This year half a million people will receive the largest pesticide dose in their lives.

Chemicals banned in other countries for their power to cause cancer, birth defects, nerve damage and allergy will be sprayed freely in our homes and workplaces.

The indoor air can be dangerously polluted for weeks, months or even years after the sprayers have gone.

It's all perfectly legal. Banks and building societies insist on it. Government scientists defend its safety. Yet some of our finest historic buildings are conserved without the supposedly essential – and costly – services of the chemical treatment firms. Nobody knows how many are poisoned by this largely needless exposure to pesticides. Nobody is looking. This book reports some of the hundreds of cases known to the London Hazards Centre – people who became ill after using them at work, handling treated timber, or just breathing the air in what they imagined was the safety of their own homes. Several have died.

Their stories are tragic indictments of an industry out of control but this is also a practical handbook. Detailed technical information shows how everyone involved – workers, tenants, householders, architects, builders, surveyors and health professionals – can halt this public health disaster.

ONDON HAZARDS CENTRE 3rd Floor, Headland House, 308 Gray's Inn Road, London WC1X 8DS.
hone: 01–837 5605

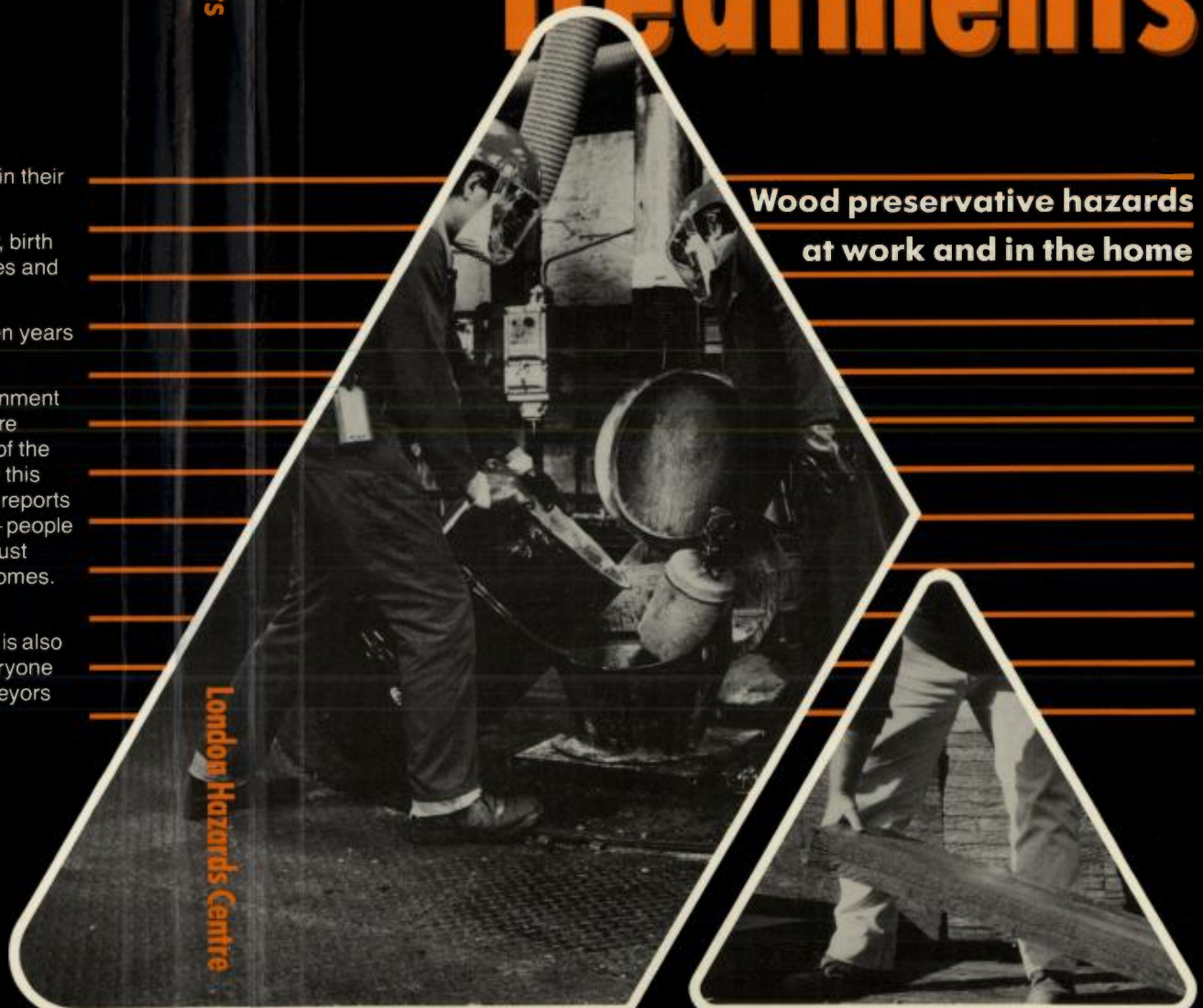
Toxic Treatments

London Hazards Centre

£5.95

Toxic Treatments

Wood preservative hazards at work and in the home



A LONDON HAZARDS CENTRE HANDBOOK

Toxic Treatments

Wood preservative hazards at work and in the home

A LONDON HAZARDS CENTRE HANDBOOK

Warning

This book describes the most serious and widespread pesticide risk facing people in Britain today.

Chemicals which are not allowed on our fields may be sprayed freely in our homes and places of work. Three million houses have been treated already. Next year at least half a million people including children, babies and the yet unborn, will receive what for many will be the biggest pesticide dose of their lives.

The wood preserving industry says this is all perfectly safe. The British government, almost alone among the legislators of Europe, agrees with them.

Before accepting these assurances we need the answers to some urgent questions:

▲ If these chemicals are safe to work with, why did Cuprinol employee Keith Pritchett die of leukaemia?

What caused the stomach cancers which killed two council carpenters in Aberdare?

Why is former Rentokil sprayer David Rea dying of leukaemia?

▲ If it's safe to spray these pesticides in people's homes, why did young Llwyd Nicholls get aplastic anaemia?

Why did Ann and Eric Riley become ill? And why did Eric die?

In trying to answer these questions we hope that we have produced a book which will change the way people think about the safety of working and living with wood preservatives.

We thank the hundreds of people who have helped us and trust them to understand our decision to single out only one person for special mention.

For Llwyd, and the future,

London Hazards Centre
November 1988.

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Introduction

Toxic treatments

Moving into a derelict old pub in sub-zero temperatures might not be everyone's idea of the perfect way to start a new year. But to Ann and Eric Riley as they took possession of their new home on 9 January 1987, the outlook couldn't have seemed rosier. The Old Town Wall House in Wyatt Street, Kings Lynn was exactly what they wanted – large and full of possibilities.

Everything needed doing to the house – building work, timber treatment, wiring, plumbing – but the Rileys knew about building. Eric was head of the construction sector at Norfolk College of Arts and Technology and together the two of them had already restored a far more dilapidated building, a 60-year old farmhouse in Wales, without any professional help.

This time they would have 'the professionals' to do the large jobs – starting with the timber treatment specialists. A local firm, Ford Preservation, began work on 13 January. They sprayed wood preservative fluid on the floorboards and joists of all the upstairs rooms and the timbers in the two lofts. The fluid contained two powerful pesticides – the fungicide PCP (pentachlorophenol) and the insecticide lindane (gamma-HCH).

The work was finished on 15 January. Despite the bitter weather, which had now blanketed the house in snow, the Rileys followed the instructions from Ford Preservation to ventilate well and keep out of the treated areas for two days. On 17 January they slept upstairs for the first time in one of the treated bedrooms.

From 13 January, the day treatment started, Ann's diary showed something was not quite right. But it was some time before both Ann and Eric realised how badly their health was being affected. Extracts from the diary show the gradual loss of their usual fitness and energy:

> **Jan 13**: headache bad. **Jan 15**: house smells. **Jan 17**: slept upstairs – Bedroom 4. **Jan 19**: very tired and Eric feeling 'unreal' today – exhaustion

generally. **Jan 20**: Both not feeling too good – tired? . . . flu? **Jan 25**: we are very tired indeed. **Jan 26**: felt very weak and feeble . . . exhausted. **Jan 28**: slept like a log, felt not very well. Legs and feet sore – all weak. **Jan 29**: I have a runny nose – plaster dust? – feel awful . . . floors up and dust all over the place . . . very tired and under strain. **Feb 3**: very tired and 'dusty' – sore throat and sinus generally. **Feb 4**: feel awful/depressed, cold, fat, spotty, sore! **Feb 5**: cramp in leg . . . fell asleep in chair all afternoon – waste of time. **Feb 9**: awful colic – agony. **Feb 10**: have flu and feel awful – headache and cold etc. **Feb 11**: ill with flu. **Feb 12**: in bed all day with flu – headache/cold/cough, etc. . . . felt awful all day, yuk! **Feb 13**: have come home to bed, exhausted. **Feb 16**: both of us very tired and stressed. **Feb 17**: damp-proofers came to do downstairs . . . awful smell. **Feb 18**: damp-proofers finished first stage, headache with spirit smell – terrible . . . headache and exhaustion, both of us worn out. **Feb 20**: party cancelled due to illness – couldn't face it. **Feb 24**: damp-proofers finished 'bits' off – smell again. **Feb 25**: smell bad – feel awful.

From January to April Ann and Eric worked hard on the house. A few days after Ford Preservation finished the timber treatment, Eric began weeks of spare-time and weekend work in the lofts, dismantling part of a huge central chimney and building a timber platform for the cold water storage tank. By the weekend of 4/5 April he had progressed to the small loft over the kitchen. From there and with much exertion in a confined space, he managed to install a lintel over the kitchen window.

Each day they had to move furniture round to clear spaces for the builders, electricians and plumbers, and to create habitable rooms for themselves. Ann describes their nomadic life at that time:

> 'We lived and slept in upstairs treated rooms which we heated up madly and cut out the ventilation because it was so cold. For example there were three heaters totalling seven kilowatts in a 12 ft by 12 ft room. All these were on at once because it was so cold in the rest of the house.'

Ann fixed two extra thicknesses of curtains at the windows and heavy draft excluders on the doors.

Through March and into April the Rileys continued to feel ill, often experiencing feelings of unreality and exhaustion, with heavy lethargy:

> 'We, who normally are two very energetic, lively people, felt very weak, feeble and lacking in muscle power. We also had digestive problems, we felt "off-colour", not hungry, sick, had cramps and muscle problems, particularly in our legs, and aching limbs. We felt as if we had gastric flu all the time; we had stomach cramps and when we had richer food were quite queasy and were actually sick on quite a few occasions.
>
> 'I know we had moved house and had a lot to do, but we are people who thrive on doing up houses, so it couldn't be put down to the planning and

work here. We lived for the idea of me being able to run my Yoga classes at home and turning the old pub into a home. It was a joy to us. We could not understand why we felt so bad and kept thinking we had "flu" symptoms all the time.'

On 11 April Eric was visiting friends when he collapsed in the kitchen with what seemed to be an epileptic fit: he was making growling noises and kicking his legs. His eyeballs were rolling under closed lids. Eric was unconscious for 40 minutes. When he woke up he had no memory

△ **Snow covers the Rileys' cottage on the day Ford Preservatives start the wood preservative treatment.**

◁ **Ann and Eric, healthy and optimistic, outside their dream home in the Autumn of 1986.**

of his collapse. Medical tests, including an electroencephalogram to monitor the electrical signals from the brain, failed to uncover anything abnormal. His collapse was put down to stress. It did not occur to the Rileys or to any of the medical staff involved that he might have been poisoned, so no tests were done for chemicals in his body. Blood samples taken for other tests were not retained by the hospital.

Eric Riley was never the same again. Gradually over the summer, with rest and sleep and much support from his wife and friends he regained some of his strength. To outsiders, he seemed to be improving but everyone noticed that he looked older, often grey in the face, more than his 40 years instead of less.

In September he returned to work at the college, but his colleagues had to make allowances, as Ann explained:

THE OBSERVER,

Rentokil safety scare after workmen die

EXCLUSIVE

by EILEEN MACDONALD

CHEMICALS sold by Rentokil and other leading manufacturers are causing death and illness, according to evidence in the hands of The Observer.

fears about chemicals. Last week the association was told they were PCP, TBTO and

with these chemic about time these banned here.'

One of the histories is tha teacher, who the Victims Pesticide Poison started having epile weeks after her sole century cottage near was sprayed

Merry may have been poisoned

Rentokil

Dry Rot, Wet Rot Fi

In DIY shops

△ ***The Observer*** **article that alerted Ann and Eric Riley to the dangers of wood preservatives** (*The Observer*, 18 October 1987).

> 'The problems he had were still there. His memory continued to be a problem, he forgot large chunks of our past, sometimes he could not remember things from one minute to the next; he could not be relied on to cope with more than one simple thing at once. His muscle co-ordination was still faulty, he still tripped up familiar steps and his tennis and badminton were not as before.
>
> 'He laid a tiled floor in our kitchen and couldn't get the tiles straight . . . and he put a tile on the wrong way up – not at all the normal actions of the previous Eric. If he made a mistake he flared up in a temper and once actually hit his head against the wall in anger. It was awful.'

In October the Rileys made the connection for the first time between their illnesses and the chemicals they'd been living with for ten months. In the *Observer* they read a report by Eileen MacDonald describing cases of wood preservative poisoning collected by the London Hazards Centre. One of the victims, a 40-year old teacher, had started to have epileptic fits two weeks after her home was sprayed with wood preservative containing lindane. After talking to the Hazards Centre and phoning the teacher at her 17th Century cottage in Essex,

Below we reproduce summaries of toxicity data on lindane and PCP taken from a guide to chemical hazards issued by the US government nine years before these substances were sprayed in the Rileys' home (NIOSH/OSHA 1978). We have added the summary from another entry in the guide, on organic tin compounds, because this group contains the third most commonly used wood preservative, tributyl tin oxide (TBTO).

Lindane hazards

Symptoms: irritates eyes, nose, throat; headache, nausea; clonic convulsions, respiratory problems, cyanosis; aplastic anaemia; skin irritation; muscular spasms.

Target organs: eyes, central nervous system, blood, liver, kidneys, skin.

Pentachlorophenol hazards

Symptoms: irritates eyes, nose, throat; sneezing, coughing; weakness, anorexia, low-weight; sweating; headaches, dizziness, nausea, vomiting; dyspnoea [breathlessness], chest pain, fever, dermatitis.

Target organs: cardiovascular system, respiratory system, eyes, liver, kidneys, skin, central nervous system.

Organic tin hazards

Symptoms: headache, vertigo; irritates eyes; psychologic neurologic disturbance; sore throat, cough, abdominal pain, vomiting, urine retention; paresis [slight paralysis/weakness]; skin burn; pruritus [itching].

Target organs: central nervous system, eyes, liver, urinary tract, skin, blood.

the Rileys knew that lindane poisoning was clearly associated with epileptic-type fits and that the known effects of exposure to lindane and PCP could explain everything that had gone wrong with their health.

The Rileys were horrified at the way in which lack of information had allowed them to increase their exposure to the pesticides by working for days in confined spaces where the chemicals had been sprayed and by sleeping in treated bedrooms sealed and heated against the bitter winter.

They immediately abandoned the upstairs rooms and started to sleep downstairs. They washed and cleaned everything which had been in the treated rooms and kept the upstairs windows open all day. Their health seemed to improve. Ann had fewer headaches and feelings of fuzziness in the head; problems with aching muscles, particularly in her legs, got better. 'I felt more energetic, more like my old self'.

Alerted at last to the possibility of poisoning, the Health Service belatedly arranged, on 27 October, for Eric's blood to be tested by the Poisons Unit at Guys Hospital in London. The Rileys were still waiting for the results when Eric had his second fit and drowned in the bath on the evening of 2 January 1988.

Ann Riley describes how it happened:

> 'We'd had a very happy day. We worked on the kitchen, fitting a sink top and then I went into the Yoga room while Eric started to tile the window area around the sink unit. When I returned after two hours I was horrified by the strong smell of the Texas tile adhesive and grout he'd been using. I immediately retched and flung open the kitchen door, but Eric said he couldn't smell anything. He'd had no sense of smell since his fit in April. Afterwards I realised he was "high" on the vapour from the adhesive or the fungicide in it. I said "It's time to get ready to go out". Eric said he needed to wash his hair and would do it in the bath. He raced upstairs, very pleased and happy about the day's work, and I went to finish some paperwork. I heard the overflow running as I went upstairs but didn't think anything of it until I reached the bathroom and found him face down in the bath with the tap still running and the water going out over the overflow.'

△ **Eric Riley, Christmas 1987. Eric died just one week after this photograph was taken.**

In another week it would have been exactly a year since they moved into The Old Town Wall House. Their friends were planning a party.

Dr Douglas Eakins, the consultant pathologist who carried out the post mortem at Queen Elizabeth's Hospital in King's Lynn, found nothing to explain Eric Riley's illness. At the inquest the Coroner recorded an open verdict. He said:

> 'This man drowned in the bath but we have to look deeper back to find out why he drowned. The symptoms described can be related to poisoning by one of the substances which may have been present when the house was treated or they can happen from from causes unknown.
>
> 'An open verdict is appropriate because there are many factors which people may wish to investigate elsewhere.'

Ann Riley is determined that investigations must continue:

> 'Until he was exposed to timber treatment chemicals Eric had not ever been ill in his life. He was slim, fit, strong, a sportsman, quick-witted and wonderful with words. His sudden collapse in the Spring and his death are very odd under the circumstances and must be investigated. I want to make the dangers known to those who use these chemicals and are exposed to them, and have them banned here in the UK as they are already in other countries.'

Official attitudes to this kind of demand were well summed up by a spokeswoman for the new owners of Ford Preservation. She told the local paper:

> 'As far as we are concerned, it is perfectly and absolutely safe and the suppliers are an extremely reputable company. It has passed stringent tests and falls within the Government's safety standards.'

Ten years of evidence

The London Hazards Centre does not agree with this stock response from the timber treatment industry, or the more long-winded versions uttered by the Ministry of Agriculture, Fisheries and Food and the Health and Safety Executive, uneasy bedfellows in supervising the agricultural, industrial and domestic use of pesticides in Britain.

As we show later in this section, researchers have been warning for more than 10 years that timber treatment in homes, schools and workplaces could lead to dangerous concentrations of pesticides in the air for months and in some cases years afterwards. And over the last decade the numbers of victims has steadily grown in a needless confirmation of the scientists' predictions.

In West Germany the Association of Victims of Wood Preservation Products (IHG) reached a membership of 5,500 members a year after its formation in May 1983. In Britain the number of cases known to the London Hazards Centre increases almost daily. At the time of writing we know of more than 200 cases where individuals or groups became ill after wood preservative treatments of homes and workplaces or after exposure to the chemical or treated wood in pretreatment plants, timber yards and building sites.

After the *Observer* article on 18 October 1987 the Centre was overwhelmed by a flood of phone calls and letters. We were able to record and follow up only the more serious cases. Several calls came in from people representing groups of workers complaining of ill-health in timber pretreatment plants and wanting advice on cleaning up the hazards.

Together the cases in our files add up to several hundred people. Each new report in the media brings in more people who, like the Rileys, never dreamed that the process of timber treatment demanded by banks and building societies and officially approved by government agencies could be the cause of illness and death.

Other deaths

Our files now include eight people who suffered epileptic fits after timber treatment of their homes or after using chemicals. We are also advising lawyers in the case of a child who started having fits soon after he was born. His home was treated for woodworm late in his mother's pregnancy. He later developed asthma.

Eric Riley's inquest produced an open verdict. This was also the verdict on the death of Jim Merry at City of London Coroner's Court on 20 September 1988. Jim was exposed to lindane, PCP and TBTO when, investigating complaints of ill-health among tenants, he inspected the recently treated roof spaces of homes on the Woodberry Down Estate in Hackney, North London. Doctors at Bart's Hospital reached a tentative diagnosis of dermatomyositis as the cause of Jim's death in November 1987.

This same rare autoimmune disease of the connective tissues also killed John Slate. In the Summer of 1987 John used the same chemicals to treat the loft and garage of his own home in Nottingham. He went beyond the minimum precautions recommended by Signpost, makers of the preservative, and wore a mask when applying the fluid. He died in hospital on 10 October 1987.

In the Autumn of 1983 John Hunter used some 20 gallons of a Remtox fluid on his house in East London. The formulation at that time was thought to contain TBTO and dieldrin, though the insecticide may have been lindane. A year later he was still suffering from a dry skin rash which itched and burned so intensely that he found it almost impossible not to scratch, sometimes drawing blood. Nervous symptoms included headaches, noises in the head and trembling. He phoned the Hazards Centre on several occasions, desperate for help: 'I cannot sleep, my mind doesn't work and I cannot look after my business. I am desperate.' The Hazards Centre helped to arrange investigations of his skin problem at St John's Hospital and tests on his nervous system, through the Employment Medical Advisory Service. Nothing did any good. John Hunter died in 1985.

The Hazards Centre case file records other deaths and many acute and chronic illnesses attributed to wood preservatives at work and in the home. We believe that the vast majority of cases show a clear link between exposure to timber treatment chemicals and subsequent illness. The most common complaints match those described by researchers from the University of Antwerp in Belgium – abnormal fatigue and weakness, headaches, digestive system disorders, respiratory problems, skin complaints, and nervous disorders, including depression. (More details of the Antwerp research are given later in this section).

This is the list of symptoms most often encountered in the West German victims:

> 'Unexpected tiredness, discomfort, nausea, headaches, weight loss, hair loss, mucous irritation, conjunctivitis, bronchitis, insomnia, nervousness, and depression'. The West German Ministry of Health recognised that PCP could have these effects. (*Que Choisir?* May 1986).

Many cases involve more serious disorders, including damage to the nervous system, aplastic anaemia, cancer and mental illness in children.

Industry denials

The wood preserving industry appears not to believe a word of this. Market leader Rentokil is usually first to defend the industry and attack those who suggest it may cause illness. The company's group safety adviser B Boulton put their case in a letter to the magazine *Health and Safety at Work*:

> 'Give enough media emphasis to almost any subject (however ill-informed) and people will respond. Some . . . will imagine they are ill, or link an illness with the miniscule contact with "chemicals".'

Llwyd Nicholls doesn't need to imagine that he is ill. If he forgets it for a moment he could get into some minor scrape that other 13-year old kids would shrug off. A bruise could be a serious injury, leading to internal bleeding and another spell in hospital. Llwyd has aplastic anaemia; his bone marrow is so severely damaged that it cannot produce the blood cells which carry oxygen, fight infection and help it to clot. His parents believe that the lindane which Rentokil sprayed in their home in May 1986 caused his illness. So, it seems, do the specialists who diagnosed aplastic anaemia at Alder Hey Hospital, Liverpool, in January 1987. Llwyd's mother, Ellen, describes how the link was made:

> 'In June '87 I had become suspicious of the woodworm spray as a possible cause. I wrote to Rentokil for a breakdown of the chemicals used. The doctors at Alder Hey picked out lindane in the list. Soon after that we had a phone call from them. They had consulted colleagues in London and they told me either Llwyd came back and stayed in hospital or I found alternative accommodation for him that day.'

Ellen immediately moved with Llwyd into a small empty cottage. Later the whole family of seven moved into a home big enough for them all – a former police house at Glyndyfrdwy. Only Adrian, Llwyd's stepfather stayed in their real home, which is also the village post office, working there by day and sleeping there for security at night.

In August Ellen wrote to Rentokil asking them to advise on the safety of the Post Office. 'Two weeks later a man came with no equipment and just sniffed the floorboards. He implied that a proper examination would follow shortly. No-one came.' Ellen recorded the sequence of correspondence with Rentokil:

> '**11 September 1987**: A letter from Rentokil saying in their opinion Llwyd could move back to the Post Office and was in no danger. **15 September**: Letter from me asking Rentokil when they would carry out a proper survey of the house. **2 October**: Letter from Rentokil ignoring my request and stating why they thought the house was safe.'

The doctors at Alder Hey did not share the company's conviction about the safety of the treated house. In July one of them phoned to express concern over Samuel, Ellen's fourth child, then less than six months old. The doctors had found research showing that babies could be particularly vulnerable to lindane.

Meanwhile Llwyd remains a sick child. He was taken ill again just after Christmas 1987 and despite long and complicated treatments, transfusions and medication, it is now accepted that his blood count of white cells and platelets will be permanently low.

Observer 5 OCT 87

Doctors see Rentokil link in 'misery' boy's illness

by EILEEN MacDONALD

A 13-year-old boy contracted an often fatal illness after his home was treated for woodworm by Rentokil. He failed to respond to treatment until, on hospital instructions, his parents moved house.

The plight of Llwyd Nicholls is just one of the many cases of suspected toxic poisoning that have been highlighted after *The Observer* revealed last week that chemicals, considered so dangerous in many other countries that they have been banned or severely restricted are widely in use in Britain.

