and Vimpani, Journal of Paediatrics and Child Health.

Furst the Hail, Now... WHAT is Coming Out of the Void?

By Elizabeth O'Brien, Coordinator, The LEAD Group, and Manager, Lead Advisory Service (NSW)

Commonly asked questions about CEILING VOID DUST in homes in the April 14th 1999 Sydney hailstorm damaged area

RESPONSE OF THE INSURANCE INDUSTRY

1. Q: Are insurance assessors familiar with the issues about ceiling dust? A: Ceiling dust was first identified as a source of lead in 1983 in both Sydney (Reference: Gulson, Mizon and Law in *The Urban Atmosphere of Sydney*, CSIRO, Melbourne 1983) and Port Pirie, lead smelter town in South Australia (Reference: Port Pirie Taskforce Report, August 1983). In 1992 in Sydney, Jason Bawden-Smith measured lead in the ceiling dust in nearly 50 Sydney homes and various newspaper reports mentioned the research. Research by Macquarie University's internationally renowned lead researcher Prof Brian Gulson (and others), which found all homes tested in the Illawarra had lead levels above 250 parts per million (ppm) in the ceiling dust, and those close to the Port Kembla copper smelter had more than 10 times this amount (Reference: Chiaradia et al, *Science of the Total Environment* 205, 1997) was also preceded and followed by media reports of lead, arsenic and cadmium being in the ceiling dusts of Port Kembla. The NSW Environment Protection Authority (EPA) produced a factsheet on the subject of lead in ceiling dust in 1997. The removal of ceiling dust from homes around the ICI Dulux site at Cabarita received some media attention in 1998-9. Only two insurance claims relating to ceiling dust had ever been reported to the Lead Advisory Service NSW prior to the hail damage of 14th April 1999. So although ceiling dust as a source of lead could be regarded as known to some extent, the other hazards of ceiling dust are virtually unknown in Sydney. For example, the effect of ceiling dust on respiratory health, is a "new" environmental health issue only recognised by this writer as a result of dealing with the case in the "Ceiling Dust Removalist Case Study" in 1998. It is not unreasonable to assume that insurance assessors are almost entirely unfamiliar with the issue of ceiling dust hazards, as, it seems, are most building consultants, many building contractors and even some environmental

consultants, even though information is available. Neither the Lead Reference Centre (part of the EPA) nor the Lead Advisory Service (a community service run by The LEAD Group) have been taken up on their offer to the major insurance companies to come out and speak to insurance assessors on the issue of lead.

Anecdote One: A caller to the Lead Advisory Service said that at a meeting in one insurance company in May 1999, management had said that ceiling dust was not removed in the Sydney Aircraft Noise Insulation Project (SANIP). In fact, dust was removed from every building in the project - which has so far amounted to 2696 buildings.

2. Q: Does ceiling dust have to be tested to know that it contains lead? A: It seems not. Every result of ceiling dust analysis that has been reported to the Lead Advisory Service (over 100 results for Sydney homes) contains some lead. Every result for ceiling dusts in Sydney in three published studies found some lead in the dust (more than 80 houses). (See the tables in the answer to **Question 8** in "Thirty Thought-Starters on CEILING VOID DUST in Homes".) An unpublished study by the CSIRO on a further 30 homes in Sydney found lead in all samples. On Saturday 22nd May Channel 7 News reported that insurance companies are insisting on the lead in ceiling dust being tested before the dust removal is decided, but the testing can take up to four weeks. It is certainly possible for the testing to be done in less than 4 weeks, 1-2 weeks being the usual time. All lead assessors in Sydney recommend that ceiling dust simply be removed if it is at risk of entering the living space, as testing will only confirm what is already known. **There's lead in ceiling dust in Sydney.**

Anecdote Two: A plasterer was told by an insurance company representative that the company had asked a government agency whether there was lead in ceiling dust and had been told "there is no risk of any lead being in that dust". This is clearly false.

3. Q: What is the best way to test ceiling dust? A: The first thing that you need to clarify

before answering how you test the dust, is: for what purpose is the dust going to be tested? Some insurance companies are insisting that the dust be tested to prove that it has lead in it. The "litmus" or colour change test used by some ceiling dust removal companies does show a change of colour in front of your eyes, indicating the presence of lead to the disbelieving or uninformed, but is otherwise a complete waste of time – it does not quantify the amount, it simply shows that there is lead in the ceiling dust – a fact that can be taken for granted. For those who have to find out how much lead is in ceiling dust because their insurance company has arbitrarily chosen a concentration of lead in ceiling dust below which the company will not pay for dust removal, the generally agreed protocol is as follows. First label a clean plastic snap-seal sandwich bag or clean sample container with details of what is being collected, from where, by whom, and the date. Then climb a ladder or otherwise gain access to the manhole, and use a clean plastic spoon to collect approximately 2 tablespoons of dust from the area you can reach from the manhole, without actually getting up into the void. Unless you also want to determine the presence of insulation breakdown matter you should be careful to avoid collecting roof insulating materials in the dust sample. The sample can then be sent to a lab for testing either by atomic absorption spectroscopy (AAS) or x-ray fluorescence (XRF). There is no such thing as a laboratory that has NATA (National Association of Testing Authorities) accreditation for testing lead in ceiling dust or in dust generally, though these could be covered by the NATA registration category of "Chemical Testing" or "Lead in Building Residues".

If the purpose of testing the ceiling dust is to help determine the full range of possible health effects from exposure to the dust, it would need to be analysed for a wide range of heavy metals, fibres, radioactive metals, organic compounds and biological contaminants (bacteria, fungal spores, lice, pest faeces, etc) (See the list of what ceiling dust can contain in the answer to **Question 2** in "Thirty Thought-Starters on CEILING VOID DUST in Homes".) We are entering the realm of research here and no householder is likely to pay for such expensive testing and thankfully it is not required by any insurance company at this time. The type of research on ceiling dust that would appear to be the most urgently needed to determine the extent of other likely health risks from ceiling dust (other than the lead-related health risk), is to test the particle size range to determine how much of the dust that's likely to be released say, during ceiling demolition (if the dust is not first removed) is:-

- non-inspirable - able to be filtered out by the nose and tubes leading to the lungs
- inspirable - small enough to enter the lungs, and
- respirable - small enough to go deep into the lungs

Particle sizing research has also been done by Macquarie University researcher Jeff Davis, on ceiling dust samples from 30 Sydney homes, but more funding is required to finish the study and publish the results (also see the answer to **Question 9** in "Thirty Thought-Starters on CEILING VOID DUST in Homes".)

If the purpose of testing the dust is to determine potential lead exposure of children exposed to the dust, that is, when the ceiling dust has left the ceiling void and is in the living areas of the building (eg after ceiling demolition and clean-up), then the best way to test its possible impact on any children who might play on the floor, is by a dust wipe of the floor (even if the floor is carpeted). This is called "clearance testing" and a result below one milligram of lead per square metre of floor (1 mg/m²) is accepted as "cleared" for young children to play on. This clearance level for floor dust has been adopted from the US Department of Housing and Urban Development (HUD), into the Australian Standard on Lead Paint Management Part 2. (See **Question 16** in this article for a description.)

Anecdote Three: A man with a lung condition (sarcoidosis), living in a Department of Housing home, was concerned about his health, when his skylight was smashed on the night of the hail, and there was a haze in the air from the fine dust released from the ceiling void.

4. Q: Should insurance companies have to cover the cost of ceiling dust testing? A: It would seem appropriate that for those insurance companies that insist on the testing of ceiling dust before a determination is made about the cost of removal of the dust, the cost of ceiling dust analysis ought to be covered. Also, for buildings in which a government department has made a policy on testing, eg the federal Department of Community Services requires childcare centres to carry out a lead audit (which can include ceiling dust testing) as a result of the increased likelihood of lead hazards following the hail storm, then payment is appropriate. (See "JBS Lead Safe Certificate Program for Childcare Centres" as an example of what lead assessors can offer childcare centres.)

5. Q: Should insurance companies have to cover the cost of ceiling dust removal? A: It seems

that the relevant legal principle here is the "but for" principle: **but for** the hail, the ceiling dust would not have entered the living space or require removal prior to demolition of the ceiling. Callers to the Lead Advisory Service have reported a range of arguments on this issue:-

- An insurance assessor reportedly said "the ceiling dust was there before the hail storm and it will still be there after the hail storm". This is true in the case of homes with no ceiling damage or roof damage. For others, the ceiling dust will be accessible when it was not previously accessible.
- A home-owner wrote in a letter of complaint to her mayor: "If the ceilings are replaced without having the dust removed and then subsequent testing shows the home to be too polluted to live in then presumably the decontamination of the home will be the subject of a new insurance claim. To have such clean up done to make the home habitable again would be much more difficult and much more expensive than having vacuumed the ceiling in the first place. Also as it was the insurance company's policies which resulted in the home becoming unfit for habitation then it would, presumably, be up to the insurance company to cover interim accommodation costs.

DEVELOPMENT OF A CEILING DUST POLICY IN "TARPTOWN"

6. **Q: Should all homes in the hail damage area ("Tarptown") have ceiling dust removed?**

A: No, the generally agreed best management of ceiling dust is to leave it alone if it is not at risk of falling into the living spaces of a home. So only those homes which have damaged ceilings or leaking cornices through which dust is escaping, and those homes which will have the ceiling demolished and then replaced, need the dust removed to avoid it's spread throughout the property during the demolition of the ceiling.

7. **Q: Is there a level of lead in ceiling dust set as a criterion level for removal of the dust?**

A: No, the general rule being "leave the dust unless it's going to be disturbed", no criterion level has been set. The corollary to "leave the dust unless it's going to be disturbed", is "**remove the dust if it's going to be disturbed**". That is, it doesn't matter what the lead concentration is, the dust should be removed rather than allowed to spread throughout the house. (See the answer to **Question 6** in "Thirty Thought-Starters on CEILING VOID DUST in Homes".) One Sydney lead assessor, Jason Bawden-Smith of JBS, lists a result above 300 milligrams per kilogram (mg/kg) as a moderate biohazard. A level of 1200 mg/kg was set by Woodward-Clyde in the

area around the ICI Dulux paint manufacturing site but this was not a health based criterion level. Woodward Clyde determined that if a home had more than the average for the Concord area of 1200 mg/kg lead in the ceiling void, then chances were that the extra lead could have been due to emissions from the Dulux site. All houses with ceiling dust lead levels above 1200 mg/kg had the ceiling dust vacuuming paid for by Dulux as a gift to the community. There was no EPA or Health Department requirement on Dulux to do this. The NSW Health Department has not and does not intend to set a policy of making a criterion level for lead in ceiling dust, upon which the dust must be removed. NSW WorkCover Authority told a resident that it would be difficult to write a policy on the criteria for ceiling dust removal because of all the different variables. For example, two adults living in a home with a lot of dust may not be as big a problem as a young child who puts their fingers in their mouth in a house with less dust. The total amount of lead, not just the concentration, is an important factor in assessing the potential of the dust to contaminate the property if the dust is not removed prior to ceiling or roof work. Gary Rhyder from WorkCover NSW has commented "WorkCover is of the view that by following the requirements of the National Standard for the Control of Inorganic Lead at Work and the National Code of Practice and Safe Use of Inorganic Lead at Work employers are able to provide safe working conditions for employees working in any lead process". An Adelaide lead researcher, Mike Van Alphen of Lead Sense, says "ceiling dust is too widespread for case by case risk assessment."

Anecdote Four: One council in the hail damage area sampled the ceiling dust of one childcare centre in which the dust was escaping from the void into the children's play area. When the analysis result came back at 1600 mg/kg for lead, the environmental health officer decided to recommend to council that ceiling dust be removed in all council childcare buildings with ceiling damage in the area, [rather than waste the money and time waiting for further analysis results].

8. **Q: The hail storm happened on 14th April 1999, why has no government agency set a policy yet, that ceiling dust be removed prior to demolition of ceilings or when dust is leaking into the rooms?** A: One reason is the attitude that people in Tarptown had enough to worry about without ceiling dust being mentioned. When the WorkCover representative on the Southern Sydney Recovery Task Force raised the issue of ceiling dust at a Task Force meeting, she was silenced. There

was therefore no information on ceiling dust in the induction program given by WorkCover to Tarptown contractors. People may like to believe that “what you don’t know, can’t hurt you”. But it can (see the case study “Child lead poisoned by ceiling dust”). People can only make informed appropriate decisions about what to do when they are informed. Information is power. To its credit, the NSW Government mentioned lead dust could have been disturbed in ceiling cavities and enter the interior of the home in its publication “Important Information for Communities affected by the Sydney Hailstorms April 1999”. The booklet advises simply “Special precautions should be taken. Contact the Lead Centre [Lead Advisory Service] on 9716 0132.” The Lead Advisory Service has taken over 200 calls on the subject and come up with the factsheet for residents: “What To Do About Ceiling Dust” which among other things, advises residents to ask the relevant ministers to set a policy.