A 29-year-old Nottingham man died three weeks ago after using a woodworm treatment on his home earlier this year. The cause of death, said his widow, was given as a rare disease which inflamed his muscles and skin. Experts say it appears to have been a classical case of 'severe chemical poisoning,' well documented in medical and scientific literature.

Mr Bill Curwen, an ambulanceman from Preston, Lancashire, was so badly affected by one of the chemicals named by us last week that he has been invalided out of the service and told by doctors that he will never work again. Four years ago his ambulance was treated with Lindane pesticide after it was infected by blood from a patient. Within minutes he and his colleagues were taken ill with breathing difficulties, blisters, nausea and headaches. Doctors confirmed he had been chemically poisoned.

Rentokil is one of a number of companies in Britain which manufacture and use Lindane, Tributyltin Oxide (TBTO), Pentachlorophenol (PCP) and Creosote. A spokesman for Rentokil said: 'The evidence that these chemicals are using are harmful is inconclusive. There is no proof that they are harmful at all.'

of someone being run over was that he drank a cup of coffee in the morning. That is putting the alleged cases you have in perspective.'

Adrian and Ellen Nicholls are considering suing Rentokil over the condition of their son. A keen former footballer and rugby player, Llwyd now gets dizzy walking upstairs. He is suffering from a rare blood disorder, aplastic anaemia, and doctors at Alder-Hey Children's Hospital in Liverpool say that, unless he continues responding to treatment, his prognosis is 'miserable.'

Llwyd became ill soon after his family moved to Glyndyfrdwy, [illegible] North Wales, [illegible] boug[illegible]e hou[illegible]le fo[illegible]r [illegible]at [illegible]ur [illegible]s [illegible]s

'Llwyd became very listless, and at first we thought he had simply outgrown his strength — he had been a very active boy.'

Then the Nicholls were told that Llwyd had aplastic anaemia, and there were only three possible causes — previous medication, radiation and chemical poisoning. 'We finally got Rentokil to tell us the chemicals it had used, and when the hospital found it was Lindane they told us to move or else they would keep Llwyd in the ward,' Mrs Nicholls said.

The family — the other children are eight-month-old Samuel, Ruth, 11, and Jacob, 18 — moved away on the day [illegible] told them about [illegible], 38, said: '[illegible]-sai[illegible]

moved, Llwyd had not been responding at all.'

Llwyd is now on steroids, and visits the hospital every fortnight. His parents have put the sub-post office up for sale, as they cannot pay the mortgage and rent for the present house.

'We doubt if we shall sell it though,' said Mrs Nicholls. 'When anyone comes to look, we tell them about Rentokil and Llwyd, and then no one wants to buy it.

'Thinking about it makes us very angry. Rentokil must know about the things Lindane can do to some people, yet it carries on using it.'

A spokesman for Rentokil said: 'A comprehensive medical report was sent to the family. There are no indications that, even if Lindane was found in the boy's blood, it would have come from our treatment. The literature on Lindane is confusing and con[illegible] found that there [illegible]tween our [illegible]

Ellen Nicholls with Llwyd: 'Rentokil must know.'

△ **Children like Llwyd Nicholls are particularly at risk from wood preservatives. Disease may develop quickly or in later life** (*The Observer*, 25 October 1987).

During his exile from home, the grossly high levels of lindane which the Liverpool doctors found stored in his body fat have gradually fallen, but his bone marrow will never recover.

Other children

In Germany Dr Wolfgang Wahlen of the University Children's Clinic at Homburg in Saar, treated three children with aplastic anaemia who had been exposed to lindane and PCP in treated homes. One of them, an ll-year old girl, died. (*Stern* 1984). In Britain Peter Wright died of the same disease. His job was to help prolong the life of telegraph poles by wrapping bandages containing wood preservatives round the base.

Like most of the industry it leads, Rentokil does not accept that there is any link between its chemicals and aplastic anaemia, epilepsy or indeed most of the other diseases mentioned here. After the *Observer* articles in January and September 1988 the company's public relations director Peter Bateman wrote to journalist Eileen MacDonald:

> 'Any cases specifically relating to Rentokil products are investigated by our independent medical consultant, one of the country's leading experts in occupational health and industrial medicine, Dr Robert Murray. So far there is no substantiated link by any politically independent, scientific, objective, competent and authoritative body. On the contrary, the scientific data available is reassuring for properly formulated preservatives, applied in accordance with the official recommendations and the appropriate safety precautions.'

Mr Bateman went on to point out that:

> 'There are many other well-documented causes for the illnesses described, all of which have been around for longer than the relevant wood preservatives. (Aplastic anaemia was first described in 1898, lindane not invented until 1948). Some illnesses arise spontaneously and all those people exposed to preservatives will also have been exposed to hundreds of other chemicals as well as to viruses, bacteria and radiation. Other causes of aplastic anaemia include ionising radiation, glues, certain prescribed medicines and infections including viral hepatitis, rubella and Epstein-Barr (glandular fever).'

Mr Bateman went on to examine other diseases and to suggest alternative explanations. For example, poisons produced by mould in damp houses produced symptoms closely resembling those of John Slate and Jim Merry. He defended the 'life-saving chemical' lindane, PCP and the other ingredients the company selects as the safest, 'consistent with the need to provide their customers with the most effective and long term protection for their property that they are entitled to expect.'

Alternatives marketed because of political and commercial expediency, said Mr Bateman, did not give the same protection.

He recommended two booklets: *Lindane – answers to important questions* and *All you have ever wanted to know about pentachlorophenol.* The first is published by the International Centre for the Study of Lindane (CIEL) in Brussels. CIEL (French for 'sky') is funded by the chemical industry. The second is published by the French multinational Rhone-Poulenc, owners of the British pesticides maker May and Baker.

No hiding place

Rhone-Poulenc is one of the world's last manufacturers of PCP, a substance which has now killed more than 1,000 people (*Safety* 1982). Driven out of most advanced countries by bans or by the near impossibility of disposing of the deadly dioxins and other impurities created during manufacture, it is now made by the French company Rhodia, at a town in Brazil called Cubatao. There the jungle provides a handy waste-disposal site, with desperate consequences for those who live nearby. (See Section 7).

Independent evidence

Compared to Rhone-Poulenc and CIEL, the Laboratory of Toxicology at the University of Antwerp in Belgium would seem to be somewhat closer to the 'politically-independent, scientific, objective, competent and authoritative body' mentioned by Mr Bateman.

Researchers from the Laboratory investigated chronic poisoning in people exposed to wood preservatives containing lindane and PCP in treated homes (Janssens and Schepens 1985). More than a hundred people had contacted the laboratory after it published its first research on the subject in 1983. Researchers measured the amount of PCP in the patients' blood and urine and ensured that all symptoms were confirmed by GPs or specialists. They eliminated from their analysis those who had no symptoms and those who had taken countermeasures to reduce or prevent exposure – such as leaving home or sealing all treated surfaces. (See Section 8: Cleaning up). This left a group of 40 patients (24 women and 16 men) with confirmed long-term exposure to PCP and/or lindane in the air and medically confirmed illness. This is how the authors summarised their findings:

> 'Nearly all persons complained of constant weakness and dizziness. In addition more than half complained of abdominal pains (sometimes accompanied by diarrhoea) or of an acne-like skin rash, together with a fierce itch and sometimes with growths.

'Several people had additional psychosomatic complaints (aggressiveness, depressiveness, restlessness). Nearly half of them complained of sickness and a tendency to vomit. One third of them had chest pains, or a sudden weight loss. Seven people had blood in their urine, without any readily-available medical cause, even after an intensive check-up'.

Summary of symptoms in 40 adults in the Antwerp study

Symptoms	Numbers diagnosed
Tired, weak, dizzy	37
Headache	23
Itch, acne, skin growths	17
Fainting, vomiting	17
Weight loss, anorexia	11
Diarrhoea, abdominal pains	17
Inflammation of upper respiratory tract	22
Tachycardia (fast heartbeat), chest pains	15
Psychosomatic complaints	18
Abnormal blood pressure	6
Thirst, hyperthermia (high body temperature)	5

The Antwerp laboratory was able to show that there was a statistically significant link between severity of symptoms and levels of PCP in blood serum and urine.

The case histories collected by the London Hazards Centre show a remarkable similarity to the picture presented by the Antwerp researchers. For example Ann and Eric Riley would have recognised most of their shared symptoms in the table. With 'patients' scattered all round the British Isles we cannot overcome, as they did, the problems described by the Antwerp researchers:

'The most important problem in judging a chronic PCP intoxication was, and still is, the less typical symptoms which occur. All kinds of other illness situations can create identical complaints in which case the majority of GPs overlooked and did not diagnose the PCP problem.'

As for chronic lindane poisoning, this is much harder to trace, according to Janssens and Schepens.

Investigators in Germany, Austria, Holland, Belgium, France, Britain and the USA have between them assembled evidence showing that thousands of individuals have been damaged by wood preservatives in their homes and workplaces. Some governments have acted.

Germany and Sweden have banned PCP wood preservatives. The USA allows them only for outdoor use by professionals wearing full protective equipment. Timber pretreated with PCP may not be used inside buildings. Lindane is banned or severely restricted in many countries. In Britain the timber treatment industry is still using most of the same chemicals and methods as it did 10 years ago.

Poisoned homes

Ten years ago scientists were already measuring the air of treated homes and coming up with results which cast serious doubts on the safety of what had become commonplace processes.

> 'Remedial treatment fluids are widely used in houses and other buildings to treat infestations of wood- destroying insects. Accurate statistics are not available but it is thought that approximately 100,000 such treatments are performed annually in the UK. An average treatment involves about 1kg of active insecticide, almost certainly the largest single input of pesticide into domestic properties.'

That was the introduction to a scientific paper written nearly 10 years ago (Dobbs, White and Williams 1979). It describes investigations by the government's Building Research Establishment to determine the amount of air pollution generated by 'remedial treatments' in the home.

Remedial treatments

Remedial treatment is the industry's term for the chemical dosing of timber that is already in use and is under attack from wood-boring insects or rot. Most of these treatments are applied to people's homes. The usual method is to spray fluid onto the wood. The type of pesticide in the fluid should match the type of attack – insecticide for woodworm, fungicide for dry rot or wet rot. In practice houses are commonly sprayed with fluids containing both, whatever the problem being 'treated'. It is also common for the remedial treatment to extend far beyond the area affected by woodworm or rot.

What begins with the discovery of a few woodworm holes under the stairs can easily end with a house in which every piece of wood contains an insecticide and a fungicide. The combined burden of pesticide could approach two kilograms. Over the next few decades the poison will gradually evaporate out of the wood and into the air of the home and the environment beyond.

In their 1979 paper the scientists at the Building Research Establishment (BRE) reported on indoor pollution levels produced by the most common insecticides of the day – dieldrin and lindane. Both are nerve poisons and strikingly toxic. A few grams of either should be enough to kill an adult. During spraying operations the BRE team measured dieldrin in the air at a level more than 12 times higher than the level set to protect the health of workers in industry during an 8-hour day. The level of solvent in the air didn't fall to its occupational 'safe' level until the second day after the spraying.

The BRE team found that soon after spraying, the level of dieldrin in the air fell rapidly then after two or three days began to rise steadily and would go on rising for 50 or 60 days, depending on the formulation of the carrier fluid.

Measurements after a typical lindane treatment showed levels rising for more than a week, to peak just under the occupational limit for 8-hour a day exposure.

The authors did not point out the obvious conclusions: that their findings made a nonsense of the industry's advice to keep out of treated areas for 48 hours: people would be returning to treated areas just at the stage when insecticide levels were starting to rise.

Lindane and dieldrin continued to be included in wood preservatives used by professionals and sold over the counter to DIY users. The advice to building occupants to keep out of treated areas for 48 hours remains the same today.

In 1983 two of the BRE scientists, Dobbs and Williams, published research which did spell out the implications for health. They showed that levels of dieldrin in treated homes could remain dangerously high for up to three years. Lindane for weeks. This time they also investigated the fungicide PCP and its contaminants the dioxins:

PCP:

'Taken together, the results of all the studies indicate that up to the first month or so after heavy treatment for wood decay, PCP concentrations of up to around 30μg/m^3 can be expected. In the longer term, values of between 1 and 10μg/m^3 can be expected from extensive treatments.'

Dioxins:

Dobbs and Williams suggested tentatively that dioxins would not be a hazard if PCP levels were below their 'acceptable' concentrations.

Nothing much changed in the wood preserving industry after the publication of the BRE findings. It just got bigger and did more remedial treatments. (See next section). Over the years the corrosive organic tin compound TBTO was increasingly added to pretreatment and remedial formulations – often in addition to the traditional fungicide PCP. At the end of 1985, by private agreement with the Health and Safety Executive, the remedial side of the trade phased dieldrin out of its mixtures (though they were allowed to use up old stocks). The pretreatment industry was allowed to go on using it.

Workers

Despite ten years of research – including its own measurements – showing persistently high levels of indoor air pollution and despite numerous reports of illness in occupants of treated buildings, the industry remains satisfied that everything is safe. The point that clinches their argument was vigorously expressed by Rentokil safety officer B Boulton in his letter to *Health and Safety at Work* magazine: If domestic exposures to wood preservatives were really affecting people in the way they believed, 'how is it that the people who work with these preparations daily are not dropping like flies?'

In practice, they claim, their workers and those using their products in pretreatment plants, timber yards and building sites are a healthy lot and no-one's ever proved that working with wood preservatives made them ill.

The reality is that many timber treatment workers have been poisoned regardless of the precautions they've taken. Some cases are even written up in medical journals. In the early 1950s seven workers in Bristol poisoned by PCP in a household wood preservative developed peripheral nerve damage and inflammation of the optic nerve behind the eyeball. (Campbell, 1952).

More recently a group of 14 local authority workers in Wales has suffered a terrible range of illnesses as a result of exposure to chemicals in the shed where they dipped joinery in preservatives supplied by Rentokil.

Rentokil argues that this was abuse of their products by the local authority employer. The implication is that this is not part of the timber treatment industry, which knows how to use dangerous chemicals safely. The Hazards Centre has certainly had a lot of complaints from local authority workers but the industry's own employees and ex-employees are also represented in our files, from production of chemicals through to spraying on site.

The fact that several callers from pretreatment plants and timber firms have been anonymous speaks volumes for their employers' attitudes to 'troublemaking' over health and safety. But the sworn statement of David Rea, former Rentokil worker, tells more:

> 'I worked as a joiner on various building sites and I did not work with chemicals throughout my working life until I worked for Rentokil . . . [In 1980 and 81] I was on the dole for about 12 months . . . and then I was informed by the Unemployment Office that unless I took the next job offered I would have my benefits taken away . . . I was then taken on by Rentokil as a technician joiner . . . in about September 1981. My employment was concerned with the wood treatment for private houses, public houses and companies. We would go along to the building and strip out the old wood and replace it with new. We would also spray the properties with various wood treatment chemicals . . . with lance-type equipment . . . The fluids were sprayed by way of atomised particles . . . The chemicals included dry rot fluids, wood preservative clear and woodworm fluid . . . all made by Rentokil.
>
> 'When I did the spraying I did this wearing ordinary boiler suits/overalls . . . I used to do all the spraying and my colleagues used to do the preparation. At the end of the day a boiler suit or overall would be soaked in the substance . . . you would work in lofts and cellars and would spray all around you and the atomised particles would fall like rain onto your clothing. I used to take these home for my wife to wash and she used to feel quite dizzy washing them. Often they would need washing every day and sometimes I would have to wear up to two pairs of overalls a day because they were so wet with the fluid . . . I wore this [charcoal] mask for about the first four years. After this we were issued . . . with an air stream helmet with a face visor [which] sucked in . . . the same air you were working in. The helmet had a filter inside . . . I complained on many occasions to the supervisor . . . and area manager . . . that I felt I could taste the substance on my lips and I felt the chemicals were getting in through the helmet, especially the wood treatment clear fluid which was very potent and strong. I was told I would have to carry on as the helmet had been passed under tests and was ideal for the job. Since the date of my illness I have since discovered that the other lads had in fact carried on wearing their charcoal masks and many of them had left their helmets in the box because they felt that they were no use. It seems that I was rather naive and carried on wearing the helmet because I was instructed to do so.
>
> 'We were issued one pair of gloves . . . short rubber type to the wrist . . . I used to complain often to the supervisor and the manager as we were only issued with one pair, these would get soaked and then they would cause you problems later. You would have to wear these gloves day in and day out. I got so fed up with this that in the end I ordered the gloves from a local builders and put them through to the company to pay the bills. I was told after about 20 pairs over about 12 months that this had to stop and after this I was not issued with gloves even though I requested them. The problem

was that after you had used these gloves . . . the substance would get into your hands turning them a red colour. Also sometimes the skin would peel off from one end of your hand from your wrist right up through to the end of your fingers . . . I reported this to [the supervisor] and showed him my hands and he said it must be something wrong with the gloves. You couldn't win no matter what you said.

'After about 1985 we started to use . . . far more of [the clear preservative] which . . . seemed to be getting stronger. [The supervisor] said it was the same stuff . . . I would spray enormous amounts of the liquid, sometimes up to 30 gallons of it in one cellar. When you were working down in the cellar you could actually see the atomised spray dropping like drops of rain. You could taste it on your lips . . .

'In October or November 1985 I complained [to my new supervisor] about the stuff getting stronger and the problems with the helmet . . . At the time I had a very bad cough. He complained to management that I was coughing and he felt that this was due to inhaling . . . preservative through the helmet . . . Management evidently carried out tests on the stuff and said we shouldn't be using this and that it should go back to the factory . . . All the drums were taken, even the stuff on the van . . .

'By January my cough was getting worse and worse, my mates would let me do the preparation work while they did the spraying as it made my cough worse . . . The doctor gave me some antibiotics saying he couldn't find anything on my chest. About another month went by until February when I couldn't really bend over. I started to choke if I tried. I was still working all the time. I went to the doctors twice afterwards and by May I was choking and coughing and the pain in my stomach was terrible. The doctor again gave me antibiotics. I said to the doctor that I felt I had some fluid in my lungs. He said if that was the case he would take a blood sample . . . Two days later the doctor contacted me and said they wanted to admit me immediately for tests. He told me I had a swollen spleen. When I went to the hospital . . . my spleen had swollen so much that it . . . was putting pressure on my lungs. Evidently what had happened was because I had got leukaemia, my blood cells have been unable to make up red blood cells and as a result the spleen had tried to take over the job and had enlarged itself to try and cope. It was pushing also on my rib cage. At the time I was very badly anaemic, I obviously then had to give up work.

'The specialist . . . diagnosed me as having acute myeloid leukaemia and he said that I had one to two years to live.

'I feel that the illness from which I am suffering is because of the use of wood treatment chemicals. I was always very fit before I worked for Rentokil, indeed I had a medical for Rentokil before I took on the job and I was passed A1.'

David Rea is 45. He and his wife Janet have two sons. They sold their previous home to help Janet provide for herself and the boys after his death.

Rentokil has pointed out that leukaemia has other causes (Bateman 1988). The company is generally recognised as one of the industry's leaders in competence and safety standards. Numerous mentions of the company in this book reflect the scale of its operations and the high profile it adopts in defending itself and the industry against criticism.

2

Growth of an industry

Coming in from the cold

For its first hundred years the timber preservation industry was confined almost entirely to the pretreatment of wood for outdoor use. The history of its development is a series of footnotes to the story of chemical manufacturing. Nineteenth century coal distillation yielded tar and creosote. The railway, shipping and telegraph networks provided a ready market: sleepers, telegraph poles and marine piles were impregnated with creosote or rival compounds based on metals - copper, chrome and, from the 1930s onwards, arsenic.

After the second world war the petrochemical industry delivered new synthetic insecticides and fungicides which were free of the nauseating reek of creosote, the staining effect of the metal salts and the blatant toxicity of arsenic.

Picture Post, January 1948.

With an abundant supply of cheap organic solvents to carry these compounds into the wood, timber treatment was ready to come indoors, to spray the places where people live and work. The remedial treatment industry was on its way.

Business boomed. Even those who were in at the beginning could not have foreseen a speed of growth which would parallel that of the agrochemicals trade. Part of the industry's success can be put down to its own efforts in persuading householders that death watch beetle and dry rot threatened the very fabric of their lives, if not life itself. Malcolm Rickards, head of a timber treatment firm, described the present-day consequences:

> 'As a result of horrific stories about the ability of dry rot to assume Triffid-like characteristics, there is an irrational fear of the dreaded fungus among professional and lay people alike'.
> ***Dry rot: the witch doctor gets his come-uppance*** **Rickards 1987**

As architects, surveyors and building societies defer to the imagined expertise of the remedial specialist (and the powerful fetish of pretreatment), it is easy to forget that virtually none of this supposedly essential work was done 50 years ago.

Jim Burnett remembers. He qualified as an architect before the first world war and is a life member of the Royal Institution of Chartered Surveyors. He has designed numerous private and public buildings and, at 96, still takes responsibility for inspecting and specifying maintenance on his own house, partly timber-framed, and the ancient wooden barn in which he has built boats for more than 50 years. He keeps an eye on the woodworm in both buildings but has no intention of spraying them.

> 'I've surveyed hundreds of properties. Whenever I found woodworm I put it in the report. The owners used to say "Oh, shouldn't we do something about it?" and I'd say "No, forget all about it, I've never known a house fall down from woodworm." All this spraying is a lot of damn nonsense.'

Jim Burnett and barn. ▷

But forces beyond the industry's own sales drive were at work on the market for wood preservatives. None could have foreseen the

bonanza of rot and decay produced by the post-war drive to cut costs and boost profits in the building, construction and timber trades. Each new technical fix bought a rich crop of abused timber – 'system building', 'rationalised traditional', 'industrialised', 'timber-frame'.

Across the nation, on houses, schools and public buildings, the architects handed out flat roofs like invitation cards. Timber firms spurned traditional seasoning methods, sold off their yards for property development and turned out a kiln-dried product which was far more vulnerable to decay and insect attack. The mechanised joinery factories gobbled it up, sapwood and all, banging out windows and doors perfectly designed to trap and hold water. The building industry shook out expensive craft labour, abandoned training, and got on with the de-skilled business of assembling structures which would need constant, skilled maintenance if they were to survive even a few decades.

Public sector spending cuts ensured that this level of care was not possible, that the stock of older, traditional structures would also fall into decay, that new housing would not be built, that scarcity would drive prices up in the private sector until banks and building societies

Housing decay: £75bn needed

'The public and private sector housing stock has reached such a stage of neglect that £75 billion needs to be spent on it, according to a report by the country's four local authority associations.

'The report, which adds that this figure represents £1,500 for every man, woman and child, is based on research and case studies of 10 cities and towns including Birmingham, Nottingham, Newcastle, Worthing, Taunton and several London Boroughs.

'It finds that 83% of council homes need repairs costing on average £4,900 for each 3.8 million houses. The picture for private sector housing was "even worse".

'Numbers of homeless families had risen from 83,000 in 1978 to 93,000 by last year. Council waiting lists had increased from one million to 1.6 million. "Much of the housing is literally crumbling".

'It's authors are the associations of District Councils, London Authorities, Metropolitan Authorities and London Boroughs.

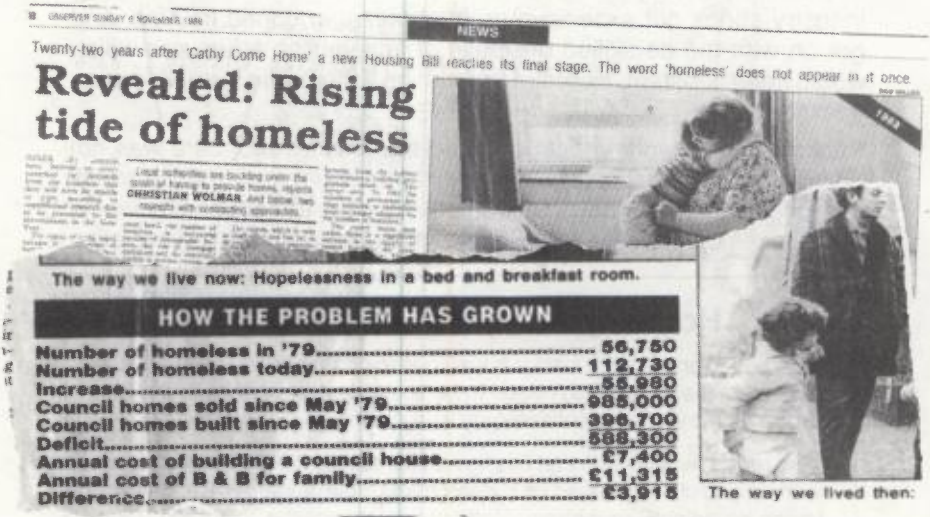
'They urge the Government to increase immediately next year's planned spending by 48% to £3.7 billion. "Given the magnitude of the problems it is likely to take decades to put matters right" the report concludes."

The case for Local Housing, AMA, Great Smith Street, London SW1P 3BI, £2.50, reported in *The Guardian*, 16 September 1986.

would routinely demand guarantees of timber treatment however slight the risk to their massive investments.

None of these activities produced what people needed. Several million continue to live in damp and substandard dwellings. Homelessness is increasing. Thousands of schools are falling apart:

> 'There is a maintenance time bomb ticking away: on present plans local authorities will not have the resources to defuse it. Systems-built schools will simply fall down.' **Audit Commission report:**
>
> **Audit Commission report: *Local Authority Property Maintenance* February 1988**



NEWS

Twenty-two years after 'Cathy Come Home' a new Housing Bill reaches its final stage. The word 'homeless' does not appear in it once.

Revealed: Rising tide of homeless

CHRISTIAN WOLMAR

The way we live now: Hopelessness in a bed and breakfast room.

HOW THE PROBLEM HAS GROWN

Number of homeless in '79	56,750
Number of homeless today	112,730
Increase	55,980
Council homes sold since May '79	985,000
Council homes built since May '79	396,700
Deficit	588,300
Annual cost of building a council house	£7,400
Annual cost of B & B for family	£11,315
Difference	£3,915

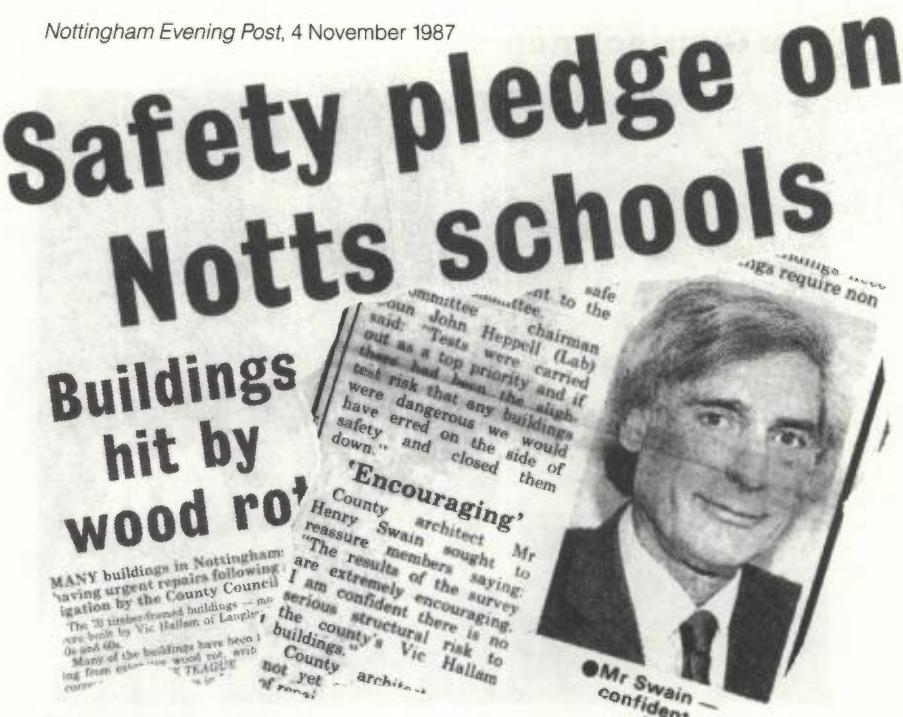
The way we lived then:

Observer, 6 November 1988

Before the schools fall down they'll probably get a dose or two of fungicide, in the spirit of the times: 'If you can't fix it, at least spray it with something'. By the end of the 1970s the wood preserving industry was doing 100,000 remedial treatments a year. In 1988 the British Wood Preserving Association was unable to give an estimate of the total but industry sources commonly quote 150,000. Dr David Belford, a consultant to the industry, has quoted 'more than half a million houses a year' (Belford 1988).

No-one knows how many firms do remedial treatments. David Scobie, Acting Director of the British Wood Preserving Association, believes there are about 1,600. This total, he says, encompasses the national operators, such as Rentokil, and the 'man and a boy' outfits doing only a few treatments a year, in among other building work. (Scobie 1988).

Nottingham Evening Post, 4 November 1987


Safety pledge on Notts schools

Buildings hit by wood ro

MANY buildings in Nottingham having urgent repairs following igation by the County Council

'Encouraging'

Mr Swain — confident

The giants

Rentokil Ltd., Felcourt, East Grinstead, West Sussex.

'Rentokil, the pest control and other property services group, which is regarded as too profitable, at least in government competition circles, raised UK profit by a quarter to over a quarter of sales last year.

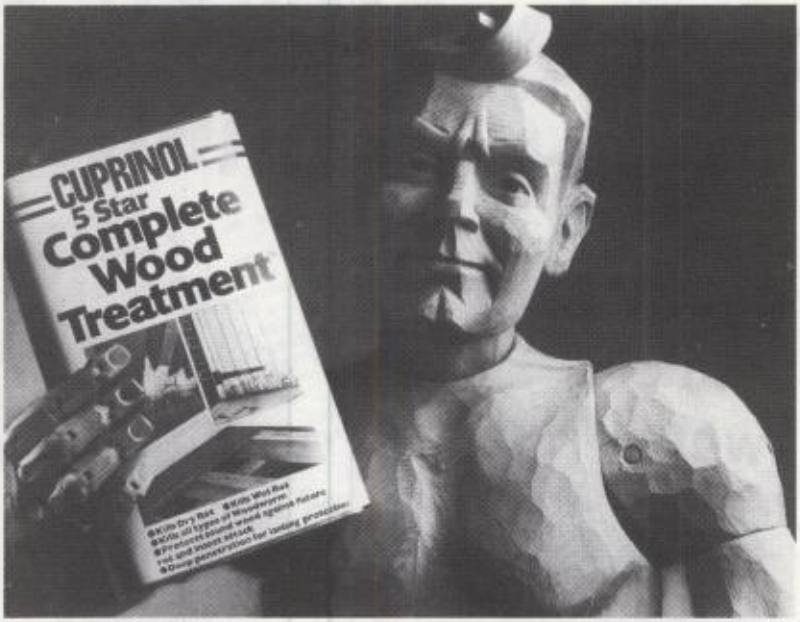
'Pre-tax profit jumped to £37.6 million from £31.3 million.
***The Guardian*, 24 March 1988**

'Rentokil, the pest control, cleaning and disposal group, may be constrained from killing off the opposition after the Monopolies Commission report* six months ago, but the interim results show that demand for its services has mounted so that margins and returns have become even more exceptional.

'The move into foliage and a handful of small acquisitions overseas boosted the rise in turnover to a sixth, but the home share of profit still predominated.

'Turnover, a shade under half of which arises in the UK, was £14.7 million up at £99.9 million for the six months. Growth in Europe was very strong, helped by a modest Swiss buy and the contribution remained above a quarter of the total. Pre-tax profit climbed to £22.9

The Cuprinol men



△ **Cuprinol advert**

Cuprinol worker ▽

million from £16.5 million. Property services, including timber treatment and woodworm and damp control . . . rebounded further with a profit rise of half to £3 million.'
***The Guardian* 19 August 1988**

In February 1988 the Monopolies Commission reported its finding that Rentokil's pest control division had acted 'against the public interest' by using its monopoly position to kill off effective competition. (Monopolies and Mergers Commission 1988).

Hickson Timber Products Ltd., Castleford, West Yorkshire.

'Hickson International's timber protection division led the specialist chemical producer's profit smartly higher in the first half of the year.

'Growth of more than 40 per cent in earnings . . .

'Pre-tax profit leaped to £12.05 million, from £8.72 million with chemicals still contributing the lion's share after Sayerlack brightened up timber treatment profit by about £2 million to nearly £4 million.'.
***The Guardian*, 5 August 1988.**

The specialists

Most of these 'woodworm and dry rot specialists' are also damp-proofing contractors. Their combined, often duplicated, entries in the London Yellow Pages add up to about seven pages.

Anyone can join the trade and become a 'specialist'. Despite the high level of risk to workers, householders and the environment, there is no licensing system, no required level of qualification, no mandatory code of practice. The industry is free to operate as an unregulated offshoot of the already lawless building industry.

Out of the 1600 firms, about 200 are members of the British Wood Preserving Association (BWPA). BWPA literature describes it as 'a scientific and advisory association . . . completely impartial in its outlook and the advice it gives'. Its officers insist that it is not a trade association. Although its membership includes learned societies and architects and other professionals concerned with the use of timber in building, its literature shows its prime objective is unashamedly to promote and improve the chemical preservation of timber. Critics within the usually solid ranks of the association can testify that a third function is to defend the current practices of the timber treatment industry.

Firms may apply to join the association if they have been trading for three years, carry adequate insurance and satisfy the Remedial Treatment Committee that they are competent. Each year, according to Scobie, 40 percent of applicants are rejected. Member firms are 'monitored' by site visits.

The National Association of Preserving Specialists (NAPS) is the only other body exercising any control or supervision over remedial firms. Unlike the BWPA it is a trade association, and proud of it. In five years it has built up a membership of about 40 firms engaged in timber preservation and damp-proof course installation. Most of its listed objectives (Nationwide Association of Preserving Specialists 1986) are similar to those of the BWPA, if somewhat less global in scope. But whereas BWPA membership depends on three years solid, competent trading – which can be difficult without the sprayer's equivalent of the Equity card – associate membership of NAPS is open to any firm satisfying the association that it is skilled, competent and safe. This is attractive to aspiring members of the British Chemical Dampcourse Association (BCDA) which also has a three-year qualification.

Cowboys

While Scobie of BWPA concedes that there are a lot of good companies outside the association – and a lot of cowboys – Ian Stewart of NAPS puts these two facts together to show what a dangerous situation the industry is in. While the majority of firms remain outside the associations, cowboys can roam freely, bringing the whole trade into disrepute. In an interview with the Hazards Centre in June 1987 he described seeing '12 new vans' – new remedial specialists – on the roads of South London in a period of a few months. 'They can be in business with a good front, including an office, for about £2,500, calling themselves specialists and knowing nothing about it.'

Stewart is one of the few people prepared to lift the lid a little on the dirty end of the trade – the 'surveyors' who drill a few woodworm flight holes to make a sale, invent new pests that need eradication, including the 'concrete beetle' (for those awkward situations where there are no timber floors to treat); and companies that pump excess chemical into a property in order to meet the quota required by the manufacturer whose products they are are contracted to use.

By comparison the trade in 30-year guarantees written on forged forms, or on blanks stolen from reputable companies, seems positively wholesome.

Stewart sees direct parallels between the remedial treatment business today and the cavity wall insulation trade 10 years ago. Cowboys cashing in on that boom did such shoddy and dangerous work that customers began to go off the whole idea. The business was cleaned up by making British Standards Institution registration compulsory for all operators. Stewart thinks this would also be the best thing for the remedial treatment industry.

Incompetence

Two independent surveys confirm the horror stories. The magazine *Building Trades Journal* (BTJ) tested the expertise of 14 firms specialising in timber and rising damp treatment, two of them nationally operating companies. All were BWPA members. The BTJ summed up its findings in the headline: 'Staggering incompetence revealed by decay investigation' (*Building Trades Journal* 1985). The house selected for the trial had no dry rot or rising damp. There was wet rot in ground floor joists and woodworm attack in the floors and stairs.

- Nine firms reported rising damp. None reported the raised paving which was causing penetrating damp in the front wall.
- The first three firms said there was dry rot. One of them estimated for 'opening up' work to identify the extent of the non-existent dry rot.
- Only one firm used an access hatch to get under the floor but the surveyor didn't go far enough to find anything. All surveyors missed five areas of soft rot in the sub-floor timbers.
- Eight firms missed the beetle infestation upstairs; all the same, three of them quoted for treatment anyway.
- None recognised signs that the roof timbers had already been treated. One, unequipped with a ladder, 'inspected' the loft from the landing and suggested treatment of the roof timbers.

There were 24 things which the surveyors should have found or done. BTJ gave a point to each item. The highest firm scored 13, the lowest got six things right. Total prices quoted ranged from £525 to £1,561. BTJ was helped in its investigation by Rickards Timber Treatment of Romford. Without such specialist advice the ordinary customer would be unable to judge competence and value for money. Selecting the cheapest quote would not have dealt with all the problems in the building. The only useful rule of thumb for the lay person is that the

firms taking longest on the survey generally scored higher; those requiring a deposit generally scored lower.

None of the firms offered a non-chemical approach or provided the information needed for specifying one. None reported the bridged dampcourse which was the main cause of dampness. Some even failed to make the one essential recommendation for defeating the wet rot: improving the subfloor ventilation.

The article reached some depressing conclusions:

> 'The seriousness of the situation to all who require remedial treatments services . . . is self-evident. Since the firms were all members of the BWPA, and some of the BCDA. what standard of service can be expected from those who do not qualify for, or who have been refused membership of, these associations?
>
> 'Furthermore, franchising in the industry is increasing, some franchisors advertising that no previous experience is necessary. What standards are they likely to achieve in the relatively short training periods inevitable in this type of operation?

This question may be rhetorical. The article had already reported:

> 'One of the lowest scoring firms runs a franchise operation, training new inexperienced recruits to the industry to set up new franchised branches.'

Franchising

Damptechnik(U.K.)

Fred Kidd & Sons (Engineers) Limited (Inc. 1939)
Trading as Damptechnik (U.K.)
Damptechnik House, George Street,
Mandale Triangle, Thornaby, Cleveland TS16 SDE
Telephone (0642)606484/670666

"Many people are entering the business world by this (franchise) route because it is one which enables them to build up a business for themselves without being cut off from help or support".

Margaret Thatcher
April 1985.

You have already heard of many household names but you were perhaps unaware that these businesses are in fact franchises run by people like yourselves using the proven services and business knowhow provided by the umbrella organisation.

A recent study compiled by the British Franchise Association has revealed that franchising promises a steady increase of 16% based on annual turnover; by early 1984 sales had passed the billion pound mark and by 1989 will exceed 5 billion pounds by today's prices. More importantly 98% of franchised operations in established franchises are successful.

You may ask yourselves what sort of service or goods are capable of being franchised the answer, to a lesser or greater extent, is everything. Already you know that [illegible] popular franchise business. However [illegible]

The BTJ had some more questions which needed to be answered 'before an already unacceptable situation becomes uncontrollable, inevitably at the expense of the general public':

- 'Quite obviously, very much higher standards of training and codes of conduct are required. Who is to encourage and implement them?
- Why are people with little or no experience or qualifications, particularly in building construction, allowed to set themselves up as "specialists" in this field?
- Can building societies be encouraged to implement tighter control of the market they generate?'

Which? tested 10 firms including a 'timber specialist' and a surveyor/valuer and reported 'disappointing results'. Asked to inspect a flat in an old terraced house, none of the firms achieved the bare essentials – to identify all the defects – *ie* two areas of dry rot and all the woodworm infestations – and recommend action to correct the sub-floor ventilation. The owner would have paid out as much as £7,000 for work which would have left the building with its rot-generating faults uncorrected (but sprayed with fungicide) and its woodworm untouched or only partly eradicated.

Where guarantees were offered most would therefore have had little value beyond persuading a building society that its investment was safe. For example the £7,000 quote specifically excluded any guarantee on the dry rot work. Only one firm quoted for, and would therefore have guaranteed, woodworm treatment.

Guarantees

'The 30-year guarantee is rubbish. You can't guarantee to kill all fungus for 30 years. If you look at the small print of the guarantee it says "as long as the structure is kept free from moisture." They are fooling people and endangering them at the same time by spraying in their bedrooms and everywhere.

'We have a 20-year history of restoring historic buildings including the Royal Pavilion at Brighton. I don't see any reason for using chemicals. We have been able to control dry rot without chemicals. Dry rot is a very sensitive fungus so it's easy to control it – but you cannot guarantee a building against it unless you continue to control the conditions.'

Dr. Jagjit Singh, mycologist, Hutton and Rostron, architects.

△ **The Royal Pavilion, Brighton.** Picture courtesy of Brighton Tourism and Resort Services Department

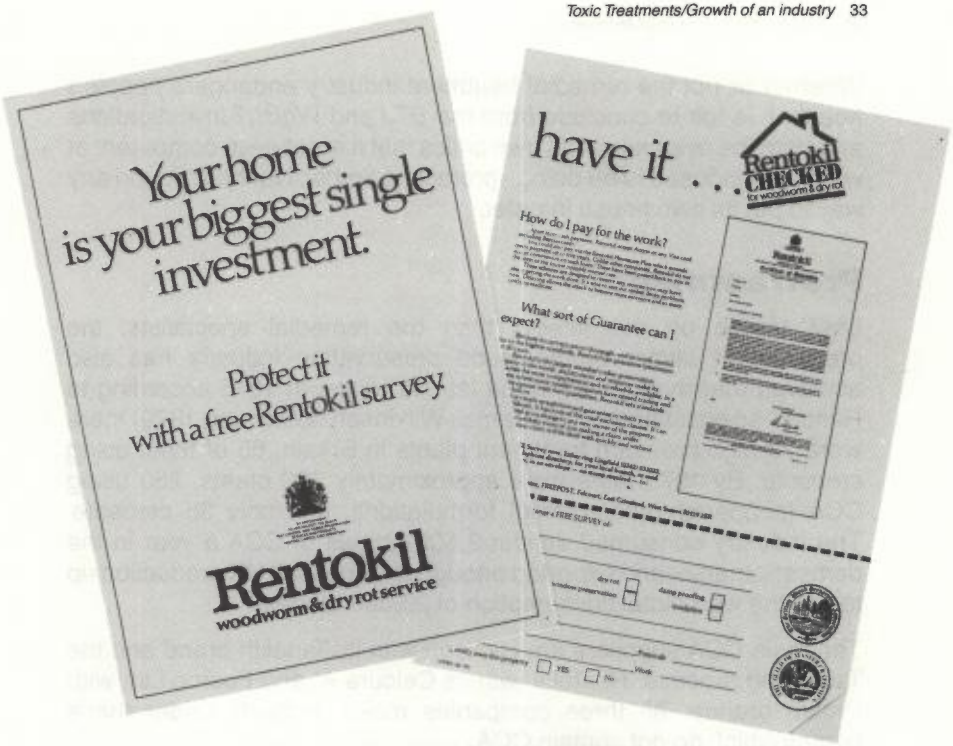
Guarantees Continued

'Building societies have a lot to answer for. They pioneered the idea of a 30-year guarantee which corresponds to the time that they lend money for mortgages.'
Roger Berry of BRE, quoted in *New Scientist* article *'Slash and burn in the dry rot jungle'* Bell 1984.

'The property owner should consider indemnifying himself against the cost of treating any other infestations or attacks, which might subsequently be suffered by untreated timbers by means of an insurance policy such as can be obtained from Rentokil Insurance Limited for many types of property'.
Footnote to Rentokil guarantee 1982.

'However, the guarantee is worthless if the firm which issued it has gone out of business – a problem not unknown among treatment firms.'
From *Which?* report January 1987

'People mock the guarantee but the public cherish it'
David Scobie, BWPA, 1988



The guaranteed guarantee

To protect your guarantee against the collapse of a timber treatment or chemical dampcoursing firm you can pay an extra fee to have it insured for 20 years by the Guaranteed Treatments Protection Trust. If they accept that the returning damp, rot or woodworm would have been covered by the original guarantee - and that may be hard to prove after 10 or 20 years - they will arrange for remedial work to be done free.

To ensure that both remedial work and guarantee are actually worth paying for, Malcolm Rickards advises (*Building Trades Journal* 1985) that the specialist firm 'should be instructed to examine all the timbers of the property for woodbeetle and fungal decay, and the walls for rising dampness'. He has devised a statement which all clients should give to the 'specialist' before inspection, and on the clear understanding that the firm will not be paid until the statement is completed. It then becomes part of the guarantee. Even if a building occupier has no intention of commissioning a standard chemical treatment, this document is a good specification for any survey for decay and its causes. (See Appendix 2)

Whether or not the remedial treatment industry endangers people's health, it is fair to conclude from the *BTJ* and *Which?* investigations and from the evidence of its own critics that it is not even competent at what it's supposed to be doing - protecting timber. Nor has it found any way to put its own house in order.

Pretreatment

Less visible on the streets than the remedial specialists, the pretreatment sector of the wood preservation industry has also achieved massive growth in the last 40 years. In 1945 according to Rentokil scientist and author James Wilkinson (Wilkinson 1979) there were 70 high pressure treatment plants in Britain, 65 of them using creosote. By 1975 there were approximately 300 plants, 250 using CCA (copper/chrome/arsenic) formulations, and only 35 creosote. The industry consumed almost 3,500 tonnes of CCA a year in the domestic market and exported enough to bring total UK production up to half the world total consumption of 20,000 tonnes.

The main CCA suppliers are Hickson with its Tanalith brand and the Tanalising process, Rentokil with its Celcure A, and Fosroc Ltd. with Protim brands. All three companies make products under these names which do not contain CCA.

In this as in every area of the wood preservative industry, the chaotic proliferation of products and trade names can lead to dangerous confusion. On building sites it is common to use the terms protimised and tanalised almost interchangeably for pressure-treated timber. Some people think both names always denote arsenic-based treatment; others that protimised always refers to timber treated with clear solutions of PCP and TBTO with or without the addition of lindane.

There are vital differences, best illustrated by restrictions in other countries. In Germany the PCP-treated timber would be illegal and far from being built into any kind of structure would have to be disposed of in a licensed toxic waste tip; CCA treated timber could not be installed where people or animals could come into contact with it. In Australia CCA-treated wood may not be used in children's playgrounds until it has stood for six weeks and the sodium sulphate salts have stopped forming on the surface. It is then hosed and scrubbed before installation (Wilkinson 1979). In the USA the PCP treated wood could not be used inside inhabited buildings: the US Environmental Protection Agency (EPA) measured levels of PCP in the air of an office building in Long Beach California in which beams had been industrially pretreated with PCP. The concentration

exceeded the level which the EPA believes can cause toxic effects ($50\mu g/m^3$). After two weeks of exposure in their new workplace, half the workers whose urine was tested showed PCP absorption. Measurements in other US buildings found airborne PCP levels ranging from $0.5\mu g/m^3$ to $10\mu g/m^3$ long after treatment of the original structural timber. (*Que Choisir?* 1986).

In Britain no such restrictions have been placed on the use of CCA or PCP pretreatment. Business is booming (see Hickson and Rentokil company results, above).

◁ **Pre-pretreatment! Logs like these being hauled on the west coast of America are often tunnel-sprayed with PCP to prevent sapstain. So even 'untreated' wood may contain fungicides. The death of an American logging truck driver was blamed on PCP exposure** (*Roberts* 1963).

One of the growth areas is in double-vacuum treatment of joinery, such as Hickson's Vac-Vac, introduced in the 1960s. By the late 1970s there were 250 commercial plants in operation (Wilkinson 1979). The relatively low pressure process does not deliver the depth or quantity

of preservative penetration achieved in the high-pressure methods mentioned earlier. Its main market is the treatment of joinery such as windows and doors, where it is claimed to be an improvement on the traditional method of dipping them in a tank. (The ineffectiveness of dipping is described in the next section.) Unfortunately the double vacuum process in practice is not the clean safe method it is cracked up to be. The second vacuum is supposed to recover the solvent carrier fluid (essential for profitable operation) and leave the wood almost dry. In reality workers complain of wood arriving at building sites and joinery firms still wet with solvent and pesticide.

The hazards of pretreatment processes to workers are described in Section 6, hazards to the environment in Section 7.

Law and order

We have seen that the remedial treatment industry enjoys – more enlightened operators would say it suffers from – a state of almost complete self-regulation in its technical and commercial dealings with the public.

In theory the situation should be much better when it comes to the control of health hazards. The law says every employer must, so far as is reasonably practicable, provide a healthy place of work and not endanger other people. The reality, again, is self-regulation. The woodworm barons are powerful, the cowboys are too numerous to count, and the sheriff's too short-handed to even keep up with the paperwork.

▽ **Law and order – a blind eye?**

HSE inspectors

There are upwards of 150,000 remedial treatments a year. A typical job lasts a day or two. Only the bigger jobs, involving building work and lasting more than six weeks have to be notified to the Health and Safety Executive under the *Factories Act* and the *Construction Regulations*. The HSE has 85 construction inspectors. In London, there are just 10 inspectors for 200,000 building sites. The law therefore provides no mechanism for informing the law enforcers that a property is about to be treated.

The average HSE Construction Inspector has little training in chemical hazards. The spraying itself is not notifiable, even under the *Control of Pesticides Regulations*. If it was, it wouldn't make much difference because the HSE has not been funded to employ any extra staff for the enforcement of these new regulations, even though they cover all uses of pesticides including remedial treatments.