9. Q: Are councils getting involved in disaster recovery works in the hail damage area?

A: Councils are not requiring development applications (DAs) for the repair work that is going on because it’s only repairs, not new roofs and the like. Councils are involved in waste collection and would therefore have an interest in the issue of separation of wastes. Removing the bulk of the ceiling dust by vacuuming is effectively separating at least 85% of the dust from the ceiling void, thus saving some tens to hundreds of kilos of dust from being mixed in with less toxic building rubble.

10. Q: Is the NSW EPA making a determination about ceiling dust removal in certain circumstances?

A: If the insurance company rings the EPA they will apparently be advised to remove ceiling dust in homes where the ceiling is going to be demolished. But the danger in allowing verbal advice to take the place of a written policy is that it is easier for the advice to be misconstrued or ignored or for some important aspect to be forgotten in a rushed call, or for different callers to be given slightly different advice.

THE COST OF CEILING DUST REMOVAL

11. Q: What is a typical cost of ceiling dust removal from a 3 bedroom home?

A: This is very variable due to a number of factors – the amount of building debris in the ceiling void that must be picked up by hand to avoid damaging the vacuum filters, the area of the ceiling, access, height of the roof, whether insulation material must also be removed, whether appropriate waste disposal costs are included, which company is doing the quoting and what other services (insulation installation,

interior house cleaning) are being quoted for in the one quote. Prices tend to range from around \$350 to \$2000 with as much as a 4-fold difference in price having been quoted for the same property by different companies.

12. Q: What are the other options for who should pay for the cost of testing and removal?

A: If the insurance companies won’t pay for the cost of removal of ceiling dust then either the owner of the premises will pay for it or it just won’t be done. If ceiling dust is allowed to contaminate the home or childcare centre, then it would be a civil matter to claim clean-up costs after the event.

Anecdote Five: One caller to the Lead Advisory Service was particularly keen for his insurer to pay for ceiling dust removal prior to ceiling demolition as he had seen the result of not having the dust removed first in his neighbour’s house. After three ceilings were demolished, it took **four days to clean up the mess. “All the black dust went everywhere.”**

It is quite conceivable that a single incident of ceiling dust being dispersed over a property could turn the property into “contaminated land”. The NSW EPA’s new guide on *Significant Risk of Harm from Contaminated Land* recommends that in the case of dust contamination, advice should be sought from a suitably qualified person. Expert advice is not cheap and all the lead assessors in Sydney would be likely to recommend clean-up, which is also not cheap.

Anecdote Six: One caller to the Lead Advisory Service thought it reasonable that the petrol companies pay for the removal of ceiling dust, or the airport authority as had happened in the Sydney Aircraft Noise Insulation Project. Vehicle and aircraft emissions are thought to be major contributors to ceiling dust.

13. Q: Is there any government requirement on insurance companies to cover the cost of ceiling dust removal?

A: No, the NSW EPA is happy to express a recommendation to insurance companies that ceiling dust be removed (and the cost be covered by the insurance) but they are not happy to set a written policy on this issue.

Anecdote Seven: One home-owner was told by his insurance assessor that the insurance company was going to get the “final word [on the necessity for removal of ceiling dust prior to ceiling demolition] in writing from the EPA”. Nearly a month later the home-owner does not have a written refusal to cover the cost of the dust removal from his insurer and as he says, “The EPA should communicate clearly with

the insurance companies to say that ceiling dust is a health risk”.

Callers to the Lead Advisory Service have mostly expressed strong views on this issue:-

- “Here is an excellent opportunity for the EPA to set a policy that will remove countless tonnes of contaminated dust from people’s homes, why don’t they take the opportunity?”

- One building consultant said “They [the government] can’t just let the market decide – the health issues [of ceiling dust] need to be decided by government and if the insurance companies have to pay then so be it. It would save time and money if the dust was removed rather than having it go to litigation.

- A manager with the NSW Department of Housing said “it’s appropriate by the precautionary principle to remove ceiling dust without hard evidence of health effects.”

14. Q: Are insurance companies willing to cover the cost of ceiling dust removal? A: Some are and some are telling home-owners that the cost will not be covered, yet no insurance company seems to have put that in writing as yet. Opinions on this issue, as reported to the Lead Advisory Service, are:-

- A resident reported that his insurance company had paid for some ceiling dust removal but only when it was included in the quote for building works, not when it was a separately quoted item.

- Another resident said her insurer said the ceiling dust and debris removal would go into the “fair and reasonable claims category” if it was less than \$1000.

- Chris Henri of the Insurance Council of Australia (ICA) has said that the removal of dust inside the house is the responsibility of the homeowner, as is therefore the dust in the ceiling void. He said that he has asked several insurance companies and loss adjusters to consider the issue of insurance companies covering the cost of ceiling dust removal, but has not heard back from them yet. Chris said that for any material which is required to be removed or neutralised by a government regulation, the ICA would say insurers should cover the cost.

- One insurance company said they would pay for ceiling dust removal if a government agency determined it had to be done.

WHAT’S HAPPENING OUT THERE IN “TARPTOWN”

15. Q: Is it up to the householder to raise the

issue of ceiling dust removal? A: Some building contractors are insisting that they will not work in ceiling voids or cut into ceilings unless dust is first removed. Apart from that it is up to the householder to raise the issue.

Anecdote Eight: One householder with pressed metal ceilings was advised by Wunderlich that moisture would gather in any dust or debris left on top of the ceilings, thus causing rusting of the metal ceilings. They recommend removing the dust as a preventative measure.

16. Q: Should it be left up to the householder to raise the issue of ceiling dust removal? A: No, a home-owner should not have to know about the risks of ceiling dust to be protected from them.

Anecdote Nine: Residents of a Department of Housing home had two asthmatics and a four week old baby in the family home at the time of the hailstorm. A tile broke through the ceiling in the baby’s and mother’s bedroom on the night of the hailstorm. One other ceiling was badly damaged and it will soon be demolished. Black dirty water ran out of the ceiling void onto the floor. The mother of the baby had an asthmatic attack at 4am on the night of the hailstorm and was hospitalised and has also been hospitalised again since then. The baby developed diarrhoea and breathing difficulties and was hospitalised requiring oxygen for two days. The grandmother was very concerned to ensure that dust exposure to the family would not occur during the demolition and clean up.

17. Q: Why are some contractors who are working in the hail damage area refusing to work on or in ceilings that have not had the ceiling dust removed? A: They care about their health, the health of their workers, the residents’ health and the environment.

Anecdote Ten: One plasterer has decided to always organise for ceiling dust to be removed before he starts work on the ceilings. He would guess that the ceiling dust removal only takes away 85% of the dust and the remaining 15% makes a hell of a mess. [Phil Hibberd from Broken Hill has come up with a way of dampening down the dust that cannot be reached by vacuum equipment. That is, to sprinkle water all around the edges of the cornices, to at least dampen the dust and limit its spread during the ceiling demolition.] The plasterer has been getting nose bleeds every single night for over a month, though he never had them before he started the hail area demolition work. He says “even though I wear a respirator, I’m *still* getting dust exposure — I can taste the dust. You get so hot and sweaty you only

wear the respirator for the main demolition work — it stings my nose — once the ceilings are down, the respirator comes off."

18. Q: How is the ceiling dust contractor industry responding? A: Several ceiling dust removal companies have sprung up since the hail storm and some contractors have upgraded their vacuum equipment to HEPA (approximate cost \$5,500) in order to do ceiling dust removal. Even when ceiling dust contractors are booked up for a month due to demand, the considerate ones such as Ceiling Suckers are advising people to call the Lead Advisory Service to get the names of other contractors, so that the work is done for the benefit of all. Ceiling dust contractors are coming to Sydney from as far away as Broken Hill to meet the demand. One ex-SANIP contractor has gained a Department of Housing contract for ceiling dust removal in some dozens of homes. Some builders are working in conjunction with certain dust removal contractors because they find the quality of their work is excellent - so alliances are being built. Several ceiling dust contractors are helping to spread information about ceiling dust hazards by disseminating the EPA's *Lead Safe Information* as well as a risk factor questionnaire published by Rotary to help parents determine whether their children are at risk of lead poisoning and whether they need a blood lead test.

19. Q: How can the resident determine that their home is safe to live in following repair work involving ceiling dust? A: Do a dust wipe clearance test. Purchase some disposable gloves, snap-seal sandwich bags and Diaparene or other baby wash cloths (which are known to contain no lead contamination). Choose an area of floor that would be accessible to children and preferably an area where children would play on the floor. Carpeted or non-carpeted areas can be chosen. Label a clean sealing sandwich bag with the exact location of the sample, the address, the name of the person doing the dust wipe, the surface area to be wiped (in square centimetres), and the date. According to Fred Salome and Professor Brian Gulson (both lead assessors, among other things):-

"An area is marked out on the surface to be sampled. The area should be at least 250 cm², preferably 900 cm² (ie 30 X 30 cm) depending on the amount of dust present. The sample area is marked off using masking tape, the lengths of the sides of the sample area are measured and the surface area is calculated and noted.... [Then the hands are cleaned using a baby wash cloth and the disposable gloves are put on.] A wipe [baby wash cloth] is placed flat onto the surface to be sampled

and rubbed in an "S" pattern [side to side in order to pick up all the dust]. The wipe is folded in half with dust inside and rubbed at 90° to the first "S". The wipe is again folded with the dust inside and placed in a sterile sample container usually supplied by the analytical laboratory." The sample is then sent to a lab for lead analysis.

20. Q: Is sarking being placed under the roof in hail damaged roofs going to reduce the amount of dust building up in ceiling voids in the future? A: Yes, with so many councils insisting on sarking being used in new roofs, the amount of dust falling into ceiling voids will be drastically reduced as the particles are caught by the sarking after they have fallen between tiles etc.

21. Q: Is lead going to build up in ceiling void dusts in the future at the same rate it built up in the past? A: Probably not. In addition to the above reason around sarking, the amount of lead in air has fallen significantly since the reduction of lead in petrol and amount of leaded petrol sold. Industry is generally better controlled in terms of emissions, by the EPA. With the Lead Reference Centre's lead-awareness media campaign and other educational activities, the number of instances of sanding of lead paint from buildings and steel structures ought to be decreasing. Councils may soon start adopting the Development Control Plan (DCP) for lead which has been developed jointly by Regional Organisations of Councils and the Lead Reference Centre. The DCP will make it easier for councils to include conditions on development approvals which control lead being released from demolition and remediation work. (See the answer to **Question 13** in "Thirty Thought-Starters on CEILING VOID DUST in Homes".) So, a general clean-up of ceiling dusts now is a real investment in the future - the level of contamination of ceiling voids will probably never be greater than it is now, unless the dust is just left in homes and is slowly added to in years to come.

22. Q: Is information about ceiling dust being offered to insurance assessors and building contractors? A: Yes, the Lead Reference Centre (phone 9879 4988) and Lead Advisory Service (phone 9716 0132) have each offered speakers and ceiling dust researchers from Macquarie University of NSW (Jeff Davis) and University of Western Sydney (Chris Whicker) as well as lead assessors and ceiling dust contractors, are willing to speak on this issue.

Quotable Quote - Dr Kate Hughes (co-founder of National Toxics Network) asks:
"What's the plural of anecdote? Answer: **DATA.**"



Lead Safe Certificate



This is to certify that on
25 December 1999

123 Kindergarten
ABC Street Wonderland

Was inspected, tested and found to be free from lead hazards.

At the time of inspection the interior and exterior areas of the building were free from deteriorated lead paint. Soil samples were below the 1998 National Environmental Health Forum, Health Based Soil Investigation Levels. Dust wipe samples were below the Australian Standard 4361.2-1998 acceptance criteria for surface dust lead loadings.