Once someone's home ceases to be a workplace or a site, the HSE inspectors are unlikely to get involved with complaints from the occupiers of the building unless it is also a workplace. Individual householders and tenants usually find they're on their own, as the enforcement authorities and companies deny all responsibility.

Environmental Health Officers (EHOs)

The environmental health department of the local council may decide that it has statutory duties under the *Public Health Act* to investigate a complaint from a private householder. Or it may not. Some people have had good service from their local EHOs, including the analysis of dust for pesticide residues.

EHOs have a statutory duty to investigate complaints from those workplaces where they are responsible for enforcing the *Health and Safety at Work Act*, the *Offices and Shops Act* and other non-industrial work safety laws. For example EHOs from Wrekin District Council closed the Ironbridge Gorge Museum in Telford for a year after timber treatment made 28 workers ill.

Product safety

The *Consumer Protection Act* does not apply to services. You can't make use of it when a treatment firm messes up your health, or your house. But products are covered. If you buy a wood preservative and it damages your health even though you used it in a sensible way, you should complain to the Trading Standards Officer of your local council and consider using the law to get compensation from the supplier.

Workers and the law

Workers in the remedial treatment industry have little chance of making the law work for them. With only one or two workers on a typical remedial site there is no such thing as an anonymous complaint. Even if the inspector plays along and pretends to be making a random inspection her sudden appearance in Acacia Villas 20 miles from the district office will be as implausible as Father Christmas popping in. The anonymous caller might as well put on a 'Grasser' tee-shirt and go home via the Jobcentre.

The prospects for law enforcement – and trade union organisation – are better in large fixed workplaces such as pretreatment plants, timber yards, joinery shops and local authority direct labour departments. The fact that some of our callers from these places, even the unionised ones, have asked to remain anonymous does not inspire confidence.

More serious failings are found higher up the regulatory system – permissive approval of pesticides, secrecy, cosy deals and incompetence.

Approval of chemicals

The Ministry of Agriculture, Fisheries and Food (MAFF) is responsible for approving the use of pesticides. The HSE then licenses products in the industrial sector. The House of Commons Select Committee on Pesticides proposed that the approvals process be taken away from MAFF, with its history of promoting chemical-based production, and handed to the HSE (House of Commons 1987). The idea continues to meet stiff resistance from ministers and civil servants.

There are close parallels with the saga of law enforcement in the North Sea oil and gas fields, where another production-centred ministry, Energy, hangs onto its safety role despite the demand, repeated after every disaster, that the HSE should take over.

Secrecy

MAFF's approval of pesticides rests on the deliberations of the Advisory Committee on Pesticides, and in particular on its Scientific Sub Committee. The data considered by these committees is an official secret. A small chink in the secrecy was opened by the *Control of Pesticides Regulations 1986* but quickly squeezed shut by MAFF in a document called Disclosure of Information: Procedures and Safeguards, issued in February 1987. The document says:

- You cannot see any reports completed before the *Control of Pesticides Regulations* came into force in November 1986. This blocks access to information on arsenic, lindane, PCP and most of the long-established wood preservatives.
- When a pesticide has gone through a Review, as is now happening with TBTO, certain people may be allowed to see the 'Evaluation Report' (summary of the evidence and conclusions) or one of the many 'Study Reports' covering different aspects of the substance's toxicology. For example if you wanted the study report on TBTO and cancer you wouldn't get a look at the one on reproductive hazards.
- You won't see a study report anyway unless you're a scientist needing the data for a suitably-funded research project and the minister approves your application. Then you'll be shown the document in a reading room. You can make notes but you may not copy it.
- Getting to see an evaluation is slightly easier but you cannot publish any of it without ministerial approval or pass it on to anyone else. Magistrates may fine you up to £2,000 for breaking any of these rules. There is no limit in the Crown Court.

It is difficult to escape the conclusion that controls on pesticides information are rather tighter than controls on pesticides.

The regulatory history of PCP (and dieldrin) in Britain tells all we need to know about the approvals system. In November 1980, Marcus Fox told the House of Commons that PCP was 'fairly understood' and that its use did not appear to show 'adverse environmental effects'. Fox was speaking for the Department of Environment though the words 'fairly understood' are a favourite of the scientists at MAFF, the ministry which should by rights have dealt with the matter as the controller of pesticides.

By 1980, however, PCP had lost its approved uses in agriculture, even as a weedkiller. Virtually all remaining applications were as an industrial fungicide, notably in papermaking and wood preservation. The health of the workers involved is 'policed' (for want of a weaker word) by the Health and Safety Executive, which is controlled by the Health and Safety Commission, which answers to the Secretary of State for Employment.

So, the Department of the Environment saved both MAFF and the Department of Employment having to explain the paradox which allows PCP to be sprayed in houses, but prevents it being put on fields.

Unfortunately for the Whitehall briefers, this neat arrangement foundered on the ignorance of their scientists, whose 'understanding' of PCP did not extend to its cancer-causing powers. Only a month after Fox's statement, the US National Institute for Occupational Safety and Health (NIOSH) announced that dioxins and other contaminants in PCP caused liver cancer in mice and rats.

After the controversy had been aired in the *New Statesman* (McVeigh 1980) Rentokil's legal, technical, research and publicity staff got together to issue a statement which would 'put the thing back in perspective' ('Rentokil fights PCP cancer link', *Guardian* 12 January 1981).

Rentokil fights PCP cancer link

by Michael Smith,
Industry Correspondent

Rentokil, the pest control
id wood preservation com-
any, is to issue a statement
day in an attempt to defuse
ne controversy over alleged
inks between cancer and an
ngredient used in several of
ts products.

The statement follows recent
eports suggesting some con-
nection between cancer and
entachlorophenol (PCP), an
ngredient used in certain of
ntokil's wood preservation
ducts.

ntokil, which is controlled by the Danish firm of Sophus Berendsen, will make the statement after a series of discussions between the company's legal, technical, research and publicity staff.

A spokesman for Rentokil said over the weekend that the statement would "try to put the thing back into perspective." He said that PCP was used in only two of Rentokil's products and contained in only small proportions.

However, the company has stepped up the programme of regular health checks a... workers at its Kirby where PCP is formulated into the products.

Rentokil is one of many UK firms that handle hundreds of tons of PCP—a total of 400 tonnes was imported into Britain in 1979—in products ranging from wood preservatives to herbicides.

In November the then Parliamentary Under-Secretary at the Department of the Environment, Mr M... told the Comm... was "f... that ...

But it is now conceded that Mr Fox made the statement without appreciating that American authorities had been examining links between PCP and cancer. Subsequently, on December 9, the US Department of Health and Human Services revealed that contaminants found in all commercial PCP caused liver cancers in male and female mice and

The *Guardian*, 12 January 1981.

In America the Environmental Protection Agency began moving towards its present ban on all indoor uses of PCP. In Britain things quickly got back into perspective. In 1980 a Rentokil spokesman was able to tell the *Guardian* that PCP was contained in only two of its products. In 1988 the HSE listed 20 Rentokil products containing PCP, five of them licensed for household use – ie available over the counter to DIY enthusiasts.

Cosy deals 1

The story of dieldrin follows much the same script. Sweden banned it completely in 1969 after environmentalists showed that it had reached every part of the globe and every living thing. Bird life was threatened by reproductive abnormalities such as thin shells and destruction of eggs. Laboratory research provided the explanation: dieldrin and other organochlorine insecticides caused the liver to destroy steroid hormones, especially oestrogen.

Dieldrin was banned in the USA in 1976, after a long battle with the Shell Chemical Company, on the grounds of 'imminent carcinogenic hazard'. Shell denied that the company's own tests confirmed other research showing that the chemical caused cancer in animals. (Epstein 1978). Nothing so draconian was to happen in Britain. Under

the gentle and secretive supervision of MAFF, permitted uses of dieldrin were gradually closed off. By 1983 no approved field uses remained, though as always there were little anomalies, such as the dipping of carrots.

But the biggest anomalies were in regulation of dieldrin as a wood preservative. Here the law of supply and demand seems to have overruled those of toxicology or environmental science. The story emerges almost incidentally in publications by the BRE's Princes Risborough Laboratory:

1966: 'Because of the possible objections to dieldrin the use of this insecticide is best confined, eg, to unfrequented roof spaces . . . In compliance with the Pesticides Safety Precautions Scheme, products containing dieldrin are now available only to commercial pest control operators.'
BRE Technical Note No.7, February 1966.

1976: 'Thus gamma-HCH [lindane] is now in short supply world wide, and wood preservative formulators have been forced to utilise the more toxic and environmentally objectionable dieldrin. The total reliance on these insecticides is not satisfactory since it is possible that dieldrin and gamma-HCH could be affected by further restrictions on the use of chlorinated hydrocarbons or the cessation of their manufacture for agricultural purposes'.
Berry, BRE paper IS 4/76, March 1976

1980: 'Although some countries have extended these restrictions [on lindane and dieldrin] to include wood preservation applications, in the UK the two chlorinated hydrocarbons have received provisional commercial clearance under the Government's Pesticide Safety Precautions Scheme'.
Baker and Berry 1980

1984: 'By voluntary agreement with the British Wood Preserving Association the insecticide dieldrin, already eliminated from retail products, is to be withdrawn from use in remedial treatment fluids in the UK.'
Footnote, in Berry, BRE Information Paper 18/84

Of course it wasn't quite as clear cut as that. The deal between PSPS/HSE and BWPA allowed the sprayers until the end of 1985 to use up stocks (*Hazards* 11, 1986).

The industry was allowed to go on formulating and using dieldrin products for pretreatment. The exact timing of the deal in this sector is not clear. The HSE's *Pesticides 1988* lists two dieldrin products from Rentokil and two from Cementone Beaver. The former are identified as export brands. The latter (Dipsar Brown and Green) are not.

HSE helps the wood preservers in Europe

The HSE writes to the BWPA about *Notification of New Substances Regulations 1982 (Pesticide Active Ingredients)*

'As you are doubtless aware, at present any new substance which is supplied exclusively for use as or in a pesticide may be exempted from the scope of the above Regulations. Regulation 12 states that either HSE or MAFF may issue a certificate of exemption provided that the substance concerned is subject to an approval procedure for pesticides containing notification requirements which are at least equivalent to the requirements of the Regulations. If a proposal being discussed in Brussels is adopted in its present format, this possibility of exemption will be removed and all new pesticide active ingredients will require formal notification under the Regulations.

The Regulations implement the notification provisions of Directive 79/831/EEC amending for the sixth time Directive 67/548/EEC on the classification, packaging and labelling of dangerous substance (the so-called "Sixth Amendment Directive"). The EC Commission has drawn up a proposal for a "Seventh Amendment Directive", which will effectively supersede the Sixth, and in this proposal the derogation on pesticides has been deleted.

The proposal has been discussed at commission working party level and a number of Member States have registered their opposition. However, in most cases this has been muted and at the most recent meeting only the United Kingdom appeared willing to take its opposition any further. As things stand at the moment the Commission seems likely to gain the necessary qualified majority of Member States for its proposal to be adopted.

In order to reverse this proposal it will be necessary to provide some convincing evidence that the proposal will seriously damage European industry. The Commission has already demonstrated that it is receptive to the legitimate concerns of industry and CEFIC were invited to make presentations at the last two meetings. However, CEFIC emphasised that they did not represent the European pesticide manufacturers.

Essentially, there are two routes to explore and you may wish to consider using one or both. You can make a national case and present it through the UK delegation or a European case to be presented by a European trade association. If you opt for a national case, I will need to hear from you by Friday, 27th May, please.'

***British Wood Preserving Association News*, April 1988**

Cosy deals 2

Pretreatment plants. Early in 1988 the BWPA put the finishing touches to its *Code of practice for the safe design of timber treatment plants*. The eight-page document contains nothing that has not already been published elsewhere as being established good practice. It leaves out much of that same material. (See for example Wilkinson 1979 and Section 6 of this book.)

In February and March 1988 correspondence between the BWPA and the HSE revealed misunderstandings about how the code was to be implemented. On 2 February David Scobie of BWPA asks Mr Harris of HSE's Woodworking National Industry Group at Luton:

> 'What is your intention now with regard to existing plants? Obviously they require time to meet the increased standards. Please let me know so I may inform the members concerned.
>
> 'At one committee meeting recently one or two members were concerned that your Inspectors were visiting plants with "the Code in their hands". None could say the Inspectors were requiring immediate up-grading but they were, as I say concerned'.

On 25 March Mr Dobson, Senior Principal Inspector of Factories, wrote back:

> 'With regard to existing plants, I would agree that in many cases, time will be required to meet the standards set out in the Code although, of course, this will vary according to the complexity of the work required . . . In order to achieve the required standards to comply with the relevant legislation, the plant modifications necessary should be carried out over a period of time to be agreed with the Factory Inspector concerned but which should not exceed two years.'

This constructive dialogue works both ways. The HSE suggested changes to the BWPA code on pretreatment plants and BWPA made a '12-page input' (Scobie 1988) to the HSE's Guidance Note on safety in remedial treatment (HSE 1988).

Incompetence and delay

In 1987 the HSE issued a draft Guidance Note on 'In-situ timber treatment using timber preservatives' (See Section 6). Much of it read as though written by the BWPA; emotive words like 'cancer' were avoided, even in the case of the undisputed carcinogens, creosote and arsenic. More seriously the document had already been made obsolete by an HSE research project nearing completion in Bootle.

- **The guidance note recommends** 'a laminated disposable paper overall' as the 'most practical garment'.

- **HSE research** shows that impermeable clothing is needed. The researchers got remedial treatment operatives to wear disposable overalls under their normal protective coveralls (usually cotton polyester). Measurement of the dose collected on the disposable showed that 'the scope for dermal absorption is very considerable', according to George McCutcheon of the HSE's occupational hygiene unit at Bootle. 'We are not dealing with a workforce using impermeable clothing and what we have discovered raises real concerns about the effectiveness of clothing and about its proper laundering.'

- **The Guidance note says:** 'Members of the public should not be allowed into the area treated until it has been checked by a competent person who is satisfied that it is safe.' The Guidance Note says that this may involve air tests for pesticides and solvent but it does not mention even the industry's standard 48-hour exclusion advice.

- **HSE research:** 'What is emerging quite strongly [from measurements done in 12 treated properties, from immediately after spraying to a few months later] is that for re-entry without protective equipment under some conditions 48 hours may not be enough.'

This research will be written up, circulated round HSE, and probably sent to the Scientific Sub-Committee of the Advisory Committee on Pesticides. Formal publication is not expected until the middle of 1989. In the sleepy world of wood preservative regulation that will be an appropriate sort of time to publish. Ten years will have passed since Dobbs, White and Williams at the Building Research Establishment showed that 48 hours is not long enough.

At this rate the timber treatment industry can expect another decade of steady growth before the law begins to catch up with it.

3

Wood and its conservation

Why chemicals aren't needed

Having survived the visit from the treatment firm, your 30-year guarantee tucked away in the sideboard drawer, and the foul smell an unpleasant but fading memory, you may believe your problems with wood preservatives, rot and woodworm are behind you. But the whole expensive, unhealthy performance could have achieved little more than satisfying the mortgage requirements.

The wood

Properly selected, installed and maintained, wood is remarkably durable. Many types of timber, particularly the more costly hardwoods such as oak, iroko and mahogany, contain natural preservatives or, in industry jargon, 'extractives'. In oak and chestnut, for example, tannin is very effective in fending off the attentions of rot or insects. But durable, resilient timbers are used less and less frequently in modern construction.

> '. . . it has been suggested that trees could be bred for their durability, although in practice, emphasis is placed on fast-growing, less durable species which can later be preserved.' (Wilkinson, 1979)

The British Wood Preserving Association (BWPA) puts this point with a slightly different emphasis:

> 'Recent developments in timber engineering allow builders and architects to use smaller, more highly stressed sections of timber, much of which is sapwood. If untreated, sapwood can be attacked by insects or fungi and this can lead to potentially hazardous structural failure. Repair or replacement of such timbers can be both costly and inconvenient, so pretreatment has a vital role to play.'
> ***Preserving confidence in timber*, British Wood Preserving Association leaflet**

The effect of the increasing use of small sapwood timbers was noted by the Building Research Establishment (BRE):

> 'The larvae [of the house longhorn beetle] feed in the sapwood leaving a thin exterior veneer of intact wood. The exit holes are cut only when the larvae have stopped feeding before pupation, which makes the early stages of attack difficult to recognise. The sapwood may be completely disintegrated in heavy infestations, so the importance of this insect has increased because of the current practice of using smaller dimension timbers which may contain a high proportion of sapwood.'
> ***House longhorn beetle survey*, Building Research Establishment, 1982**

But where house longhorn beetle could quickly reduce unprotected sapwood to a powdery husk, heartwood is a different proposition. The BRE comments:

> 'Not all infestations are active when they are discovered. In old houses infestation can long be extinct, having caused little or no structural damage as the timbers are of large cross-sectional area with little sapwood. Attack will in any case die out when the sapwood is consumed but it may cease before because of the nutritional unsuitability of aged wood.'

It is easy to see the benefit to the timber treatment industry of introducing inferior timber to housing. The benefit to the rest of us is less clear. Insects and rot can certainly damage timber, but only if that timber is in an unsuitable environment. Proper design and maintenance is a far more sensible way to protect wood, property and human health.

Wood-boring insects

> 'Most of the wood-boring insects will attack only damp wood or are encouraged by dampness, and some have a preference for wood which is already partly pre-digested by fungal attack.'
> **Dr Jagjit Singh, The Mycologist, 1989**

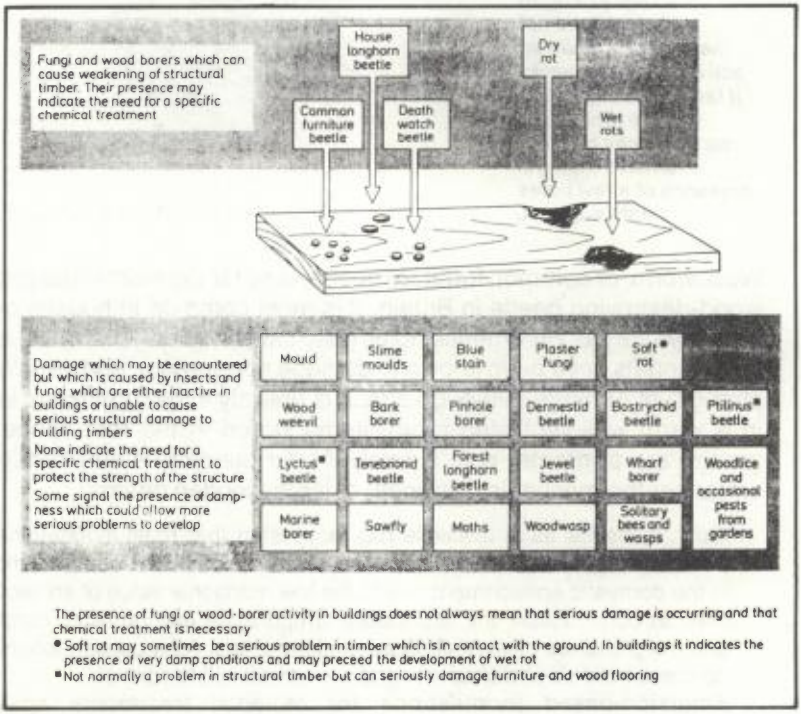
Sound, seasoned wood which is well-fitted and maintained offers little to insects. Death watch beetle, wood-boring weevils and many other borers have great difficulty surviving in sound timber. But in situations where timber has been decayed by continual exposure to damp conditions it will be especially liable to attack, particularly if rot has already developed. Even so, structural damage is only a remote possibility unless small sapwood timbers are used, as is increasingly common in modern construction. In virtually all cases it is not the insects that will be the main problem, but the physical damage by damp, and the rot that accompanies it.

Most people will recognise the small flight holes in wood as confirmation of an insect infestation. Some will know to look for the bore dust or 'frass' in or near the holes that would indicate that the infestation was still active. And the billboards and full page advertisements in the Sunday papers tell us just what to do next. Call in the wood preservers.

Not everyone thinks this is such a good idea:

'Remedial treatment of wood with insecticidal or fungicidal chemicals is expensive, inconvenient to occupants and potentially undesirable environmentally. Treatments should not, therefore, be undertaken unnecessarily. Of the many types of insects and fungi that can be found in buildings, only a few are capable of damage which can lead to structural weakening.'

Clive Turner and Tony Bravery, Building Research Establishment, in *Building Trades Journal*, March 1987.



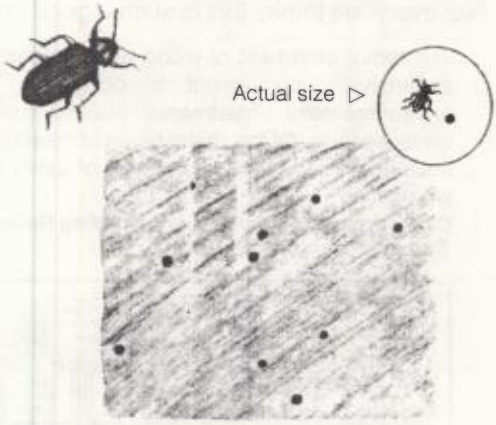
Reproduced from *Building Trades Journal*, March 1987.

Most of the insects that infest timber in houses do not cause serious damage to wood. Only common furniture beetle, death watch beetle and house longhorn beetle can be a real problem. Whatever the infestation, many of the treatment company 'experts' are no more qualified to diagnose rot or insect infestation than you are. Use the information below to ask a few searching questions.

Woodworm

(Common furniture beetle, anobium punctatum)

WOODWORM ▷
Woodworm is common in houses over 20 years old. It isn't necessarily a cause for alarm: it's rare for an attack to develop to the extent where there's serious structural damage. The discovery of flight holes does not necessarily mean an active attack; however, if larvae are still active in the timber, the damage may be more extensive than the presence of a few holes might suggest.

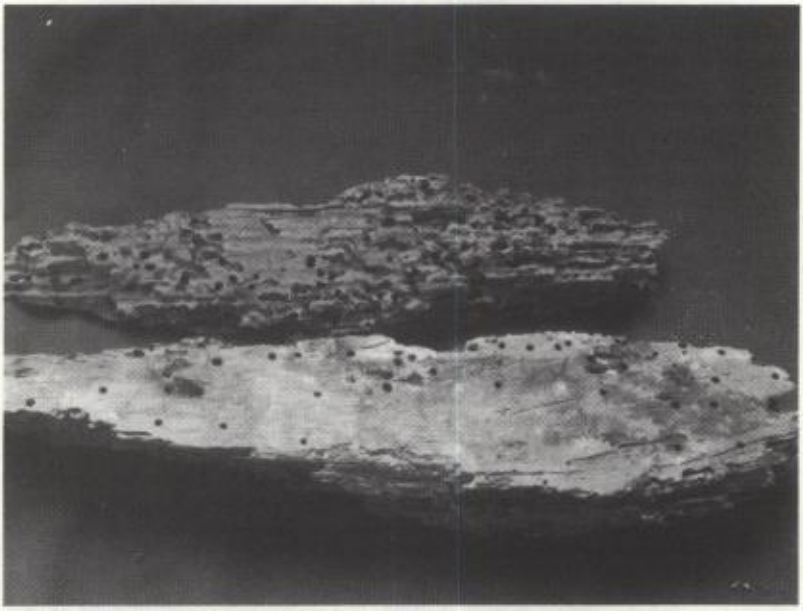


Dee McLean, *Which?*, January 1987

Woodworm, or common furniture beetle, is by far the most widespread wood-destroying beetle in Britain. It is most common in houses over twenty years old. Emergence holes (also called flight or exit holes) and larva tunnels have been known to damage appearance and structural strength of furniture, although attack is unlikely if the furniture is kept in a warm well-ventilated room. Items stored in the roof space or garage are at greater risk. It rarely if ever penetrates sufficiently to endanger the mechanical strength of large wooden beams.

> 'Such evidence as is available has suggested that most infestations of woodworm are at a low level when discovered. The insect does not thrive in the domestic environment due to the low nutritional value of softwoods used in construction, the associated temperature and humidity controls and the presence of several successful parasites. As a consequence, its numbers build up at a slow rate and are not difficult to control.'
> ***Emulsion-based formulations for remedial treatments against woodworm*, R W Berry and R J Orsler, BRE Information paper, 1983**

The attack is mainly confined to sapwood. As it requires damp/high humidity to flourish, infestations are unlikely in centrally heated buildings or buildings free from damp, particularly where well ventilated.



△ **Extensive common furniture beetle damage in softwood joist.** Photo: Remtox Chemicals Limited

Detecting woodworm

Infestation is usually detected by emergence holes and tunnels. These are 1mm to 2mm in diameter, circular and mainly in the direction of the grain. Frass – the dust produced from boring – is cream-coloured and contains lemon-shaped pellets. It is gritty when rubbed between the fingers. The adult beetle is not visible for most of its life and is usually 3–5mm long, and dull brown in colour.

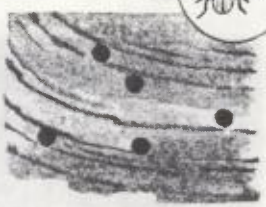
The BRE report *Recognising wood rot and insect damage in buildings* advises that adult beetles can be found on or around damaged timber late March to early August, particularly in warm weather. They are attracted to windows and white surfaces. In houses, timbers adjacent to the toilet, shower, hand basin and bath are likely areas to look. In roof voids adult beetles are often found in cobwebs.

Woodworm infestation is greatly encouraged where fungal rot is already established.

Deathwatch beetle

(Xestobium ruforillosum)

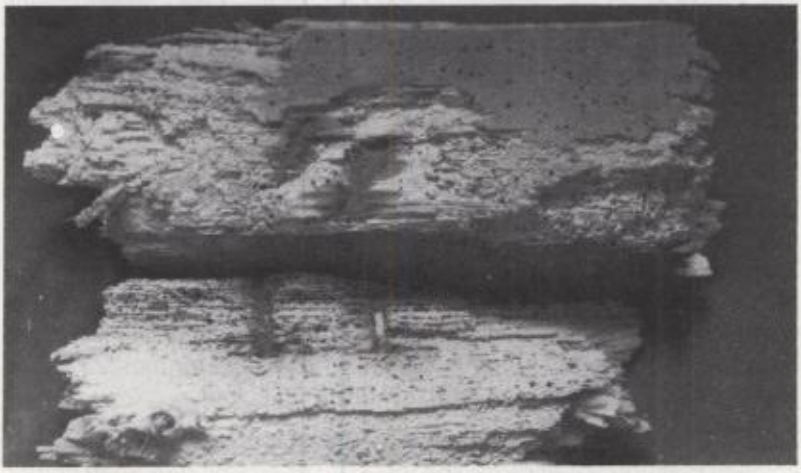
Actual size ▷



This beetle generally attacks hardwoods, such as oak, particularly if there is already fungal decay. It's therefore most common in old buildings like churches.

Dee McLean, *Which?*, January 1987

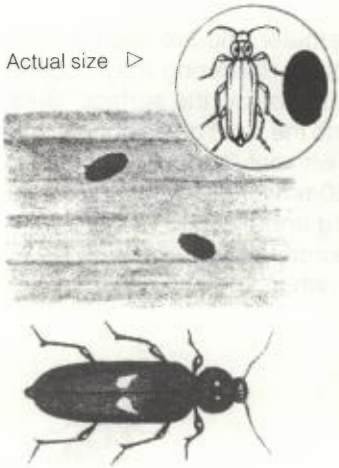
Deathwatch beetle will rarely make any impact on structural timber in good repair and free from decay. It can flourish in wood decayed by continual exposure to damp, especially if fungal decay is already established. The beetle generally attacks hardwoods, mainly oak. In conditions favourable to infestation deathwatch beetle has been blamed for severe damage to structural timber, although it is likely that the timber would have been in a pretty poor state as a result of damp and rot. Deathwatch beetle is commonly found in old and historic buildings such as churches.



△ **Extensive death watch beetle damage to oak.** Photo: Remtox Chemicals Limited

Detecting deathwatch beetle

Emergence holes and tunnels are extensive, circular, and 3mm in diameter, mainly in the direction of the grain. The frass is cream-coloured, containing disc-shaped pellets that are gritty when rubbed between the fingers.



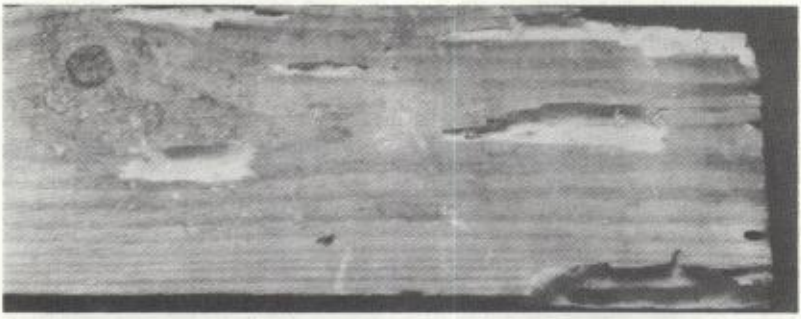
House longhorn beetle (Hylotrupes bajulus)

An attack by the house longhorn beetle is potentially much more serious than a woodworm attack. At present it occurs only in certain localities, for example in the Home Counties, and, in particular, Surrey. It attacks mainly the sapwood of softwoods such as pine. The flight holes are oval, and are usually filled with bore dust. The larval stage may last up to 11 years. In the later stages of the attack, blistering may appear, caused by tunnels packed with bore dust just below the surface. By the time flight holes appear, the damage can be in a very advanced state, with perhaps only a thin shell of sound timber left.

Dee McLean, *Which?*, January 1987

There is currently a very restricted area of infestation centred on the Home Counties, particularly Surrey. Pretreatment of timbers is mandatory in designated areas of high risk. It attacks mainly the sapwood of softwoods such as pine, particularly roof trusses. It may also attack joinery. Larger timbers with little sapwood are unlikely to suffer any serious damage (Building Research Establishment 1982). The BRE warns that structurally unimportant damage caused by forest longhorns has in the past been confused with that caused by the house longhorn and that '. . . assessments of the activity of infestations were not always accurate; of fourteen supposedly active house longhorn infestations which were inspected, eight had been correctly identified but only three were active.'

The BRE supplies pre-paid notification cards to local authorities and remedial firms operating in the area designated to be at risk.



△ **House longhorn beetle damage to softwood rafter. Tunnels exposed for demonstration purposes.** Photo: Remtox Chemicals Limited

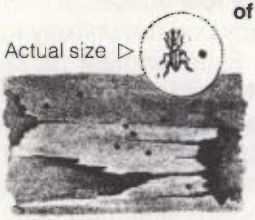
Detecting house longhorn beetle

The flight holes are oval, 6–10mm in diameter and are usually filled with bore dust. In the later stages of attack, blistering may appear, caused by tunnels packed by bore dust just below the surface. Bore holes are extensive and join up. By the time the flight holes appear, the entire sapwood may have disintegrated, with only a thin skin of sound timber remaining. The larvae are up to 30mm long, straight and pale cream; the adult beetle is 10–20mm long and black to dull brown in colour. Bore dust is usually cream-coloured, and the beetles leave sausage-shaped pellets that are gritty when rubbed between the fingers.

Other wood borers

△ **WOOD BORING WEEVILS**
These prefer decaying hardwood and softwood and so can be found in damp timbers in cellars, for example. Treatment for the decay should eliminate the weevil without the use of insecticide.

Actual size ▷



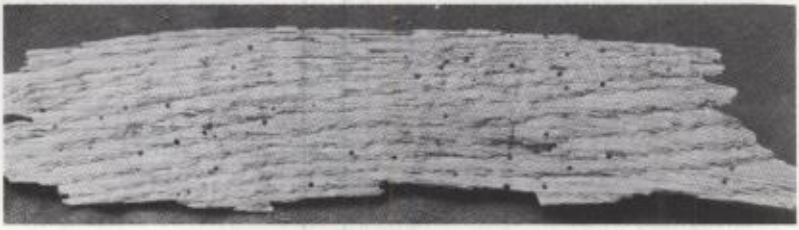
▽ Actual size

△ **POWDER POST BEETLE**
The powder post beetle is found only in the sapwood of hardwoods and it doesn't attack old timber. It tends to be found in timber yards, fencing, furniture and hardwood flooring blocks.

Dee McLean, *Which?*, January 1987

Wood boring weevils, wharf borers etc will only attack sodden hard and softwood which is already badly decayed by fungus (in cellars for example). If the infested timber and the source of the damp is removed, the infestation will not return. Parasitic mites and wasps, together with bats, also hamper the development of infestations of wood-boring beetles of all species.

▽ **Powder post beetles holes in oak.** Photo: Remtox Chemicals Limited



Rot

If dry rot was the threat to buildings its reputation suggests we would all be living in piles of rubble surrounded by triffid-like growths. We don't. The credit for this does not lie with the fungicides in pretreatment and remedial treatment wood preservatives so much as with the sensitivity of rot itself. Timber won't rot unless there is excessive moisture in the wood. Neither dry nor wet rot can develop unless wood is in an area of poor ventilation. All rot in building timber is a failure of design or maintenance. Once timber has started to rot, even the heaviest application of fungicide is unlikely to stop it unless the source of moisture is stopped and proper ventilation allows the wood to dry out.

In an unsatisfactory environment, pretreatment of new timber with fungicide will allow it, at best, to survive a bit longer. If pretreatment is specified as a necessary part of the design this is an admission either that the environment will not be suitable or that the wood will not be properly maintained. In the case of a building neither admission bodes well for those who will use it.

> 'Mention dry rot and the building industry has fits . . . Dry rot has been built up as a cancer of buildings, so we need to find out how to put it into recession.'
> **Architect Geoffrey Hutton, interviewed by John Bell, *New Scientist*, April 1984 (Bell 1984)**

The Building Research Establishment has looked at the problem of fungal decay of building timber:

> 'Fungal spores are so minute and ubiquitous that it is impossible to prevent their entry into buildings. Preventive measures depend therefore on conditions being unsuitable for spore germination or mycelial growth; this can be ensured by preventing the wetting up of substrates by condensation or ingress of water and by generally maintaining dry conditions.'
> ***Reducing the risk of pest infestations*, BRE Digest, June 1980 (BRE 1980)**

Geoffrey Hutton of architects Hutton and Rostron has examined many buildings with quite severe dry rot problems:

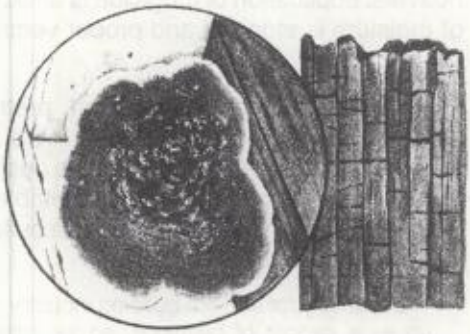
> 'Dry rot may attack timber with a moisture content of about 20 per cent . . . This is five to 10 percent wetter than timber should be indoors and indicates water penetration.'

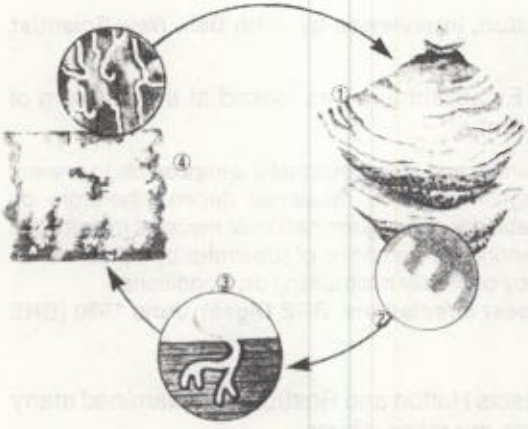
Even at this excessive level of moisture the risks are limited. Dry rot requires far more moisture to flourish – 20 percent moisture is not enough for dry rot spores to germinate. Basically a building that can support rot – wet or dry – is a building in poor repair.

Rot is just one symptom of this disrepair. Unless proper refurbishment addresses the root cause of the problem, the rot will inevitably continue and with it a host of other problems. Digestive problems, allergies and lung diseases are all more common in people, particularly children, living in damp housing. Recent outbreaks of meningitis have also been linked to damp, defective housing. Introducing highly toxic chemicals to the equation can only make matters worse.

Dry rot

DRY ROT ▷
Dry rot is serious. It feeds off timber, making it crack and crumble. The worst thing is the way that it can spread over substances like brickwork to reach uninfected timber. It can cause a lot of damage before it is detected.





◁ HOW DRY ROT DEVELOPS
A mature fungus produces a fruiting body (1), which liberates spores (2). A spore, falling on damp wood, produces thin tubes called hyphae (3). These often from a fluffy, cotton wool-like mass, called a mycelium (4) over the surface of the wood. Eventually another fruiting body develops, producing more spores and the process continues.

Dee McLean, *Which?*, January 1987

This is a type of fungus related to mushrooms and toadstools. It is a serious problem if allowed to develop unchecked. As the spores (rot 'seeds') are found everywhere, the only way to prevent dry rot is to ensure that a suitable habitat does not exist. The fungus has the ability to grow through plaster, brickwork and masonry – which means it can

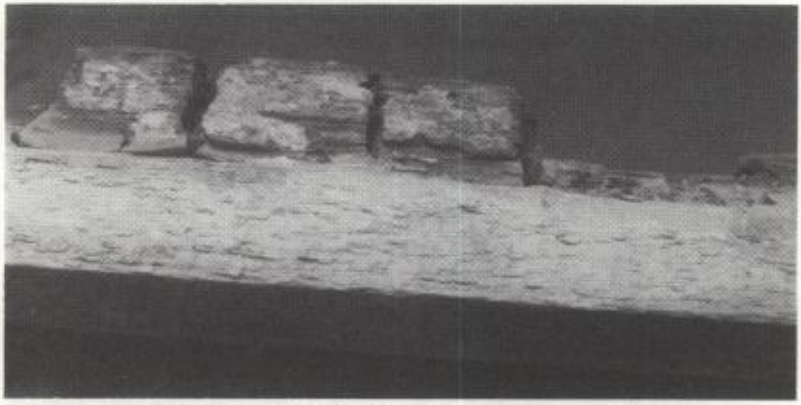
quickly colonise unaffected areas of timber. This will only happen, however, where timber is already predisposed to rot development, ie where it is already affected by moisture. Because of its ability to spread rapidly it is important to detect early signs of attack.

Dry rot hates well-ventilated and, in fact, 'dry' places. It needs timber moisture levels of at least 20 per cent to develop; 30–40 per cent to thrive. It also requires poor ventilation. Timbers immediately adjacent to infected wood can be protected by a draught. It will not grow below 0 degrees Celsius, a relatively common temperature, particularly in exterior timbers, for much of the year.

Dry rot often occurs in out-of-the-way places – beneath timber floors with insufficient ventilation, in cellars, in understairs cupboards and behind wall-panelling.

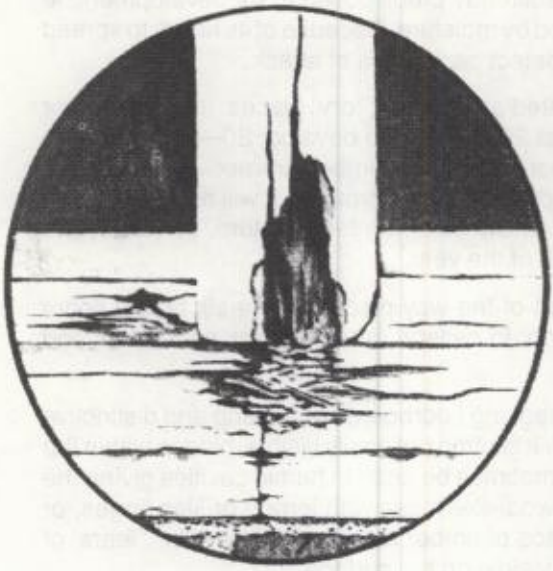
Signs of dry rot include creaking floorboards or a damp and distinctive musty, mushroomy smell. It is often not easily visible, hidden within the wood, although it can sometimes be seen in humid cavities giving the appearance of a cotton wool-like mass with lemon or lilac tinges, or growing across the surface of timber as a grey-white skin. 'Tears' of moisture are sometimes visible on the surface.

Wood affected by dry rot becomes light in weight, crumbles under the fingers and becomes a darker, characteristic dull brown colour. Damaged wood develops a distinctive cracking across and along the grain, giving a cube-like appearance. Reddish-brown spores, like a fine, rusty dust, may also be visible. If the moisture content of the timber drops below 20 per cent and stays there, the fungus dies in nine months to a year.



△ **Large cuboidal cracking and darkening caused by dry rot.** Photo: Remtox Chemicals Limited

Wet rot

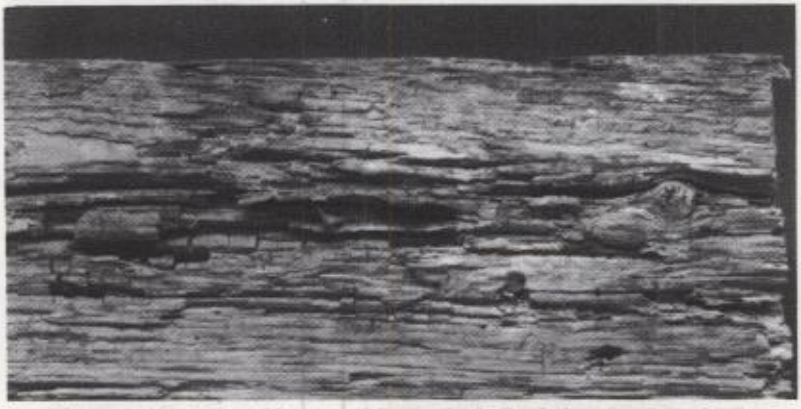


Dee McLean, *Which?*, January 1987

◁ **WET ROT**
Wet rot isn't as serious as dry rot because it can't spread in the same way, and lives only on wood that's always wet. If the wood dries out, the fungus dies.

Wet rot fungi have a similar life cycle to dry rot. The hyphae grow into the wood, softening it in the process. It's unusual, though, to see a sheet of mycelium, and fruiting bodies are unlikely to occur indoors. The decayed wood is brown or bleached and fibrous; cracking is mainly along the grain, although the cube pattern, similar to dry rot, can occur.

Wet rot is generally far less serious than dry rot as it doesn't spread from the rotten wood on which it feeds to other timbers through masonry, brickwork or plaster. Spores, though, will be found throughout the property, so any other suitably damp wood is likely to rot.



△ **Wet rot in joist caused by slow dripping leak. Rot is localised.** Photo: Remtox Chemicals Limited

Wet rot requires high levels of moisture to become properly established (50–60 per cent) and usually occurs in persistently wet wood. It is slow spreading and dies if the wood dries out. It is found where wood or masonry is being repeatedly wetted; this could be as a result of plumbing faults, leakage near blocked gutters, drains or water thrown off the roof. Timbers in contact with outside walls such as window sills and frames, and door frames are at risk. Garden furniture will be vulnerable at joints and where it is in contact with the ground.

Wet rot attacks both softwood and hardwood, causing a darkening of the timber (brown rot) or bleaching (white rot). The wood cracks, mainly along the grain, although a cube pattern similar to that seen with dry rot can occur. Timber affected by wet rot will yield if probed with a sharp object, such as a screwdriver.

Soft rot

This is a term often used to describe rot at the base of fence posts and other wood in contact with the ground. It can be thought of as a superficial form of wet rot, again requiring a wood with a relatively high moisture content. Soft rot can sometimes resemble dry rot in the form of dull, brown, decayed wood; however it rarely damages anything beyond the outer wood. Hardwoods are more susceptible than softwoods, and it is most commonly seen in waterlogged wood, for example in boathouses and quays.

Why buildings fall prey to rot and insect infestation

New or old houses can, potentially, fall prey to rot or insect infestation. Often this is the result of poor initial design. The systems-built flats so popular with architects and developers in the 1960s found less favour with tenants. The design allowed cheap and easy construction, giving a fast and lucrative return on investment. This priority left building standards an inevitable casualty. The result was an environment more suitable for rot than tenants. The joints in the Bison wall-frame system of flats, for example, were known to leak from day one, but they continued to be used for a further ten years – it was cheaper to continue to build in the flaw.

Traditional housing, too, has design problems. The government's Building Research Establishment has estimated that 50 per cent of faults in traditional housing under construction are as a result of defective design (*Quality in Traditional Housing*, BRE).

Moisture content

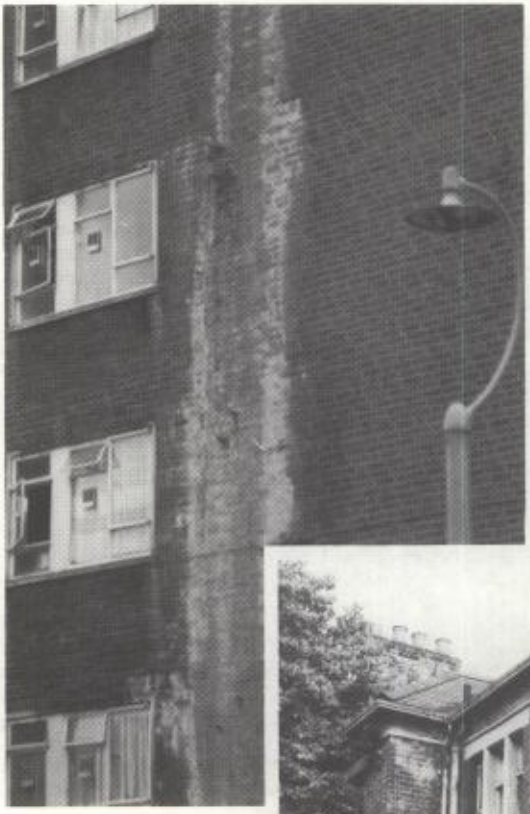
Controlling the level of moisture in buildings is the only way to effectively control timber pests. Dry rot can colonise wood with a moisture content of about 20 per cent but requires considerably more moisture in order to germinate (between 30-50 per cent). Wet rot needs saturated, persistently wet wood and does not readily spread. Woodworm and death watch beetle will not flourish at moisture contents below 15 per cent. The beetle larvae will desiccate and die below about 12 per cent.

> 'In order to reduce the risk of decay or insect attack to a reasonable minimum, it is necessary to maintain a moisture content in timber below 22 per cent . . . this is relatively simple if correct constructional details are followed which should maintain average of around 14 per cent.'
> ***Timber pests and their control*, Timber Research and Development Association (TRADA/BWPA, 1984)**

On the subject of rot, the TRADA/BWPA report comments:

> 'Even when decay has become established in a piece of wood, a change in conditions may cause a change in moisture content or temperature which, whilst not immediately killing the fungus, may make it revert to a dormant condition. If conditions remain permanently unfavourable the fungus will eventually die, but if the change is only temporary, the fungus will resume its attack when conditions again become suitable.'

△ **Factory made joinery with poorly constructed joints allow water penetration. Frames suffering local decay by wet rot. Vertical section of right hand frame has been replaced previously because of rot.**



◁ **Dwindling budgets for council house maintenance means inevitable decay. Here defective overflows have soaked brickwork, leaving joinery, floorboards and structural timbers vulnerable to rot and insect attack.**

Spot the defect: ▷ Rising damp clearly visible in wall to right of the photograph. Broken rainwater pipe causes the wall to be permanently wet *centre*. Broken guttering leads down to pipe leading nowhere *left*. Unchecked vegetation holds moisture against brickwork and damages pointing.

◁ Valley roofs allow water to accumulate next to vulnerable small roof timbers. Concrete division between ground and first floors forms a cold and moisture trap (these 'boldly expressed structural members' are a design failing always associated with damp problems). Neglected paintwork leaves sub-standard timber doubly vulnerable.

▽ Pitch covering of slate roof allows water penetration, prevents ventilation and maintenance. Guttering pulling away from wall. Barbed wire won't keep the rot out here.

Chemicals: do they work?

The wood preserving and chemical industry are clear in their defence of chemical wood treatments. The chemicals are essential and safe (if used as directed). Even people concerned at the potential hazards attached to the use of any toxic chemical view them as a necessary evil, banishing insects or fungi from timbers. But is wood so severely threatened by infestation? And are the chemical treatments all they're cracked up to be?

Several responsible timber treatment firms believe too much emphasis is put on chemical solutions to timber pests.

> 'Suffice to say at present that overall chemical treatment of all the accessible timbers of a building is excessive, particularly since those most at risk in the long term are inaccessible. Wholesale drilling and irrigation of walls to combat dry rot is also excessive and is acknowledged by most competent contractors to be so.'
> **M Rickards, *Building Trades Journal*, March 1987**

A Consumers' Association report, published in 1988, commented that even in the relatively hostile garden environment:

> 'Even the cheaper softwoods like pine and red or yellow deal, which are not naturally durable, should last at least five years and longer in some situations without preservative treatment so long as they remain fairly dry. For example, the Countryside Commission for Scotland has been running a trial for the last ten years using pine wood panels. Some of the panels were treated with different wood preservatives and some were left untreated. Despite being left outside on an exposed wall, none have yet rotted, the reason being that, as they aren't in contact with the ground, they never get wet enough to support colonies of wood-rotting fungi.'
> ***Gardening Which?* 1988**

Architect Geoffrey Hutton also believes that in using wood preservatives we are often putting the chemical cart before the horse:

> 'Defects can be inherent or induced by change. Damp, decay and beetle infestation are rarely inherent, and a cure is not achieved by treating the symptoms.'