Jason Bawden-Smith
Managing Director

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What To Do About Ceiling Dust

A Factsheet for Residents in "Tarptown"

By Elizabeth O'Brien, Coordinator, The LEAD Group, and Manager, Lead Advisory Service (NSW)

Decide whether you might be affected by dust out of your ceiling cavity or void (the space below the roof and above the ceiling):- The older the house, the more dust will have built up in the ceiling void (up to half a ton may be present). If you are still living in your house and there are holes in your ceiling, broken skylights, cornices that do not seal the dust inside the ceiling cavity etc, in rooms that you cannot just "shut the door on" (eg essential rooms, open plan rooms, hallways that are in use), you may be at risk. If a ceiling in a room you are using is in imminent danger of collapse, you should not be using the room. If your roof is now or was previously asbestos cement, there may be asbestos fibres in the ceiling dust. If dust is getting from the ceiling cavity into the interior of the home and there are elderly or very young residents, asthmatics or people with other respiratory problems, if there are crawling babies or young children who still spend a lot of time playing on the floor, if there are children with a lot of hand-to-mouth activity (nail-biting, thumb-sucking, eating non-food items), in all these "at-risk" cases you need to act to stop the dust getting in and being inhaled or ingested **OR** you may have to remove the at-risk person from the dusty situation.

If you are still in your home and a contractor comes and kicks down your ceilings you definitely do not want to be breathing the dust or cleaning it up with your domestic vacuum cleaner. You would want the majority of the dust removed from the void **before** work begins on the ceilings.

If you decide you are being or will be affected by ceiling dust, negotiate with your ceiling or roof repairer – tell them you want the ceiling dust removed as part of their quote for the work. Ask them to call the Lead Advisory Service (phone 9716 0132) for a list of ceiling dust removal contractors (there are approximately 2 dozen companies on the list). Let them know that you are concerned for their health as well as the health of the residents, neighbours and the environment, especially mention any residents who are "at-risk" due to age, hand-to-mouth activity or respiratory disease. If the contractor ignores your concerns and says he's never been affected by the dust, ask him to show you the result from his last blood lead test. The blood lead level is just one indicator of exposure to ceiling dust but it is one that is easily

measured by the GP or at the Workers Health Centre (phone 9897 2466). So if his blood lead level is higher than the Australian goal of 10 micrograms per decilitre, this quashes his claim that he hasn't been affected by the dust. If he hasn't had a blood lead test but he's working in ceilings all the time, unless he shows a willingness to have the test, it could indicate that he is not concerned about his own health. Chances are, if he's not concerned about his own health, he may not be concerned about yours.

Once you have obtained a quote for ceiling dust removal and ceiling repair, submit it to your insurance assessor. If the claim is knocked back, ask for the reason in writing. If you are not satisfied by the reason given or you receive no written reply, you might offer the insurance company more information on the topic (such as the NSW EPA's factsheet *Lead Safe: Lead in Ceiling Dust*, or The LEAD Group's newsletter *LEAD Action News vol 7 no 2 1999*). This information is available from the Lead Advisory Service (phone 9716 0132). Decide how much energy your dust situation is worth using up in negotiating or making a complaint. If you have other issues which are more urgent you may have to put the ceiling dust issue aside for a time. With any luck, the Minister for Industrial Relations or the Southern Sydney Recovery Task Force will have set a dust removal policy in the meantime.

At the time of the ceiling dust removal and ceiling demolition, leave the house unless the contractor is sure he can guarantee you will not be exposed to any dust. It is possible when the ceiling dust removalist has prepared the job properly (by taping plastic over all points of entry of dust), that no dust will enter the interior of the home. If the ceiling/s to be demolished after the dust removal, in a room or rooms which can be closed off (including sealing gaps under doors), staying home should be okay as well. If it's not possible to contain the dust, children and anyone who is allergic to dust should stay away from the home until the dust has settled and been cleaned up. For ceilings that are being demolished, the contractor should pick up any building debris in plastic sheeting, then use an industrial HEPA vacuum cleaner on floors and other hard surfaces and finally wet clean all hard surfaces using a solution of sugar soap.

If you are observing a dust-releasing building repair job and you notice that an exposed worker is not wearing a respirator to filter the dust, phone WorkCover (131 050) to report your concern for the worker's health. If they are allowing ceiling dust to enter stormwater gutters or drains, phone your local council who may be able to send an inspector out. The inspector must observe the contamination of stormwater **while it is happening**, to be able to fine the contractor. Similarly, paint (flakes or dust) is not permitted to enter stormwater.

If the clean-up by the contractor has left dust everywhere, ask for a proper clean-up. If it's time to move the family back in but there's still dust on everything, remember that only industrial strength HEPA vacuum cleaners (available from Safe-T-Vac on 9597 6544) and wet-cleaning with liquid sugar soap is recommended for lead dust clean-up.

The "acid test" for whether a home is lead-safe for young children following demolition or repair work is a floor dust wipe that passes the clearance test. A floor wipe result below one milligram of lead per square metre of floor (1 mg/m²) is accepted as "cleared" for young children (under 5) to play on. You will need to purchase some disposable gloves, sandwich bags which seal properly, and Diaparene or other baby wash cloths (which are known to contain no lead contamination). Choose an area of floor that would be accessible to children and preferably an area where children would play on the floor. Carpeted or non-carpeted areas can be chosen. Label a clean sealing sandwich bag with the exact location of the sample, the address, the name of the person doing the dust collecting, the surface area to be wiped (in square centimetres), and the date. According to Fred Salome and Professor Brian Gulson (both lead assessors, among other things):-"An area is marked out on the surface to be sampled. The area should be at least 250 cm², preferably 900 cm² (ie 30 X 30 cm) depending on the amount of dust present. The sample area is marked off using masking tape, the lengths of the sides of the sample area are measured and the surface area is calculated and noted.... [Then use one of the baby wash cloths to clean the lead off your hands (we all have small amounts of lead on our skin) and put on the disposable gloves.] A wipe [baby wash cloth] is placed flat onto the surface to be sampled and rubbed in an "S" pattern. The wipe is folded in half with dust inside and rubbed at 90° to the first "S" [thus picking up all the dust in the sample area]. The wipe is again folded with the dust inside and placed in a sterile sample container usually supplied by the analytical laboratory." The sample is then sent to a lab for lead analysis. A list of labs who do lead analysis is

available from the Lead Advisory Service (phone 9716 0132) or you can ask NATA (National Association of Testing Authorities) by phoning 9736 8222, or you can look up "analytical laboratories" in the Yellow Pages. Prices vary enormously. Expect to pay at least \$25 for lead analysis, more if other heavy metals are also analysed.