In fact, the chemicals so long defended and pushed into our homes are not particularly effective at treating even the symptoms. The Building Research Establishment examined the permanence of PCP in dip-treated timber. Their findings cast doubts on the ability of any pretreatment to provide prolonged timber protection. Up to 50 per cent of the PCP had disappeared within months of the treatment:

> 'The PCP levels in the lateral zones of dip-treated, painted, redwood sapwood were only partially effective in hindering fungal growth after 40 months of normal ageing.'

The authors found that, at best, the treatment might offer superficial protection.

> '. . . only the 0–4mm [outermost] zone of the unpainted, but protected, sample contains levels of PCP likely to provide protection against C. puteana [wet rot].'

These results led the authors to comment:

> 'It is clear that unless the penetration can be improved there is little use in applying organic solvent preservatives by this means for the long term protection of timber.'
> **R J Orsler and M W S Stone, Building Research Establishment, in *The International Journal of Wood Preservation*, Volume 1, Number 4, 1979**

The only good thing the authors could find to say about the performance of PCP was that lindane (gamma-HCH) performs even less impressively:

> 'The pattern of loss of PCP from unpainted timber is similar to that found previously for [gamma] HCH, although much slower.'

So, for three decades workers have been exposed to lindane and PCP whilst dipping timber. Joiners and carpenters have inhaled the chemicals absorbed on wood dust and have handled the treated timber. Homes have had chemicals introduced with their fixtures and fittings. And the sole benefactor of all this chemical exposure? The chemical wood preservative industry.

Painted timber

The quick decline in the concentration of PCP, lindane and other organic solvent wood preservative chemicals after treatment is not a phenomenon restricted to timbers that have been 'dipped' or 'immersed'. The same physical and chemical properties allow their rapid disappearance from any treated wood.

> 'The relatively high volatility of PCP and the water solubility of its ionised form have lead to widespread contamination of the environment with this compound. Depending on the solvent, temperature, pH, and type of wood, up to 80 per cent of PCP may evaporate from treated wood within 12 months.'
> **United Nations Environment Programme, *IRPTC Bulletin*, Vol 9 No 1 (June 1988)**

Painted timber fares even worse than unpainted. The preservative dissolves in the paint and then evaporates to the atmosphere. This provides an extremely effective way of actively removing wood preservatives from treated timber.

> 'The removal of PCP from treated wood by painting may not be significant where reasonable penetration allows the total absorption of preservative to provide sufficient protection for long-term service. But where penetration is low . . . a much higher proportion of the total preservative will be removed by the application of paint. From distribution determinations for unpainted wood, this can be assessed at 50 per cent of the original loading for a simple immersion treatment. Further losses, as detailed for the Scots pine/alkyd paint experiment could leave superficially treated timber with only 25 per cent of the original loading of preservative for its long-term protection.'
> **Orsler and Stone 1979**

The Building Research Establishment has voiced similar concerns about the effectiveness of remedial treatments. The BRE concluded that it was not possible, due to losses of preservatives over the years, to predict how effective the treatment would be in the long-term:

> 'In view of this uncertainty there would appear to be little justification for in situ treatments of unaffected dwellings as a precautionary measure . . . infestations are more economically and effectively dealt with as they arise, unless there is an imminent and obvious risk of attack. Moreover, such an approach would ensure that the unnecessary introduction of toxic materials into the building environment is avoided.'
> ***Emulsion-based formulations for remedial treatments against woodworm*, BRE Information Paper IP 15/83, 1983**

Geoffrey Hutton has long believed that chemical treatments are an inappropriate and unnecessary hazard in buildings:

> 'Eradication of fungal or insect vectors . . . is, in practice, impossible. The volumes of chemicals necessary and toxicities required would be damaging to both the building and all its occupants. Although many of the chemicals used are persistent and come in concentrations necessary to support 20- and 30- year guarantees, they nevertheless fail to penetrate more than the immediate surface of the material and lose their toxicity by ageing and leaching. The use of potentially hazardous insecticides and fungicides not only causes concern to health authorities, wild life interests, and environmentalists, but develops resistance in the target organism.'
> ***The Biology of Timber Decay in Buildings*, Geoffrey Hutton, 1988**

Some timbers prevent preservatives from entering, even when subjected to high pressure treatment. Spruce, for example, is naturally impermeable. Neither water-based (eg CCA) nor solvent based formulations achieve any significant level of penetration. Only protecting the environment in which the timber is used can be expected to protect it from decay.

Fast-grown, kiln-dried and pesticide-steeped timber means fast profits. No other logic can really explain the timber industry's eagerness to abandon sound, seasoned, fair sized and durable timbers. Of course, small cross-section sapwoods are easy prey for rot

and insect attack and wood preservatives may increase their life. But reliance on chemicals to protect structural or other timbers is showing faith in wood preservatives they scarcely deserve.

On those occasions that wood preservatives do permeate wood and hang about long enough to take on the twin perils of decay and infestation, they cannot be relied upon to work. The industry's glossy literature rarely mentions that the super insecticide lindane doesn't work quite so well as the less toxic pyrethroid compounds. Yet Roger Berry of the Building Research Establishment reported exactly that in 1980. You rarely hear warnings about arsenic or PCP treatment affecting the performance of timber, making it less suitable for situations where it will be subjected to considerable stress and strain. The United States National Institute for Occupational Safety and Health thought it was worth a mention:

> 'Few if any railroad ties are treated with PCP or arsenical chemicals because they impart brittleness to the wood causing excessive wear and splitting from the repeated stresses and expansions.'
> **NIOSH Technical Report, 1983**

It is not unknown for a remedial treatment to make a dry rot infestation worse. Threaten dry rot with chemicals and it can respond with a 'stress reaction'. These reactions result in the release of many millions of spores, spores that can potentially colonise other unaffected wood.

Concern about the worth of pouring large quantities of toxic chemicals into an enclosed occupied space seems well-founded, the evidence is to hand. But no one markets this information. No glossy warning leaflets. Timber treatment is big business. Who dare argue with Big Business?

Breaking with chemicals

Wood boring insects and fungal rot can damage wood and, in some instances, the structural strength of buildings. But it is not the absence or otherwise of chemicals that really determines whether this damage occurs. It is the existence of suitable environmental conditions. The factors favouring the decay of timber are moisture, humidity and lack of ventilation. Controlling the environment through diligent building inspection and maintenance will ensure that timbers remain sound and free from infestation. As Geoffrey Hutton says:

> 'Timber is under attack from multiple sources. Once infected the damage of the resultant decay can be expensive to correct; left undetected it may even become irreparable . . . Providing it is identified in time and the corrective measures taken are properly defined and carefully managed, the process of degradation can be arrested. Preventive medicine is by far the best.'

△ Mycologist Dr Singh points to an inspection hole, into which an optical fibrescope can be inserted, at Netley House.

△ Dr Singh using a fibrescope which has optical cables for illumination and for photographing inside a cavity.

△ Rot viewed through a fibrescope

Alternatives

For 20 years architects Hutton and Rostron have been using non-chemical methods to control attacks of rot and beetle in historic buildings. These include the listed National Trust property, Netley House, Gomshall, Surrey, where they have their offices, the Brighton Pavilion, the Mansion House in London and castles in Scotland. The firm has been commissioned to write a British Standards Institution code of practice on conservation of historic structures. It can be expected to urge restraint on the 'open-out-and-spray-it' methods which, says Geoffrey Hutton, have needlessly damaged much fine plasterwork and panelling. In many cases they have been called in after chemical methods have failed and, in the case of the Brighton Pavilion, made workers ill as well.

'The reasons for work in a building should always be questioned,' says Hutton. 'Damp, decay and beetle infestations are rarely inherent, and a cure is not achieved by treating the symptoms. Analysis of the circumstances is essential.'

◁ Netley House, where dry rot has been controlled by drying out and ventilation.

▷ Data-logging, weather station crucial in monitoring and controlling humidity, temperature and ventilation

DAMP CAUSES and TYPES of

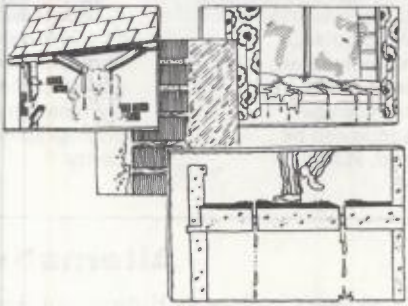
PENETRATING DAMP CONDENSATION

PENETRATING DAMP

WHAT IT IS:
Water penetrating through the structure. eg leaking roof, rotten window frames.

SIGNS:
Damp patches, usually worse after rain or snow. They may appear a long way away from the cause of the leak as the water will travel within the structure before emerging.

CAUSES:
Failure in weather-proofing of structure. eg. broken gutter, holed roof, perished brick-work, defective seals around windows or between concrete panels.



CONDENSATION

WHAT IT IS:
Water vapour in the air that is deposited as droplets on cold surfaces.

SIGNS:
A "misting" or "sweating" on surfaces, particularly external walls, floors, windows and in "stagnant" spots eg corners. It gets worse in cold weather. Usually, it is only on the surface but can be within the structure too. Bedding and clothing can feel damp and often mould or mildew can occur.

CAUSES:
Lack of insulation-allowing walls, floors and ceilings to get cold. Smaller cold areas are caused by "cold bridging" (a gap in the insulation) or disrepair and damp, which ruins the insulation.
Lack of heating - which fails to keep the structure warm.
Lack of ventilation - to remove moisture where it is produced.
Heavy Construction - eg. concrete or solid brickwork, which takes a lot of heat to warm up.
Porous materials - which attract moisture.

RISING DAMP

TRAUMATIC DAMP

RISING DAMP

WHAT IT IS:
Water soaking up from the ground into walls and floors.

SIGNS:
A tidemark on the wall (rarely above 3-4 ft. high.) Present all year round. Associated with timber rot, fungus and perished plaster, and musty smells.

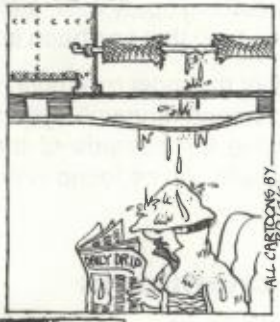
CAUSES:
Non-existant, faulty or by-passed damp-proof courses (DPC) which allows water to rise from the ground below.

TRAUMATIC DAMP

WHAT IT IS:
A sudden deluge of water due to a disaster. (eg. burst pipe.)

SIGNS:
Dripping or flowing water, often through the ceiling. Usually the cause is easy to identify.

CAUSES:
Inadequate lagging to pipes and tanks in the loft. Faulty valves or equipment. Blocked or faulty overflows. Breakdown of household equipment (eg. washing machine).



CONSTRUCTION MOISTURE

WHAT IT IS:
Water in building materials to make them workable (eg. cement, plaster). Over time (about 6-9 mths) all the excess moisture should evaporate out.

SIGNS:
Flaking paintwork on walls, peeling wallpaper and staining.

CAUSES:
Paper and paint applied too soon after construction work. Lack of heating and ventilation to remove moisture.

4

Chemicals and ill health

Wood preservatives in the body

Wood preservatives are powerful pesticides, chosen for their ability to kill insects and fungi and for their persistence – the ability to remain toxic for 20 or 30 years. Inevitably, whatever anyone tells you, they can also cause harm to humans.

Many can poison through the skin as well as through the lungs and digestive system. People can become ill after handling treated timber, or by breathing spray mist, vapour, contaminated dust or sawdust, or by eating food that has been in contact with wood preservatives.

Several of the most commonly used chemicals cause cancer, allergy, nerve damage, immune system damage or birth defects. Below we summarise the hazards of the most common wood preservatives. More details can be found in the Chemicals Directory.

The chemicals

Arsenic

Insecticide and fungicide. Pretreatment only, usually with copper and chrome (CCA – eg. 'Tanalith' process). Timber is most dangerous in the first two weeks after treatment. Handling wet timber has caused arsenic poisoning. Splinters fester painfully under the skin.

▲ **Deadly poison.** Lethal dose in adult around half a gram. Causes skin damage, skin and other cancers; damage to peripheral nerves causing loss of movement or feeling.
Control limit UK: 0.1mg/m^3.

Creosote

Fungicide and insecticide. Pretreatment and remedial treatment on external timber. Commonest DIY product. Banned in USA for all but professional use.

▲ **Highly poisonous.** Causes skin and eye irritation and burning made worse by sunlight; permanent damage to cornea of eye; acute bronchitis from spray mist; nausea, headaches; cancer of skin and lungs.
Control limit UK: none set.

Dieldrin

Developed and used as insecticide since 1948. Once much used in remedial treatments and in pretreatment fluids, it now has no approved wood preservative uses in the UK. Producers may still formulate for export. Banned in the USA 1975. UK will obey EEC directive to ban it in 1992.

▲ **Highly poisonous.** Lethal dose in adult: probably 2–3 grams. Poisons through the skin; nerve poison; causes cancer.
Control limit UK: 0.25mg/m^3.

Lindane (gamma-hexachlorocyclohexane or gamma-HCH)

Discovered 1912. Exploited as an insecticide since 1940s. Pretreatment and remedial use. Common in DIY products. Banned or severely restricted in Japan, USA and many other countries.

▲ **Highly poisonous.** Lethal dose in adult: around 3 grams. Poisons through the skin; irritant, allergen; brain and nervous system poison; causes epilepsy; damages blood system; causes cancer in animals.
Control limit UK: 0.5mg/m^3.

Pentachlorophenol (PCP)

Discovered 1841, preservative properties exploited since 1930s. Fungicide. Pretreatment (eg. 'Protim' process) and remedial use. In many DIY wood preservatives. Banned in many countries, and in USA restricted to professional outdoor use.

> '. . . in recent years, most developed countries have restricted the use of of PCP, especially for agricultural and domestic applications. The domestic use of PCP . . . has been of particular concern because of the possible health hazards associated with the indoor application of wood preservatives containing PCP.'
> **United Nations Environment Programme, *IRPTC Bulletin*, Vol 9 No 1 (June 1988)**

▲ **Highly poisonous.** Blamed for 1,000 deaths worldwide. Lethal dose in adult: about 2 grams. More poisonous through skin than by other routes. Wood, air, dust and objects in treated buildings remain toxic for years. Irritant, nerve poison. Acute effects: rapid rise in body

temperature, collapse, death. Chronic effects: local nerve damage and paralysis, persistent painful skin rash ('chloracne'). Liver, kidney and heart damage. Contains impurities, including dioxins, which cause cancer and birth defects.
Control limit UK: 0.5mg/m^3.

SAFETY, SEPTEMBER 1982

UK CHEMICAL PROBE AFTER 1000 DEATHS WORLDWIDE

GOVERNMENT health experts are investigating the medical records of hundreds of British workers exposed to a highly toxic chemical, responsible for one thousand deaths worldwide.

The chemical pentachlorophenol — which contains the deadly impurity dioxin — is used in the manufacture of fungicides, herbicides and wood preservative.

Production of the chemical ceased in this country four years ago. But now a team of doctors from the Employment Medical Advisory Service (EMAS) are attempting to trace workers at the Monsanto chemical plant in Newport, Gwent, who were involved with the manufacture of pentachlorophenol from 1950 to 1978.

In an earlier study of the plant, which was found to be exceeding the legal limit ex[illegible]

chemical, one in six workers out of a group of 158 were discovered to have contracted the severe skin disease chloracne.

Of these, two developed a rare form of cancer known as non-Hodgkins lymphoma. Both workers had been exposed to the chemical for over fifteen years.

Tumours

There have been 2,000 diagnosed cases of this form of tumour in Britain. Although medical opinion is divided, some doctors believe that chloracne could be an early symptom of the cancer.

The EMAS team, led by Dr R. D. Jones, are now working with the Office of Population and Census Surveys (OPCS) to 'tag' the 158 Monsanto workers.

If any of the group are [illegible] have

tion card attached to their OPCS record then details will be sent to EMAS.

A spokeswoman for EMAS said: "To put it at its most morbid what we are looking for is another death. Although the two cancers in this small group of workers is in excess of the expected figure we can't say yet there is a causal relationship with pentachlorophenol."

Running in tandem with this study is another EMAS investigation into chloracne among workers involved in the manufacture of wood preservatives at Rentokil and five other firms. Tests are being carried out on the liver enzimes and cholesterol levels of affected workers.

There is a clear precedent for this. In a toxicity review of pentachlorophenol, published last month by the Health and Safety Executive, details are revealed of deaths among wood preservers in France, pentachlorophenol herbicide sprayers in Australia and American saw mill workers.

The TUC, t[illegible]

Advisory Committee on Toxic Substances, has been pressing over the last year for a much more comprehensive investigation of the health hazards of the chemical.

Public risk

Committee member Jim Hamilton of the TUC told Safety: "The two cancer cases at Monsanto may be just the tip of the iceberg. We want to know what percentage of the 2,000 lymphoma cancer deaths are linked to pentachlorophenol.

But the unions are also concern about the hazards to the general publ In Kentucky, USA a number of le residents fell ill with chloracne af handling firewood made from ex Army ammunition boxes treated pentachlorophenol wood preservat

"What we are alarmed about is extent to which the stuff is bein [illegible]m," said Ha[illegible]

TBTO (tributyl tin oxide)

Developed in Holland 1954. Fungicide. Pretreatment and remedial use. Present in DIY products. Banned as boat anti-fouling paint because it stops marine animals reproducing. Other uses under review.

▲ **Highly poisonous.** Absorbed through skin. Lethal dose in adult around 6 grams. Irritant, burns skin/eyes, painful rash. Probably an allergen. Nerve poison. May damage heart and liver. Toxic to foetus in animals; effects on human reproduction not known. Cancer risk and damage to immune system still under investigation. Under review by UK Advisory Committee on Pesticides.
Control limit: 0.1mg/m^3 (measured as tin).

Others

Less hazardous chemicals are those accepted by the Nature Conservancy Council for use where bats roost. Two are shown below. 20 new compounds are patented as wood preservatives each year.

Permethrin

Insecticide. Developed Rothamstead Research Station 1973. Belongs to the synthetic pyrethroid family (all ending '- thrin') which is associated with irritation, nervous system damage and allergy. Laboratory experiments suggest it causes cancer. Human lethal dose probably around 35 grams. Even the inventors still do not know exactly how it works in the insect nervous system, let alone in the human. In the present state of ignorance it would be unwise to put a lot of it into the indoor environment.

Boron compounds

Insecticides and fungicides. Inorganic boron compounds (eg. borax) have caused poisoning in medical use but they can probably be used safely in certain kinds of pretreatment and as solid rods in remedial work. Organic boron compounds (boron esters), like all organic metal compounds, should be treated as nerve poisons.

How you are exposed

Everyone is potentially at risk from wood preservatives. Three million of Britain's 22 million homes have already been treated (Bateman 1988). Many other buildings also contain wood preservatives, either in the original timber or as a result of remedial spraying. Almost any piece of wood may contain preservatives even if it is not sold as such. The timber industry sprays fungicide, usually PCP, on logs and 'green' timber for cosmetic reasons, to prevent 'sapstain'. You don't need to work with treatment chemicals to be exposed to them.

These pesticides are now everywhere in the environment – in the air, drinking water and soil, rivers, lakes and seas. Most of us have dieldrin, PCP and lindane in our bodies. We already carry a toxic load of dangerous chemicals – there's no margin for adding more.

Chemicals get into our bodies by three routes – breathing, swallowing and touching.

Breathing

Inhalation of contaminated air. Gases and vapours go straight down into the lung and there may cross rapidly into the bloodstream. Fine dusts can follow the same route. Larger particles are trapped in the nasal passages or the 'mucus escalator' of the bronchial tubes. Irritants cause inflammation and production of excess mucus. This is called rhinitis (nose), bronchitis (bronchial tubes), pneumonitis (lung).

Chemically induced pneumonitis may produce so much fluid that the patient 'drowns'. The condition is easily mistaken for pneumonia, especially when infection follows. Pulmonary oedema also fills the lungs with fluid but this time as a result of heart-valve failure. Lindane has been given as a cause of pulmonary oedema (Sax 1979). So has TBTO (Murray, V., 1987).

The nose normally has a very efficient method of removing inhaled particles. Small hairs, assisted by mucus, produce an 'escalator', carrying the inhaled particles out of the body. Wood dust trapped by the defences in the nasal passages slows down the system's clearing rate (mucociliary clearance). This leads to an increase in common colds and middle ear infections (Anderson, Anderson and Solgaard 1977). Wood dust stays longer in the nasal passages than other dusts. This helps to explain the increased risk of nasal cancer in woodworkers. It is not yet known if all wood dusts can cause cancer, but in Sweden, where woodworking is a major industry, the authorities say all wood dust should be treated as a potential carcinogen.

Asthma is caused by an allergic reaction which puts airways into spasm, restricting the passage of air. Lindane is an allergen; it is probable that TBTO and other wood preservatives are also allergens. Allergic alveolitis is a similar reaction but deeper in the lung. The onset of breathlessness may be delayed for several hours after exposure to substances such as red cedar, maple bark and mould spores.

Swallowing

Swallowing the substance directly, eg after licking contaminated fingers, or in food and water. Food and water can be contaminated without direct contact: they absorb it from the air in treated and adjacent rooms. We also swallow larger particles of dust and droplets trapped and rejected by the respiratory system, as explained above. The chemistry of the substance dictates how much of it is absorbed from the digestive system and what becomes of it. The swallowed substance has to pass through the acid of the stomach, the alkali of the small intestine and the bacterial colony of the gut. These may alter it chemically, as may the liver (see Chemicals inside the body, later in this section.)

Touching

Penetration of skin, and mucous membranes (the body's moist surfaces – eg mouth, nasal passages, throat). All the common wood preservatives can get in this way, through unbroken skin. It is possible to be severely poisoned before the skin itself feels sore. Penetration is

faster if the skin is broken by cuts, abrasions or rashes, as is common in building and timber trade workers, and when it is hot and sweaty. Some areas are more 'permeable' than others: for example the inside of the wrist is many times more permeable than the palm. Pesticides dissolved in organic solvents penetrate faster. Initial contact can strip off the skin's grease layer, a natural protection against entry of chemicals. Once this has happened absorption is much easier.

△ **Hackney Direct Labour Organisation carpenter and union shop steward, Mick Holder – off sick for six weeks with chest troubles after handling treated timber.**

The skin is the most important absorption route for many substances. Most PCP poisonings and deaths happen this way. A woman developed aplastic anaemia after regularly washing her dog in a lindane shampoo (Sax 1973). A child was poisoned by PCP in bathwater after contamination of the water storage tank by remedial treatment in the loft. Others in the family had milder symptoms. Alerted by this incident, the GP identified another case soon afterwards. (Chapman and Robson 1965). Newborn babies in a nursery were poisoned by PCP added to the water in which their nappies had been washed. (Robson and others 1969).

You can be poisoned through the skin by dusts, mists and gases – not just liquids. Contaminated clothes provide a 'reservoir' of chemical from which workplace pollutants can be absorbed even outside working hours.

Physical properties of wood preservatives

How easily a chemical gets into the body depends on its physical state – solid, liquid, vapour, gas; the way the manufacturer formulates it; and the way it is used.

Solids

Most wood preservative chemicals are solids at room temperature and pressure. This means dusts are created in manufacture, packing, handling and in preparing the product for use. Treated surfaces can also give off dust (see below). Some of the solids, notably PCP and lindane, have significant vapour pressures – this means a proportion of the chemical will always be present in the air as vapour. Several researchers have shown that this can result in every surface and every object in the home being contaminated with PCP.

Generally the preservation industry does not want this volatility because it depletes the level of poison remaining in the wood. At the end of 20 or 30 years the wood may again be palatable for wood-boring insects. In the the case of dichlorvos (vapona), manufacturers exploit its volatility by producing blocks of vapona which are placed in roof spaces to kill woodworm during their beetle stage.

One of the few wood preservatives made and installed as a solid is inorganic boron. Boron rods are used to stop wet rot in window frames and other external joinery. The BRE found they worked well. Boron rods can also be used in brickwork for dry rot control. Having no significant dust or vapour hazard boron rods appear to be one of the few environmentally acceptable uses of chemicals in wood treatment.
Warning: boron rods could be tempting for small children to chew or swallow. They should be supplied only in sealed child-proof containers, with the number of rods clearly marked on the outside.

Liquids

Whatever their natural physical state, most preservatives have to be processed into liquid formulations for use as pretreatment fluids or remedial sprays. Creosote is one of the few that are liquid at room temperature. So is TBTO. Substances that are water-soluble, such as

the copper, chrome and arsenic salts in CCA formulations, and the sodium salt of PCP, can be mixed up straight away to make 'waterborne' or WB preservatives. Others must be dissolved in organic solvents such as toluene, methylene chloride or ethanol. This concentrated solution can then be further diluted in another organic solvent, usually white spirit, to make OS-type wood preservatives; or, by adding emulsifiers, the concentrate can be made to mix with water. The latter appear under product names such as emulsion concentrate, aqueous preservative, AQ and ATP.

Vapour

Liquids give off vapour. The higher the vapour pressure – the more volatile it is – the faster a substance evaporates. In wood preservatives the organic solvents are far more volatile than the insecticides and fungicides. In a treated space their highest level in the air is in the first few hours after treatment (though the room may still be dangerous for days), while the level of insecticide in the air may not peak for weeks. The type of carrier fluid has a big influence on pesticide levels in the air (Dobbs, White and Williams 1979). Regular exposure to solvent vapour can severely damage the brain. This is readily accepted as a consequence of 'glue-sniffing' but workers are told that headaches and dizziness are 'only' caused by solvent. By contrast, in Denmark pre-senile dementia caused by solvents is a recognised industrial disease.

Evaporation increases with temperature. As a rough guide, a 10 degree rise in temperature increases vapour pressure by five times. Quite small changes in temperature, atmospheric pressure and humidity have a big effect on levels of PCP in the air of treated homes. (Gebefugi, Parlar and Korte 1979). This may help to explain the common experience of people made ill by timber treatment that certain kinds of weather aggravate their symptoms. Vapours from liquids condense on cold surfaces. This is particularly relevant when water is stored in the treated space. BRE researchers showed that a concentration of 1μg/m^3 in air would produce a concentration of 1μg per litre of water. Water tanks should therefore be sealed as tightly and as permanently as possible with polythene and adhesive tape – not just covered over with a board.

Mists are fine droplets of fluid suspended in the air. They are produced by aerosol cans sold for DIY woodworm treatment and by remedial spraying. Mists deliver high doses of chemical to the lungs and skin. There is no place for aerosol cans in wood treatment and they should be banned. Formation of mist and fog by 'professional' spray lances

can be reduced by setting the nozzle to give a coarse spray but a mist is still produced in practice.

Note: occupational hygienists also use the term 'aerosol' for any airborne suspension of fine particles, including dusts and fumes.

Pastes, mayonnaises, mastics, jellies

These are thick (viscous) fluids. Their increasing use in wood preservation is welcome. In pretreatment, pre-mixed pastes are an essential substitute for the traditional dust-bombs of copper, chrome and arsenic powders. In remedial treatments pastes are applied to timber by mastic gun or spreader. The active ingredients diffuse into the timber. There is no spray mist and very little release of solvent vapour. However the formulations contain highly concentrated doses of pesticide, often PCP and lindane, which will get into the air and can easily contaminate the skin and clothing of workers and subsequent users of the treated space.

Some more enlightened firms are also introducing jellied preparations for injection into drilled timber and walls. This does away with spray mist and run-off and the gross contamination of workers and environment which can result from 'irrigation' of masonry against dry rot.

Fumes

Very small particles generated by heating or burning solids or liquids. Individual fume particles are invisible to the naked eye. You see fume only when it is dense enough to block light. In practice any fume or smoke will also contain gases and vapours. Fume is deliberately generated by lindane 'smoke generators' used in fumigation treatments for wood-boring beetles. Burning lindane or heating it beyond 180 degrees Celsius produces highly toxic 'thermal decomposition products'. Allergic dermatitis and very rapid acute poisoning have been blamed on insecticidal vaporisers used in shops and similar places. The US Environmental Protection Agency has banned lindane smoke bombs and vaporisers. Even in terms of effectiveness they have little to recommend them (see Section 3).

Burning treated wood is the other main source of fumes from wood preservatives. All treated wood, even small offcuts and shavings, must be disposed of as toxic waste. A fire in arsenic-treated wood led to evacuation of villages in Yorkshire (See Section 7. Waste disposal, including preservative-treated shavings, is dealt with in the same section.)

Note: the words fume and vapour are used interchangeably in everyday speech but should not be when discussing hazards. Fumes can be stopped by mechanical filters, *eg* a good dust-and-fume respirator, but vapours and gases pass straight through along with the air you breathe unless they are trapped chemically.

Dusts

Dusts are particles of solid material small enough to float in the air. The smallest that can be seen with the naked eye in normal light are between 50 and 100 microns in diameter. One micron is a thousandth of a millimetre. You may just be able to see particles as small as 12 microns when they are caught in a shaft of light against a dark background. Particles which get past the lung's defence system are mostly smaller than 6 microns. This means that dust particles which can reach, damage or pass through the lung are always invisible to the naked eye. The larger particles can cause upper respiratory tract infection however, and lead to sinus, nose and throat problems.

Control of dust is crucial in preventing chemical-related illness in workplaces and treated buildings. Vacuuming out dust before and after remedial treatments is central to the Cornwall County Council Specification – see Appendix 1. Cornwall's architects blamed illness in schoolchildren on TBTO contaminated dust found throughout treated schools. In an Essex old people's home, staff noticed a second peak of ill-health after the hurricane of October 1987 which increased dust levels. (More on dust control – see Section 6).

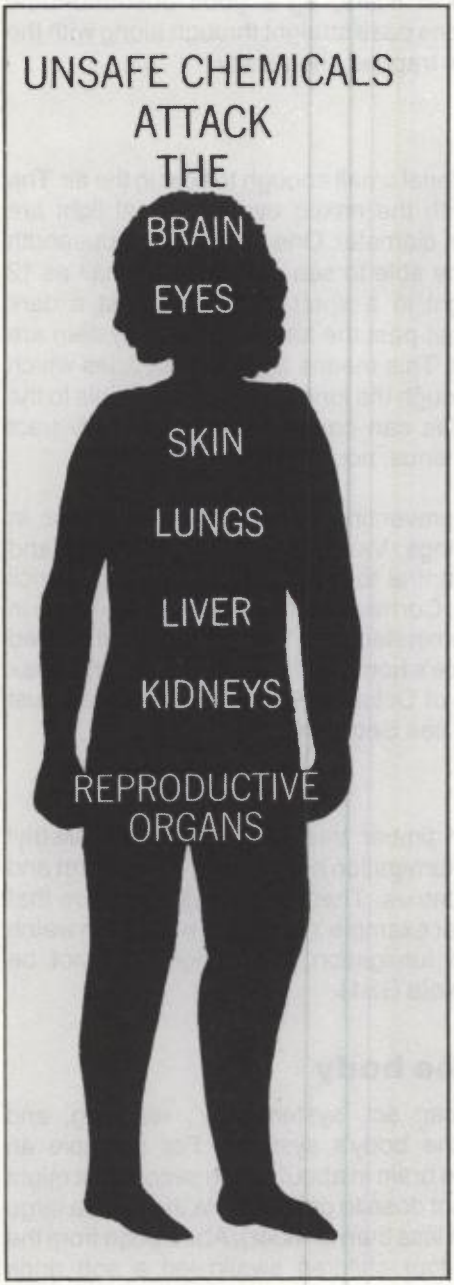
Gases

Gases are not often used in timber treatment in the UK. Methyl bromide is used in agricultural fumigation here and for woodworm and termite treatment in other countries. There is always a chance that someone will decide to use it, for example in a church with death watch beetle. As with smoke-bomb fumigation, the dangers cannot be justified (See HSE Guidance Note GS1).

Chemicals inside the body

Once absorbed, chemicals can act 'systemically', reaching, and perhaps damaging, any of the body's systems. For example an inhaled substance can be in the brain in about seven seconds. It might take half an hour for a significant dose to get there via the skin (a large splash of phenol proved fatal in less than an hour). Absorption from the gut takes longer still: when four children swallowed a soft drink

containing lindane, three vomited and had convulsions in less than six hours, the fourth within 12 hours.



The liver may succeed in breaking chemicals down into safer substances, or it may get it wrong and turn out a more toxic 'metabolite'. Aldrin is turned into dieldrin; lindane is partly converted to PCP. In the process of attempting to detoxify alien chemicals the liver itself is often damaged. Most organochlorine compounds and organic solvents damage the liver. Arsenic compounds cause cancer of the liver.

The kidneys filter unwanted materials from the blood. They are crucial in eliminating PCP from the body because most of it is excreted, unchanged, in urine. They may be damaged in the process, as they are by arsenic, lindane, dieldrin and organic solvents.

Some chemicals accumulate faster than the body gets rid of them. Substances such as lindane which are soluble in fat can end up stored away in fatty tissue. These deposits can be mobilised back into the system by illness, weight loss and other changes.

From Substandards Broadsheet, *Hazards Bulletin*, December 1987

This is a fairly simplistic view of the major parts of the body affected by exposure to wood preservatives. So is most occupational medicine, hygiene and toxicology. Long after lead was known to affect the brain and reproductive system, company doctors checked for 'excess absorption' (poisoning) by having workers stand in line and hold their arms out. Those with 'wrist-drop' – a sign of serious damage to peripheral motor nerves – were laid off. Those who just felt like death kept on working. So it is today with pesticides and other chemicals at work – and in the home.

Only the most obvious effects are observed and accepted as the characteristics of poisoning by a particular material. These observations usually come from acute poisoning incidents when the illness follows soon after exposure and no-one can dispute the link. So we know that severe PCP poisoning causes a fever which may get so hot that the patient dies, despite being packed round with ice; and lindane and dieldrin cause convulsions. Cutting open dead victims may show that other organs were damaged but subtle effects on the brain, immune system, or the structure of individual cells are unlikely to be revealed.

Other data on acute toxicity come from poisoning animals, mostly rats, in laboratory experiments. The most common test is the LD50 – finding out what dose is needed to kill 50 per cent of a group. The oral lethal dose in the rat has become the standard for comparing the toxicities of different compounds. It is usually expressed in milligrams per kilogram of body weight (mg/kg). So if a one milligram dose were to kill half a group of rats with an average body weight of 250 grams (a quarter of a kilo) the LD50 would be 4mg/kg. This would put it in the deadly poison category along with arsenic pentoxide, the compound used in CCA pretreatment (LD50: 8mg/kg).

Scaling up from this for human body weights may give a very rough idea of how much would kill a person. But it may be more or less toxic. It doesn't tell you how much is needed to give you a headache, or make you feel extremely ill. Rats cannot tell us how they feel.

Chronic effects

When it comes to the long-term, or chronic, effects of a particular substance in your body, the data from the post-mortem room and the animal test laboratories are even less helpful. When long-term animal tests are done, say for cancer, industry likes to quote those which give negative results and question the relevance of those which give positive. (For a graphic account of Shell's dispute with the US authorities over the cancer-causing properties of dieldrin, see *The*

Politics of Cancer, Epstein 1978.) Little details are overlooked, such as the atrophied testicles of the rats exposed to the pesticide dibromochloropropane. The relevance of this effect became apparent when workers making the stuff discovered that they had become infertile.

Other data, animal and human, get lost in a way that seldom happens to discoveries with commercial implications. For example standard textbooks do not quote the 1959 Tokyo Medical College research which confirmed that TBTO can cause permanent loss of the sense of smell (*Daily Press/Times Herald* 1987).

Proving a connection

The longer the gap between the dose and the effect the harder it is to establish a connection. An isolated individual may never be able to prove that there is any connection, except in those rare diseases, such as the asbestos cancer mesothelioma, which has almost no other known cause. As the makers like to point out, all the diseases caused by wood preservatives can be produced by other agents.

However, when a group of people get the same illness from the same substance at the same time, this argument cannot be used. It would be extremely difficult to argue that the illness of children in Cornish schools, workers in the Ironbridge Museum and staff and patients in the Essex old people's home all arose from some agent other than the chemicals recently introduced into those environments.

In an attempt to dismiss the mass poisonings, 'hysteria' has often been suggested by chemical makers and company doctors as an explanation for outbreaks of occupational illness, especially in women. This diagnosis was applied to women suffering the acute effects of organic solvent poisoning in a tennis ball factory. By the time a proper diagnosis was made several were suffering chronic nerve damage (*Hazards Bulletin* 26, June 1981)

Most of the victims of timber treatments are not in groups but are isolated individuals. In Belgium the University of Antwerp's Laboratory of Toxicology was able to study exposure history and medical symptoms in a group of more than 100 people who contacted them in the belief that their health had been damaged by wood preservatives. Their research (described in Section 1) provided the essentials for making a causal connection between timber treatment and ill-health: the people had been exposed; they did have medically confirmed symptoms which could be related to PCP and lindane and, most importantly, those with the highest levels of PCP in their bodies had the most severe illness.

The central point in this is not the intelligence of the toxicologists but the intelligence of the victims. Science confirmed what the people already knew – wood preservatives had made them ill.

Science can be used in another way to prove or disprove the suspicion that something causes ill-health: you compare the incidence of particular health complaints in an exposed group to that in a non-exposed group, or to the rate expected in the general population. This is called epidemiology. To get results that are statistically significant means proving that any difference between the two groups could not have occurred by chance – or is so improbable that the case is taken as proved.

Large numbers are needed and a lot of care to ensure that you are actually studying what you think you are studying. It can take a very long time, especially when investigating diseases such as cancer which may not show up for more than 30 years after exposure. It took years of epidemiology to prove in the 1960s what doctors had observed for decades – that smokers are more likely to get lung cancer than non-smokers. This undeniable causal link does not allow you to say that a particular smoker's lung cancer was caused by tobacco. Tobacco makers will point out that there are other causes of lung cancer.

In Britain no-one will fund even small-scale investigations of the health of people in preservative-treated buildings. Toxicologists at the Department of Community and Environmental Medicine at Barts Hospital in London offered to do some research for the HSE. The HSE said they couldn't fund the work (Jenkins 1988).

When industry's medical experts tell us there is no evidence, it usually means no-one has looked. When they do look, you can be sure the chemical will be given the benefit of the doubt.

The medical resistance

In the absence of such research we have to learn from the experience of occupational groups, such as coal miners and asbestos workers who had to discover their own diseases and convince the 'medical-industrial complex'. Groups who waited for the evidence found they were providing it the hard way, in death certificates. In the front line of medical resistance are the company doctors. Their special skills in occupational medicine and occupational hygiene tell them if it's technically possible for a worker to have the occupational illness being complained of. For example a glance at the list of control limits for airborne pollutants shows if the workers are breathing 'enough' of the substance to be ill or have 'enough' of it in their bodies. If you fail these

simple tests you don't get into the statistics. This confirms that the control limit is 'safe'.

Despite these holding operations, evidence of ill-health eventually builds up to the point where regulatory agencies have to act. Over the years the control limits are gradually reduced. 'Revised downwards' is the polite jargon which covers up the fact that previous 'safe levels' made people ill.

Control limits

Control limits provide a system for licensing pollution of the air breathed by workers. They are supposed to represent the concentration of a chemical in the air which you can breathe for eight hours a day for a working life without any unacceptable risk to health. The best known is the 'threshold limit value' (TLV) developed by the American Conference of Governmental Industrial Hygienists. Despite the official-sounding name, ACGIH is a voluntary body which has yet to live down its reputation for setting standards comfortable for industrialists. Many TLVs are based on nothing better than crude animal-poisoning data and may well ignore actual human experience of discomfort and irritation at lower concentrations – or laboratory tests indicating a cancer risk.

The TLV for wood dust illustrates all these faults. For years it has stood at 5mg/m^3 – a 'nuisance' dust. This is an uncomfortable amount of dust. It is also dangerous to health. Danish researchers showed that the limit would have to be more than halved to prevent an increase in common colds and middle ear inflammation – let alone nasal cancer (Andersen, Andersen and Solgaard 1977). Any standard-setting body which ignores this evidence cannot be giving the protection of workers a high priority.

Like many other ACGIH standards this one has been incorporated into the UK list of control limits. It would have been better for workers if this country had borrowed the Swedish standard for wood dust. This is set at 3mg/m^3 in existing operations and 2 mg/m^3 in new factories. A limit of 2mg/m^3 applies in any workplace handling wood impregnated with pesticides.

The setting of standards therefore owes as much to political priorities as to scientific assessment of risk. This subject is covered more fully in an excellent article 'Substandards' (*Hazards* 16 1987). Alternative control limits are also listed in the Chemicals Directory of this book. Other names for these standards are Occupational Exposure Limits; Permissible Exposure Limits; and Maximum Acceptable Concentrations.

Community/environmental standards

Occupational exposure limits (OELs) don't help you judge if air pollution in the home or community environment might be hazardous to health. As there are no standards for indoor pollution various researchers have devised their own. One way is to take the occupational limit and reduce it to take account of the time factor. Occupational limits are based on 40-hours a week exposure. In the home people may be exposed for 168 hours a week. So the first step is to reduce the OEL to a quarter – though a bigger factor should be employed to take account of the fact that constant exposure allows the body no recovery time. From then on it's all guesswork. What factor should you put in to protect a baby? Would a further tenfold reduction be enough? Are babies more susceptible than adults? What about asthmatic babies? And how much should you allow for the possibility that the infant may also swallow the substance from various sources and absorb it through the skin from treated surfaces?

The conventional answer to all these questions is to apply a safety factor of 100 to the occupational exposure limit. This would be the result for three common preservatives:

	Work limit (mg/m^3)	Home limit (mg/m^3)
Dieldrin	0.25	0.0025
Lindane	0.50	0.005
PCP	0.50	0.005

The BRE researchers used the World Health Organisation's 'acceptable daily intake' (ADI) figures for pesticides and converted them into 'acceptable air concentrations' (AACs). They assumed that a 70-kilo adult would be exposed 24 hours a day and would retain all the inhaled pesticide. They made no adjustments for children, the elderly or the ill; for other sources of exposure; or for interactions between chemicals. This was the result:

	ADI (mg)	AAC (mg/m^3)
Dieldrin	0.007	0.00038
Lindane	0.70	0.038
PCP	0.20	0.011

The two methods give oddly different results. Dobbs and Williams found that the air in preservative-treated homes could exceed the AAC levels for several years in the case of dieldrin and for weeks with lindane and PCP. Using the other method the risk from dieldrin would look less serious, the risk from lindane and PCP very much worse.

One conclusion to draw from these figures is that those devising exposure limits for people at work and in the community don't have much idea what they are doing. Even so it is clear that, whichever unsatisfactory limit is chosen, the indoor use of wood preservatives can easily exceed it. Just by breathing the air of a treated home people can absorb a prolonged overdose of toxic substances. When the remedial treaters have had their turn they have already used up any margin of safety which might accommodate those other licensed polluters – the employers, the food growers and the water companies.

The case histories which follow give some idea of the price which is paid for the extraordinary freedoms enjoyed by the timber treatment industry.

5

Casefile

Real people, real illnesses

> 'Almost all the media coverage results from the London Hazard Centre who have so far declined to make available their findings to either the Health and Safety Executive or to the British Wood Preserving Association.'
> **Peter Bateman, Public Relations Director, Rentokil, in letter to John Edmonds, General Secretary, GMB, 25 August 1988.**

The Health and Safety Executive has not shown the slightest interest in our work on wood preservatives – let alone asked to see our findings. We have certainly not declined to make our findings available to the BWPA. In a cordial, if slow-moving correspondence with the association beginning in November 1987, we have made it plain that we want to share our information with anyone who will take it seriously. In May 1988 we wrote to the association asking to see the evidence for its case that fungal spores can cause most of the diseases complained of by people who became ill after remedial treatments:

> 'At least it appears that we can agree on the existence of illnesses coincidental with timber treatment, while disagreeing on the cause. This leaves some room for discussion – unlike the view from some people in your industry that all the alleged sickness is an artefact of press publicity. As you know, we believe that our file of cases provides convincing evidence that exposure to wood preserving chemicals made people ill who had never heard a word about possible hazards.
>
> 'Obviously we will want the industry to see this evidence as soon as it is collated and cleared for disclosure by the individuals concerned. This is a lot of work for a small voluntary organisation dealing with wood preservatives as one of many issues. We would ask for your patience . . .'

In this section, with some reluctance, we summarise the evidence in our files. We do not like turning our clients into 'cases' and statistics but the increasingly dismissive tone of the wood preserving industry leaves us little option. By bringing our 'cases' together as a group in these pages we can show that they are not, as they are portrayed by the industry's more rabid defenders, isolated hypochondriacs, hysterics and neurotics with nothing better to do than imagine they are ill.

They are real people who developed real illnesses after exposure to wood preservatives. Most of them experienced a mixture of acute or chronic symptoms similar to those described by the University of Antwerp researchers (see Section 1). Unlike the Belgian investigators we do not have the resources to confirm the link between wood preservative exposure and illness. In some cases doctors have made this diagnosis. In most, however, no-one thought of doing tests for chemical absorption at the time of the illness.

The Belgian researchers showed that the people who came to them had good reason for blaming wood preservatives for their ill-health. We believe that proper investigation would show the same to be true for the people in these pages.

We begin by bringing together groups of people who suffered from quite distinctive illnesses. The last part of the section gives brief summaries of some of the other incidents where people's symptoms were less specific. For uniformity these shorter cases are identified only by initials, even when we have permission to publish names in full.

Epilepsy

The book began with the story of Eric Riley who drowned in the bath after his second epileptic fit. We know of seven other adults who had fits after exposure to wood preservatives. Here are four of them:

Dennis Ashton sprayed two 5-litre cans of Cuprinol 5 Star Wood Treatment in the basement of his home in Richmond. At the time, the Spring of 1984, the product contained lindane, PCP and zinc naphthenate. That evening Dennis had epileptic convulsions. Later, as he drove to the railway station to collect friends, he suffered spasms and found he was making involuntary noises. During the night he became unconscious and was taken to hospital. Like the Essex teacher he had regular fits and was given tranquillisers and anti-convulsant drugs.

> 'I was like a drunken man for three years. I couldn't drive, couldn't run my business as a management training consultant. I lost a lot of memory: for example I went to Taiwan with a friend and can't remember anything about it. I had terrible problems with digestion and suffered from persistent noise in the ears – tinnitus. I also had a detached retina twice, though that may not be anything to do with it.'

By the time Dennis Ashton got his life together again three years had passed, during which he was diagnosed as having epilepsy, 'unknown nervous disorder' and 'psychological disorder'.

'I was mentally incapable of defending my own case during that time and now I am told it is too late to sue for compensation. I wrote to Cuprinol who said they didn't know of any other cases.'

Since Dennis Ashton used it, Cuprinol 5 Star has been reformulated. It no longer contains lindane or PCP.

Andy Rose is a 30-year old RN helicopter electronics expert. In 1987 his home was professionally sprayed with a product containing lindane. A week later he suffered two epileptic fits. He was admitted to intensive care at Yeovil Hospital where tests showed no abnormalities, such as brain tumour or infection, which might explain the attacks. No blood tests were done for lindane.

Triton Chemical Manufacturing Company, makers of the treatment fluid, and West Country Restorations, the remedial treatment firm, deny any liability.

△ **This is the house which gave an Essex teacher epilepsy. For weeks after a wood preservative treatment she suffered repeated fits – up to a dozen on a bad day.**

J.V. and his wife and baby son moved into an old house in Derbyshire in 1979. The house was full of woodworm and they got Rentokil to spray it a few weeks after they moved in. The company used lindane and TBTO.

'Within two or three months of the spraying I became ill. At first the exact nature of my illness was unclear. It took two years for the doctors to determine that I had developed a type of epilepsy. I am now on permanent medication.

'During the two years in which I was being investigated my wife developed rheumatoid arthritis and a severe stomach condition. Our son within two years of the spraying developed the skin condition vitiligo.

'Before we were aware of the toxic nature of lindane we had no idea why we should have all developed such serious illnesses in such a short space of time. Our lives have I believe been devastated by these products. If not for us, for the sake of others I feel that something must be done about them.'

E.C. Brother of the doctor treating one of the other cases in our file. He suffered an epileptic fit after using wood preservatives on his home.

All these people were relatively young and healthy, with no previous history of epilepsy. No other causes, such as head injuries or brain tumours, were found. The opinion of the consultant in one of these cases seems appropriate to all of them:

'We are left with an external cause and, since the reactions to acute over-exposure to lindane include muscle spasms and epileptiform convulsions, this chemical is a prime candidate for the role.'

Damage to blood-forming system

Llwyd Nicholls. Age 13. Aplastic anaemia after remedial treatment of home with lindane. See full account in Section 1.

P.W. Worker who died of hypoplastic anaemia after using the COBRA process to treat telegraph poles.

David Rea, remedial treatment worker who developed leukaemia after working with Rentokil for five years. See full account in Section 1.

Keith Pritchett. Cuprinol production worker, Frome, Somerset. Leukaemia after long exposure to lindane. Inquest adjourned, September 1988.

The medical literature contains numerous reports linking lindane exposure with aplastic anaemia but the experts still dispute whether the link has been proved. PCP used as a wood preservative has also been blamed for one death from this cause. (Roberts 1981).

Damage to nervous system

One of the workers poisoned in the Welsh local authority's dipping shed, developed a withered leg. (More details of this case: Section 6).