For those rare hail damage victims who have time, you could write a letter to the NSW Minister for Industrial Relations, Jeff Shaw, or to the Minister for the Environment and Minister for Emergency Services, Bob Debus (Parliament House, Macquarie St, Sydney) asking them to set a disaster recovery policy:- that houses with ceilings damaged by hail have the ceiling dust vacuumed out prior to ceiling demolition. Such a policy would protect workers from excess exposure to the dust, and help to protect the residents and the environment from the contaminants in the dust as well as allow appropriate disposal of this contaminated waste (separated from other building debris). The lead in the dust can be recycled by taking the properly contained dust to the Australian Refined Alloys (ARA) secondary lead smelter in Alexandria (phone 9516 5099).

Remember that only you can keep the ceiling dust problem in the proper perspective. You will know if the electrical power is not safe or if there are other issues which take priority over the ceiling dust issue. Asbestos removal, whether done by the householder or a contractor, must follow the safety procedures in the Asbestos Regulations. Only asbestos removal for asbestos materials greater than 200 square metres in area requires a licensed asbestos contractor.

If you need assistance, you can call the wonderful people at the Recovery Centre on 9697 9389 for help with any problems. The Southern Sydney Recovery Task Force (according to its Community Information Update of 7th June 1999) will attend to all "high priority" households first and then extend its work to other households. "High priority" households include those with elderly people or children who are living in unsafe conditions. Houses are considered unsafe if the ceiling could fall down, if roof coverings could fall through the ceiling, if the roof covering could blow away, etc. Advice is available at the Recovery Centre for everyone – including people who are having difficulty getting work done on their homes, tenants, and relatives and neighbours of "high priority" households. For emergency help call 1800 227 228. The Insurance Council of Australia (ICA) has a representative who handles insurance complaints and who is a member of the Southern Sydney Recovery Task Force. Phone the Insurance Council of Australia on 9253 5100.

Young & Bracey's Ceiling Dust Removal Procedure

*By Peter Kearns, Builder's Licence No: 35894, Young and Bracey Pty Ltd, BUILDING CONTRACTORS,
14 Fitzroy Street, MARRICKVILLE NSW 2204, Telephone: 9565 1155, Facsimile 9565 2667*

This Procedure to Remove Ceiling Dust was prepared by our employees (not Sub Contractors) based on their experiences over the last 3½ years in 400 houses under the Sydney Aircraft Noise Insulation Project [SANIP].

We employ 3 foremen to monitor and control this work and have a staff of 16 to carry out the work.

Air monitoring is carried out by an Independent Company. We use H.E.P.A. Vac systems – Trailer mounted 1 x 20 Litre Portable, 1 x 12 Litre Portable. Currently we are pursuing a second trailer mount vac unit.

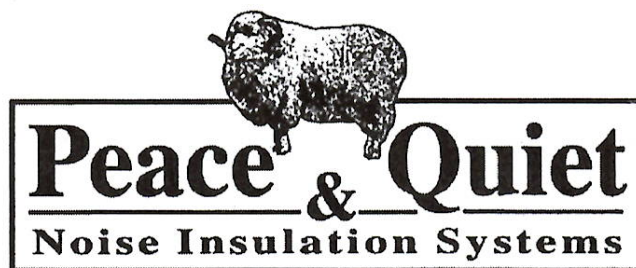
We have in place an accredited quality assurance procedure and a full O.H.S. Policy

CEILING DUST REMOVAL PROCEDURE

- Ensure all HEPA Vacuum machinery is well maintained and serviced by manufacturers of equipment.
- Contact homeowner three (3) days prior to starting work on site.
- Visual inspection by staff to seal up penetrations and cracks at wall/ceiling junctions, manholes, light fittings etc.
- Seal any cracks, opening and the like with tape or sealants.
- Place air monitoring equipment inside home, and on workman clipped to his belt. Air monitoring is carried out by A.D. Envirotech Australia and a report is sent to Young and Bracey Pty Ltd for our records.
- Set up site by fixing ladders in position below roof entry point. Should roof guard rails be required these are installed prior to

starting on site.

- Workmen – direct employees of Young and Bracey Pty Ltd are now ready to commence vacuuming process and appropriate protective equipment is put on by all staff entering roof cavity. Dust mask gloves, disposable overalls, air monitor, lighting, work boards and goggles.
- The roof is opened for access usually by lifting off 1m² of roof tiles or one sheet of metal strip roofing this point of entry is where the vacuuming commences.
- The vacuuming process is carried out by a team of two workmen.
- The extracted dust is sealed in metal drums on the trailer mounted vacuum unit.
- When fully vacuumed the ceiling is sprayed with a P.V.A. spray to consolidate any dust not accessible or not able to be picked by the vacuum. The spraying commences at the furthest point of entry and is worked back to entry point.
- All equipment is removed from roof, any debris, rubbish, gloves, overall. Etc are bagged and sealed in heavy duty clear plastic bags for disposal by Young and Bracey Pty Ltd.
- The roof is reinstated and rendered watertight.
- All ladders and guardrails required are removed.
- The dust and contaminated clothing are disposed of in accordance with EPA regulations. Waste is disposed of through Pacific Waste depots with certification nominating the type of waste.



Peace & Quiet Systems Pty Ltd.

ACN 073 420 587 P.O. Box 190 NORTH SYDNEY NSW 2059

Warehouse Cnr Queen and Railway Sts: PETERSHAM

Commenced business on 26th March 1996

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Peace & Quiet have three crew of experienced operators with powerful Nilfisk industrial vacuum cleaners to safely vacuum all dust and debris from ceiling spaces. These most powerful industrial vacuum cleaners have 2 x 1200W motors with HEPA filters which are able to be wheeled into the most difficult sites closest to the ceiling dust source. P&Q follow all procedures from the Minimising the Creation and Spread of Lead Contaminated Ceiling Dusts:- the general procedures detailed in Division 1, Introduction (page 2) Clause B from S.A.N.I.P. are followed. All work is been carried out according to NSW Workcover Authority guidelines:- Workers wear disposable masks and suits during vacuuming and dust and debris is sealed in heavy duty plastic bags and removed from site. The disturbed dust is MONITORED during operations and a hazard report provided to householders.

P&Q work from OUTSIDE roofs, roofing is removed, so all dust is sucked out from ceilings, out through roof to sealed vacuum containers. This ensures no possible hazardous dust enters homes.

Peace & Quiet vacuum ceilings in conjunction with supplying and installing thermal and acoustic insulation:-

InsulfleeceTM Australia's most thoroughly tested and proven New Australian Wool insulation, 100mm thick – 10kg/m³ density, moth, mildew and fire proofed

PolyrollTM polyester 85mm thick – 20kg/m³, 50mm thick – 32kg/m³ or 25mm thick – 32kg/m³

All these soft fibre insulations come in 10m rolls 430mm wide to fit 450mm joists or 580mm wide to fit 600mm joists.

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Ceiling Dust and Emission Sources

By Mike van Alphen, Lead Sense, PO Box 3421 Rundle Mall SA 5000

A report on lead in Port Pirie by the SAHC (South Australian Health Commission) in August 1983 is the first place known to me where lead in ceiling dust is mentioned. Anecdotal evidence suggests that collapses of ceilings in both Broken Hill and Port Pirie under the sheer weight of ceiling dust have been known for at least the last 30 to 40 years.

Ceiling dusts in Broken Hill readily amount to 2-5 cm and more deep and 40 to 100 kilograms per square metre in older mine-houses close to the line of lode. (ie the ore body).

Ceiling dusts preserve the history of fugitive dust fallout and accumulation in our communities. From the days of dusty roads and horse drawn carts, ubiquitous coal and wood burning to the advent of the motor car and the rapidly growing use of leaded petrol from the 1930's the settled dusts in the ceiling space of older houses may preserve an amazing stratigraphy. They are artefacts of historical air pollution and surface dust emissions. For the biologist there is a rich collection of pollens for example. In industrial suburbs there will be accumulations from foundries, coal-gas works, brick works, battery factories, pigment factories and other industries that have long since closed down or moved elsewhere.

Ceiling dusts are an excellent media for assessing the geographic extent and magnitude of dust emissions in residential settings. Ceiling dusts can be long-term accumulations over the age of a building, or preserve the chemical fingerprint of a short-term episode of local particulate emissions. Chemical species in emitted dusts have a good chance of being preserved intact in the absence of moisture and mechanical abrasion once trapped in the confines of a ceiling space. The processes of degradation of toxic compounds that may take place in soils for example may be unlikely to take place to the same extent in ceiling dusts.

The scientific value of ceiling dust as a long term deposit gauge analogue is important. Direct human exposure to ceiling dust cannot be underestimated. Pathways of exposure can be many and varied; the risks of exposure to ceiling dust are not well understood as ceiling dusts have not been comprehensively characterised. Lead in ceiling dust is one issue among many. It is assumed by many

that the community is not exposed to ceiling dusts.

Broken Hill

I first sampled ceiling dusts while working as a geologist in Broken Hill in 1989-90 and living in the former "British Mine" manager's house ON the line of lode north of Blackwoods Open cut. On windy days dust visibly blew / trickled through vents linking the ceiling space and the house living space. In order to seal the vents hundreds of kilograms of dust were removed. Out of curiosity I had the dust tested. Over subsequent months I collected and analysed samples from 21 locations. This work was reported by letter to government, industry and other authorities and then later in the 'Barrier Daily Truth', on the 20th of March 1991.

The geometric mean lead concentration in Broken Hill ceiling dust from 21 locations was ~ 0.6% Pb [lead] or 6000 mg/kg, with Pb > 1.0 wt % (on a whole sample basis) for 8 locations either adjacent to the line of lode or in Broken Hill South.

These data were evidence of the high mobility of Pb in dusts in Broken Hill and the probable penetration of Pb dusts into the living space as well as ceiling space. Comparison with the Port Pirie ceiling dust data available from Peter Body [of Royal Australian Chemicals Institute and SA Dept. of Planning and Environment] suggested that community-wide Pb dust mobility in Broken Hill had at least been at a high magnitude at some time and would be reflected in elevated child PbB [lead in blood]. The particular design of ceilings in Broken Hill with vents commonly linking the ceiling space and living space was recognised as being problematic. Ceiling dust was not suggested to be THE source of child Pb exposure but was proffered as evidence of widespread residential Pb contamination. The need for a child PbB survey was now very clear.

A subsequent child blood lead testing survey in 1991 established the nature of child lead exposure in Broken Hill and in time the community has come to both accept and deal with the Pb issue. Broken Hill as a location and community maintains its standing as a wonderful jewel in the NSW outback. Some without local knowledge state that the Broken Hill child lead issue was recognised as a result of the Pb poisoning of dogs in Broken Hill. Curious indeed

given that key health figures were not aware of a publication on dog Pb poisoning by Koh and Babidge (1986) in the Australian Veterinary Journal (Barrier Daily Truth, 24 April 1992).

Levels of Pb in ceiling dust > 1% reported in early 1991 were critical in getting the extent, magnitude and implications of dust contamination in Broken Hill recognised. This was the public information that exposed the extent of Pb dust in homes in Broken Hill. The blood lead testing of Dr Don Howarth in late 1990 and the many letters of residents written to NSW politicians complaining about dust emissions, and the local residents action group were also important. The subsequent NSW Government 'political response' to Pb appeared to be catalysed by emerging findings and political sensitivity to the Broken Hill issue and was substantially founded on readily available findings from Port Kembla, Boolaroo (particularly post-earthquake), Glebe, Mort Bay and Summer Hill. Lead advocacy in NSW is also the strongest of any Australian State. Responses included the Interdepartmental Lead Taskforce, and Select Committee upon Lead Pollution. Today New South Wales has the most proactive approach to community wide child lead exposure of any Australian State.

At 1% Pb in Broken Hill ceiling dust, (based on my 1991 data) there is 1.5% Zn [zinc]; 200 mg/kg Cu [copper]; ~ 60 to 120 mg/kg As [arsenic]; 60 mg/kg Cd [cadmium] and 20 mg/kg Ag [silver] (2/3 of an ounce of silver per tonne of ceiling dust) this reflects classic Broken Hill ore body elemental ratios.

To find SILVER near two ounces per tonne in ceiling dust from one house for example indicates unambiguously the orebody origin of the metals in ceiling dusts of the Silver City [Broken Hill].

Adelaide Data

To get the gravimetric ceiling dust loading value you need to sample a measured area. Accumulations of <100 micron fraction ceiling dust in 11 houses in an older non-industrial Adelaide suburb averaged 430 g/m², (s.d.=370) while in an inner-city industrial setting 10 houses had dust accumulations of 1640 g/m² (s.d.=1130). A maximum value of 3.6 kg/m² of ceiling **dust was encountered.**

What sort of roof material?

Galvanised Iron

What are the influences of roof material on the

character of ceiling dusts? Galvanised iron roof materials fail at the overlapping sheet margins with age and white accumulations of ZnO and ZnCl appear at the laps. If you look carefully at the ceiling dust in an old house with a deteriorating galvanised iron roof you will see parallel white bands of Zn rich powder in the ceiling dust (readily 4% Zn). Check whether the white bands match the position of edges of the *current* roof iron sheets. If you are interested in nearby industrial emissions I could advise that samples be taken between these bands but more usefully don't choose houses with galvanised iron roofs for testing for Zn and Cd in dusts. However, in Broken Hill and Port Pirie the galvanised iron effect may be swamped by the high levels of Zn in depositing dusts.

For 12 non-galv. roofed houses in non-industrial settings, in Adelaide, the mean Zn in ceiling dust level was 600 mg/kg (s.d. = 234); whereas in 21 galv roofed houses the level was 4870 mg/kg (s.d.=1570). For a representative sample of the ceiling dust, for exposure investigation purposes, a representative area or transect sample type is appropriate, not a point grab sample. Where houses have been re-roofed, paint chips can be seen at iron sheet boundaries. The sieving of ceiling dust can limit the impact of "non-dust" materials and is recommended for research purposes when preparing ceiling dust samples. Paint Pb does not appear to be a major component of ceiling dust relative to motor vehicle Pb.

Terracotta Tiles

There is much fine-grained red-orange ceramic chips and dust material in ceiling dust in houses with terracotta tile roofs. One of the elemental curiosities of ceiling dusts from such houses in Adelaide is elevated levels of Vanadium (eg 94 mg/kg compared to 28 mg/kg in houses not tiled with terracotta).

Cement Tiles

The particle size distribution for ceiling dusts associated with terracotta tiles, cement tiles and slate will reflect a contribution of coarse material from the roof material. Ceiling dust associated with cement tiles can have a high proportion of sand sized particles from abrading cement.

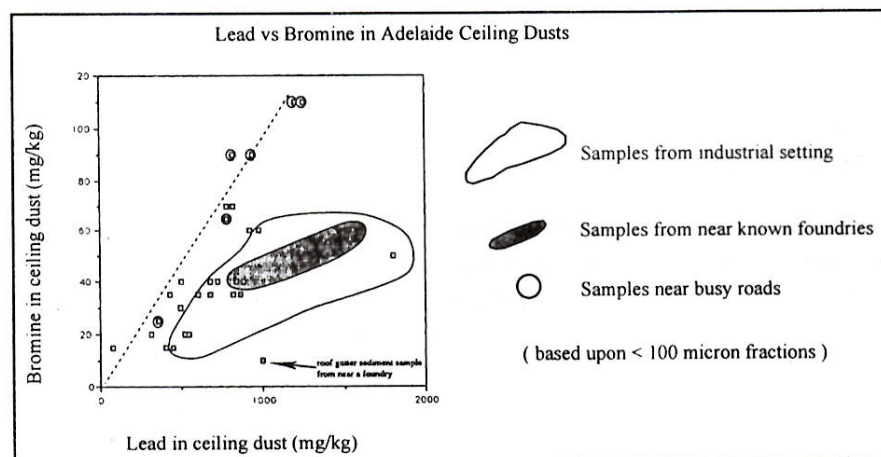
Gross dust accumulation rates

Dust accumulation rates determined in Adelaide range from as low as 1 gram per square metre per

year from newer houses in distant settings to some 60 grams per square metre per year for houses in industrial settings. It is clear that prior to the 1950's and 1960's, dust deposition rates were substantially greater than they are now.

Motor Vehicle Lead in Ceiling Dust

For houses in non-industrial settings there is a strong linear relationship between lead and bromine in ceiling dust that reflects the ratio of these elements in leaded petrol. The presence of industrial Pb can be separated from motor vehicle lead.



In industrial settings the Pb -Br [lead - bromine] relationship breaks down due to the presence of non-motor vehicle Pb emissions.

A simple traffic proximity index that is a sum of the traffic flow divided by distance to the road for all roads within 400 metres can be easily developed. Additional functions for prevailing winds and complex deposition decay functions with distance could be used. An added dimension to the index is the historical and current traffic count data. Using a traffic proximity index the lead loading in ceiling dust (mg Pb/m^2) can be seen to be strongly related to a simple traffic proximity index.

The upshot is that *hot-spots for high lead loadings from motor vehicles in ceiling dust can be predicted.*

Miscellaneous Observations

I mention the stratigraphy of dusts - look carefully for colour changes layer by layer when gently scraping down through dusts. Within 1 metre of the eaves of the roof (if the eaves are relatively open and the house exposed to the wind) you can see

sometimes 'sand ripples' that are evidence of high speed winds across the dust surface. This disturbance is limited in extent.

Re-roofing and laying insulation can variously tend to preserve further or destroy the scientific integrity of ceiling dust accumulations. Brilliant historical snapshots are available from houses that are regularly extended with new rooms. The age of a house, room or ceiling needs to be known so as to interpret the deposition rate of dust or lead for example. In addition, if you collect samples from under insulation you need to know when the insulation was installed.

Ardeer Battery Factory Melbourne; Vic EPA

Lead in ceiling dusts was analysed with a view to evaluating the extent of Pb contamination adjoining a former lead-acid battery factory in Melbourne. This is another example of using ceiling dust as a long term deposit gauge to determine the extent and magnitude of a point source emission problem. (The Age, 20/7/92, p.10). Samples > 2000 mg Pb /kg were encountered in this investigation.

ICI Dulux, Concord, Sydney; Woodward-Clyde

The investigations at Concord, Sydney are another example of using ceiling dust as a means of drawing a line around an area subject to potentially heavy airfall contamination.

Summary

Risk assessment associated with ceiling dust, and the characterisation of ceiling dust is in its infancy. However the technique of using ceiling dust as an analogue for dust deposition gauges is showing much promise. Concentrations and loadings of contaminants in ceiling dust can be used to readily delineate areas subject to various degrees of impact of near-by industries, polluting activities and road emissions for example.

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