Jack Amond suffered loss of movement in his legs and arms after treating his house with lindane and TBTO. (See J.A. in 'Short case histories', later).

A carpenter in Scotland, regularly exposed to PCP, lindane and TBTO, became paralysed. Doctors rejected their own initial diagnosis of multiple sclerosis and remain mystified.

B.D. A woman whose home was treated with dichlorvos (DDVP, commonly known as Vapona) developed neurological damage resembling multiple sclerosis. MS was one of the diagnoses applied to workers making another organophosphorus pesticide, leptophos, which also appears under Mental illness, below.

C.H. Remedial treatment worker, E. London, numbness in hand, and nerve problems affecting two fingers.

Permethrin and other synthetic pyrethroids also cause local nerve damage. See Directory of chemicals.

Mental illness, depression

This is a feature of many cases. Difficulties of confirming diagnoses and attributing them to a cause mean that they cannot be listed and numbered. Patients and their doctors are unable to say whether clinical depression, moodiness, 'complete change of personality' are directly caused by chemicals or result from the often-disastrous changes brought about by other symptoms, such as total loss of energy. Eighteen per cent of the Antwerp group were classified as having 'psychosomatic problems', including depression.

A typical case was a group of timber yard workers in Cornwall whose safety representative told us that since they started working with timber pretreated in a tank on site, several workers were suffering from irritability and depression and 'couldn't get on with each other any more.'

Some of the strongest evidence for a link between timber treatment and mental illness was provided by a child psychologist who consulted one of the authors in 1976 about two children with psychoses (Clark 1978).

In neither case could paediatricians or psychiatrists explain the symptoms in terms of physical causation or family stress. One child had symptoms suggesting schizophrenia – spells of rambling disconnected speech and strange utterances about witches. Her head teacher thought she was possessed by evil spirits. When the family moved home the child made a rapid and total recovery. Her home had been recently treated for woodworm.

The psychologist used this experience to intervene in the case of another apparently psychotic child living in a timber-treated home. On his advice the child was sent away to stay with relatives and recovered completely.

The psychologist left the profession before completing his research. In 1988 he confirmed his unpublished findings in an interview with the Hazards Centre:

> 'My job involved seeing 800 kids a year for several years and it got to such a stage that I made it a routine to ask "Have you had your house sprayed?" Child psychoses are so rare that the paediatrician involved in the first case had not seen one in 25 years of practice. I used to ask colleagues to let me know about all cases of child psychosis and there was a handful where you couldn't explain the condition in terms of family psychology or the recovery in terms of a change in the *emotional* environment.
>
> 'I saw a huge number of hyperactive children and here again there was a handful of fairly striking cases where there was exposure to wood preservatives or other chemicals. In young children the effect of these chemicals is paradoxical: they suffer first from headache and depression but this is manifested as hyperactivity. As a routine I would put them onto a healthfood diet and this often brought about improvements not all of which could be attributed to the "attentive parent effect".'

Schizophrenia was diagnosed in eleven Australian glasshouse workers who had sprayed organophosphorus (OP) insecticides. (Gershon and Shaw 1961). This was also one of the diagnoses applied to workers manufacturing the now-banned OP insecticide leptophos at the Bayport, Texas, plant of the Velsicol Chemical Company (NIOSH 1978). Although OP compounds are not common in wood preservation dichlorvos (DDVP, commonly known as Vapona) has been used in woodworm sprays and vaporising blocks in loft spaces. (See Case BD, above under Damage to nervous system).

Respiratory disease

Tight chests, chest pain, chronic irritation of upper respiratory tract, chronic cough and asthma appear in many of the LHC case histories. Twenty-two per cent of the Antwerp patients were diagnosed as having inflammation of the upper respiratory tract.

Eldon and Glenys Bone of Nottingham, both had breathing difficulties after their loft was treated. Glenys was admitted to hospital and put on a ventilator. Their friend Tony Palmer was sick for a day and a half after going up into the roof to fix a light.

Frances McLelland of Belfast had her home professionally treated

with PCP and lindane. After initially suffering dizziness and chest pains she had persistent breathing difficulties which were diagnosed as asthma. The doctor at Belfast City Hospital told her he had another patient who became severely asthmatic half an hour after going back into her shop which had been recently treated. More than a year later, Frances still feels ill if she spends time upstairs.

Connective tissue diseases

Two people, **John Slate** and **Jim Merry** died from diseases in this category after exposure to PCP, lindane and TBTO.

Post viral syndrome

Two people on our files have been diagnosed as suffering from the post-viral syndrome known as myalgic encephalomyelitis (ME). Both developed their illnesses immediately after their homes were treated with wood preservatives and neither accepts the ME diagnosis. Comparing the typical ME history and symptoms with those of wood preservative victims it is easy to see that this disease, recognised formally by the DHSS in November 1987, provides what one self-diagnosed wood preservative victim described as 'a convenient box to tidy me away in'.

As with wood preservative poisoning there is no single, simple diagnostic test for ME.

Short case histories

Cases involving groups of people:

A.D. and three others. Building workers for a London Borough. Remedial treatment to roof, floor and partitions using lindane, TBTO and organoboron.
Symptoms: sore throats, coughing, chest pains; one skin rash.

J.L. and others. 1987. Office workers. Lindane, PCP and TBTO remedial treatment.
Symptoms: light-headedness, headaches, nasal inflammation and sores, chest pains, breathing problems.

J.M. and others. Old people's home: remedial treatment with lindane, TBTO, organoboron. High lindane levels in dust.
Symptoms: 2 deaths, one epilepsy, others 'very ill'. See more detailed account in Section 8.

D.P. and others. Vac-Vac pre-treatment workers, TBTO and dieldrin.
Symptoms: depression, stomach complaints, skin rash, spots.

Mrs R. and others. Museum workers. PCP, TBTO, lindane, dieldrin.
Symptoms: 28 workers affected. Eye damage, conjunctivitis, respiratory problems, 2 workers hospitalised with chest pains.
Comments: Museum closed for a year.

Cases involving individuals or families

J.A. Man. Pre-1983. DIY, sprayed loft. Lindane and TBTO (builder supplied unlabelled chemicals, later analysed).
Symptoms: skin rashes, loss of limb movements, tingling and cold in limbs persists in 1988.

C.B. Woman. May 1987. DIY furniture treatment, wearing protective clothing and working outdoors.
Symptoms: dizziness, lethargy, breathlessness, headaches, sore throat, nausea, swollen glands, pain in limbs and buttocks, weakness. Diagnosed as M.E.

G.B. House treated with lindane.
Symptoms: depression, anxiety, palpitations, weakness, breathing difficulties. Nine months after remedial treatment, high concentrations of lindane found in blood (15.2 to 18 nmol/litre).

R.B. Woman. Husband treated bedroom dressing table with lindane.
Symptoms: sore eyes, urticaria, oedema, depression, debility.

A.C. and daughter. Moved out for two days during remedial treatment with TBTO, lindane and possibly dieldrin. Floors and ceilings left wet.
Symptoms: swollen eyes, headaches, blocked nose, diarrhoea, vomiting, tiredness, lasting at least four months.

S.Ca. Woman. Summer 1987. Dry rot remedial, lindane and PCP, in bedroom.
Symptoms: persistent cough.

S.Co. Woman. 1987. Remedial, TBTO, lindane.
Symptoms: sleeplessness, pains in legs, nausea. Friend also affected by nausea.
Comment: "I asked the guy before he did it if it was lindane. He said no, it was gamma HCH!"

J.F. Woman. 1987. Lindane injected by firm by mistake for damp-proofing, in large amounts.
Symptoms: exhaustion, suspects early miscarriage. Cat and kittens died: vet said lindane could be responsible.

L.F. Woman. 1983. PCP dry rot treatment in school.
Symptoms: lost full use of arms for 18 months; muscular spasms.

M.H. Man. Local authority building worker exposed to timber freshly treated with dieldrin, lindane, TBTO, CCA.
Symptoms: chest pains. Six weeks off work.

P.H. Woman and husband. House next door sprayed, fumes through cellar brickwork.
Symptoms: husband very ill with vomiting. Persistent taste of chemical.

S.J. Remedial treatment of home, lindane, PCP, TBTO. Son occupied room a year after treatment.
Symptoms: skin and breathing problems.

B.K. TBTO, dieldrin, remedial treatment in next door house.
Symptoms: baby developed bronchitis, blood tests showed 8 different pesticides.

J.K. House next door sprayed: company would not disclose chemicals.
Symptoms: difficulty breathing and tightness in chest for several days, during pregnancy.

G.L. Man. Builder.
Symptoms: gets 'very ill' every time he goes into a treated space.

P.L. Woman. Dry rot domestic remedial treatment.
Symptoms: asphyxiation, legs gave way, nausea, watery eyes.

J.M. Woman teacher. Remedial treatemnt of whole house, 1986. PCP and TBTO.
Symptoms: vertigo and dizziness, breathing problem – felt she could not get any air, panic attacks, palpitations, pains in chest, loss of weight, digestive system problems, overacidity in stomach, fatigue and debility. Gradual improvement over a year. Health now normal.

S.P. Remedial treatment before family moved in. Lindane, dieldrin, PCP.
Symptoms: deterioration in asthma, headaches. No effect on rest of family.

C.R. Man, builder. Using CCA pretreated wood.
Symptoms: splinters festering in skin.

M.R. Man, non-smoker, previously fit. DIY wet and dry rot fluid used on window sills.
Symptoms: general ill health for four months, eventually diagnosed as lung cancer (oat cell).

Mr S. 30 years old. Extensive DIY remedial treatment of wattle and daub cottage.
Symptoms: asthma followed by sudden death.

N.S. and family. Remedial treatment next door with TBTO and lindane.
Symptoms: N.S. suffered breathlessness, depression, tension, nightmares, anxiety, shaking, blotches on skin which ceased when she left the house. B.S. had choking sensation at night. Danish doctors advised against returning to house.

P.V.S. and family. Remedial home treatment, dieldrin and TBTO. Company claimed to have dropped dieldrin but it was shown on label.
Symptoms: Mr and Mrs S suffered breathlessness, sore throats,

△ **J.S. collected treated timber from this yard in Alresford, Hants.**

nausea, vomiting. Baby (Mrs S two weeks pregnant at first exposure) had vomiting.

J.S. Collected and handled wet pretreated timber from timber yard. Symptoms: vomiting, diarrhoea, nose bleeds, weakness, irrationality and confusion, memory loss, aches, tremors, twitching, clamminess, feeling cold; skin of hands cracked, inside of mouth peeled; green urine; striations on toenails; hands blanched; raised nodules on inside of wrist. Classic symptoms of arsenic poisoning. J.S. had to give up his job.

J.W. DIY use of PCP and zinc naphthenate. Used mask with carbon filter.
Symptoms: sore throat, developing into dry throat and cough.

P.W. Whole house treated with TBTO and lindane.
Symptoms: sore throat, sore windpipe and chest, pains in nose.

6

Hazards at work

Everyone at risk

Wood preservatives can endanger your health wherever you work. In 1987 remedial treatments caused sickness in staff at Birkbeck College, London; at Ironbridge Gorge Museum, Telford; and at an old people's home in Essex. The US Environmental Protection Agency has reported illness in an office built with beams pretreated with PCP.

All these places had good trade union organisation and were able to take action which led to extensive cleaning up of their workplaces and in one case, closure for a year. Workers could also call on their unions for help in obtaining compensation for their illnesses.

Since it is unlikely that only trade unionised buildings are sprayed with wood preservatives it's reasonable to suppose that there have been other cases, in unorganised workplaces where the victims had no-one to turn to for technical advice and support.

Most of this section is written for people who work with wood preservatives or with treated wood. The workers most heavily exposed to wood preservatives are in remedial treatment, woodworking and pretreatment. Many other trades involve substantial risks, often unrecognised by workers and management. Householders, tenants and those in other kinds of job may also find this chapter useful: when workers in timber treatment and construction win proper control of 'their' hazards, they help to protect us all.


Death probe into DIY best-seller

△ **Manufacturing: Cuprinol workers load the reactor with chemicals. Tests by the government's Employment Medical Advisory Service found blood abnormalities in four workers. One worker has died of leukaemia. More details in Section 2**

Part 1: Working with wood preservatives

Methods of application

Measurements of chemicals in the air and in the bodies of workers show that some method of application give much higher exposures than others. In order of decreasing risk they are:

Spraying
Dipping timber or joinery in tanks
Pressure impregnation
Brushing
Spreading/mastic-gunning pastes/mayonnaises
Drilling and injecting jellies
Drilling and inserting rods

This should be taken as a general guide only, ideally after reading Section 4: Chemicals and ill-health. Quite small changes in formulation, method or protective clothing can turn the very dangerous into the relatively safe – and vice versa. For example one of the pesticides incidents investigated by HSE Factory Inspectors in 1987 involved brushing:

PESTICIDES INCIDENT REF NO 16/04/11, DATE 30.01.87
Activity: timber preservation
Chemical: tributyltin oxide
Number of persons: 1
Summary of incident: brush application of preservative to ceiling joists. Arms splashed and suffered severe irritation. Inadequate instruction and supervision.
(***Pesticides Incidents* HSE 1987**)

Dipping shed poisons 14

Local authority carpenters in the Welsh town of Aberdare dipped pieces of joinery into a huge tank of preservative and then stood them to drain. The shed had no mechanical ventilation to remove the vapours of solvents and pesticides, and no special protective equipment. They went home in their overalls.

Gareth Enoch's wife used to make him take his overalls off as soon as he came in the door, the smell of chemicals was so strong. They could smell it in the air when she was ironing his work clothes.

It took the workers a long time to realise that they were all getting ill. The foreman retired early through illness and died soon afterwards from stomach cancer. Gareth began to suffer continuous pain and nausea. He was admitted to hospital but tests failed to identify the cause. He was off work for six months.

When Gareth's mate Malcolm Finn became ill and then died of stomach cancer in his twenties, the workers began to investigate. 'We put our heads together,' said Gareth, 'to try to think what it was and everyone said they were suffering from different things – stomach trouble, headaches, chest trouble, skin rashes . . . The only thing we were doing together was using the dip tank.'

Dr Alastair Hay, the toxicologist called in by the men's union UCATT, is investigating the role of the organic solvents as well as the pesticides in this and other cases where timber preservatives have damaged workers' health. It has been reported (*Observer*, 18 October 1987) that the Rentokil fluid used at Aberdare contained PCP, lindane and TBTO.

Spraying is potentially the most hazardous method because it creates a high concentration of mist and vapour ideal for both inhalation and absorption through the skin:

> 'I would often spray ten 25 litre drums per day. If for example I was working in the cellar I would spray enormous amounts of the liquid, sometimes up to 30 gallons of it in one cellar. When you were working down in the cellar you could actually see the atomised spray dropping like drops of rain. You could taste it on your lips.'
> **David Rea, former Rentokil worker**

Dipping should be safer than spraying but bad management of the job quickly turns it into a messy operation. In an enclosed space, without proper ventilation and protective equipment workers get disastrously high doses of solvent and pesticide through their lungs and skin. This is what happened to the local authority workers in Wales (see box).

Studies of US timber treatment workers confirm that dipping operations can lead to some of the highest levels of PCP absorption. (ACGIH 1986)

Spraying is the main method used by the remedial treatment industry. An HSE survey found the highest levels of PCP absorption in this group, though other groups were also getting doses:

> 'All the occupationally exposed groups showed evidence of PCP absorption; highest mean concentrations were found in remedial timber treatment operatives . . . Timber-yard workers also showed substantial evidence of absorption . . . Persons formulating PCP-containing wood preservatives had the lowest concentration of any exposed group sampled'.
> **Jones, Winter and Cooper 1986**

Effects on workers: Rentokil denies

In the study just quoted, the HSE researchers, led by Dr R D Jones, Deputy Director of Medical Services in the Health Hazards Assessment Branch, looked at the levels of various biochemicals in the blood which might indicate liver damage and examined the workers for chloracne, the characteristic skin disease produced by PCP. The conclusions were ambiguous, if not contradictory. The authors admit that, as they did not standardise for other factors known to affect the biochemical indicators examined,

> 'the inference that can be drawn from these measurements is therefore limited. There was, however, no evidence of any disadvantageous effect of PCP on health *as measured by these parameters.* No *overt* case of chloracne was found.'(Our italics.)

The HSE researchers did not claim to show that having five or six times the 'normal' amount of PCP in your blood plasma does not do you any harm. They did not look at any of the other systems which can be damaged by PCP – respiratory, cardiac, blood-forming, nervous and reproductive. They did not ask the workers how they felt. Nor did they investigate cancer mortality.

Nevertheless, the HSE paper is among those quoted by Rentokil's Peter Bateman in a document sent to journalists and others who suggest that wood preservatives may endanger health at work or in the home (Bateman 1988). This is how he quotes from the conclusion of the HSE paper:

> '"There was however no evidence of any disadvantageous effect of PCP on health". (310* workers sampled)'.
>
> [* LHC Footnote: Only 209 occupationally exposed workers were studied. The remaining 101 workers were non-exposed 'controls'.]

The qualification 'as measured by these parameters' has disappeared.

In paragraph 9 of the document he gives more detail of the

> 'health monitoring of Rentokil timber treatment staff . . . undertaken by Dr. Jones:
>
> 'The results confirm those of previous surveys carried out within the wood preserving industry under the auspices of the British Wood Preserving Association, that none of those examined has suffered ill-effects from their daily work with approved wood preservatives.'

John Edmonds, General Secretary of the GMB, one of the trade unions representing workers handling wood preservatives, does not believe this. In the September 1988 issue of *Health and Safety at Work* magazine he challenged Rentokil to allow the union 'open access to their employees and ex-employees in order that we can conduct some serious research into their health'.

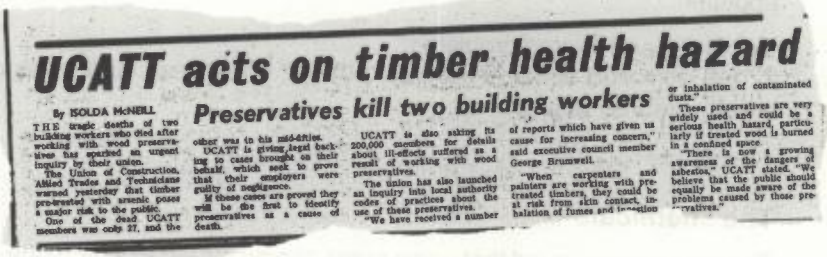
Edmonds pointed out that no harm would be done if such research showed the workforce was healthy and remained so.

The challenge was not taken up by Rentokil. Replying direct to John Edmonds, rather than to the magazine, Peter Bateman said that monitoring the health of the workforce was already being conducted under the direction of Dr. Robert Murray. This work was

> 'expected to confirm the results of existing previous surveys carried out within the wood preserving industry through the British Wood Preserving Association who have also carried out work in conjunction with another trade union UCATT'.

Effects on workers: the UCATT survey

The Union of Construction and Allied Trades Technicians (UCATT), though having its name taken in vain, is no more convinced than the GMB. Following numerous calls and letters from members, General Secretary Lol Urwin decided that the union had to do its own survey. In the autumn of 1987 about a thousand copies of a detailed questionnaire were sent to all currently-listed shop stewards and safety reps, including bricklayers and others not expected to have direct contact with wood preservatives. One hundred and twenty-one questionnaires were completed and returned. A ten per cent response rate is normal in such surveys.



UCATT acts on timber health hazard

Preservatives kill two building workers

By ISOLDA McNEILL

THE tragic deaths of two building workers who died after working with wood preservatives has sparked an urgent inquiry by their union.

The Union of Construction, Allied Trades and Technicians warned yesterday that timber pre-treated with arsenic poses a major risk to the public.

One of the dead UCATT members was only 27, and the other was in his mid-fifties.

UCATT is giving legal backing to cases brought on their behalf, which seek to prove that their employers were guilty of negligence.

If these cases are proved they will be the first to identify preservatives as a cause of death.

UCATT is also asking its 200,000 members for details about ill-effects suffered as a result of working with wood preservatives.

The union has also launched an inquiry into local authority codes of practices about the use of these preservatives.

"We have received a number of reports which have given us cause for increasing concern," said executive council member George Brumwell.

"When carpenters and painters are working with pre-treated timbers, they could be at risk from skin contact, inhalation of fumes and ingestion or inhalation of contaminated dusts."

These preservatives are very widely used and could be a serious health hazard, particularly if treated wood is burned in a confined space.

"There is now a growing awareness of the dangers of asbestos," UCATT stated. "We believe that the public should equally be made aware of the problems caused by those pre-servatives."

The results were analysed in the Division of Computing Mathematics and Construction Science at the Polytechnic of the South Bank. The resulting report (UCATT 1988) shows that the union was right to be concerned. Out of 116 respondents working with wood preservatives or pretreated timber 46 (40 per cent) had suffered ill health which they attributed to these products.

The survey confirms the league table of application methods and risk given earlier in this section. While brushing was the most common method, the incidence of health complaints was higher in dip and spray workers. The table shows the incidence of health complaints in those using only one method and in those using more than one method:

Using one method	**% complaining of ill health**
Dipping	44
Spraying	43
Brushing	35
More than one method	
Dip and brush	37
Spray and brush	40
Spray and dip	53

Symptoms

Analysis of reported ill-health showed that all of the symptoms fall into three broad categories:

▲ Skin and related problems:
Out of 116 respondents, 42 (36 per cent) suffered from splinters, rashes, blemishes, mouth ulcers, watering eyes, nasal irritation, eye infection, burnt skin or hardening of the fingernails.

▲ Nausea and related problems:
38 (33 per cent) suffered from sickness, headaches, dizziness, upset stomach, bringing up blood, lethargy, loss of concentration or loss of appetite.

▲ Chest and related problems:
22 (19 per cent) suffered from sore throat, chestiness, shortness of breath, pleurisy or bronchitis.

The chemicals

The researchers found that using some chemicals led to a high rate of health complaints:

Chemical	% of users complaining of ill-health
PCP	43
TBTO	37
Lindane	35
Dieldrin	33

Pretreated timber

The survey did not enable any conclusions to be reached on risks from handling pretreated timber. All of those reporting ill health from applying chemicals also handled pretreated wood. On the other hand 49 of those reporting no ill health also handled it.

Protective equipment

The UCATT researchers found more extensive use of skin, eye and respiratory protection in the group without health complaints than in the group which attributed ill-health to the chemicals. Only three workers had been issued with respirators.

Conclusions

Compared with those who argue for the safety of wood preservatives, the union is honest and scientific in its conclusions:

> 'The limitations of the UCATT survey mean that it cannot be taken as absolute evidence of a link between ill health and occupational use of wood preservatives and fungicides and pretreated timber.'

However the union is greatly concerned that 40 per cent of respondents said that wood preservatives had made them ill. Its researchers believe that their findings on application methods, chemicals used and protective clothing point to a clear link between exposure and illness. A pattern of increasing illness with increasing dose (the 'dose-response relationship') is essential in showing that the diseases complained of are occupational.

Protecting the workers

As a result of their survey, UCATT has made the following recommendations:

1. No wood preservative should be used by UCATT members unless:

▲ The chemical content of the product has been identified

▲ Training has been given to operatives, covering potential hazards and essential safety precautions

▲ A full range of protective clothing, including overalls, eye protection, gloves and a suitable mask is provided and used.

2. Timber should be treated in its manufactured form either by pretreatment in the factory or by painting on site. Pretreated timber should only be worked on site if operatives are trained and provided with full protective clothing. Whenever dust is created by the work a suitable respirator should be provided and used.

3. Wood preservatives and fungicides should only be sprayed or used as a dip by operatives who have been properly trained and equipped, including provision and use of a suitable respirator.

4. The Health and Safety Executive should carry out a more detailed investigation with utmost urgency and with the intention of publishing occupational exposure limits and detailed guidance on the use of wood preservatives and fungicides and pretreated timber in the construction industry.

The UCATT recommendations are eminently reasonable. Trade unionists can demand immediate implementation in the knowledge that they are not asked for anything that is not already required of a responsible employer under the Health and Safety at Work Act, Food and Environment Protection Act, and Control of Pesticides Regulations. Simple compliance with these laws would undoubtedly reduce the high rate of health complaints from UCATT members, and from the much larger population of workers in building and remedial treatment which has no trade union to fight for its health and safety.

But the union's demands fall short of procedures and safeguards already negotiated by more advanced union branches and enlightened employers – see Appendix 3: Chemicals policies. They are also being overtaken by the HSE's own advice to the remedial treatment industry, which is already being influenced by the impending Control of Substances Hazardous to Health (COSHH) Regulations.

Below we list the subjects which all employers – even 'remedial specialists' – will be required to consider, and act on, to comply with the COSHH Regulations. Several are already partially covered in the HSE guidance note but it will be revised in 1989 to take full account of the new law.

▲ Assessment of the risks: chemical and other risks and consideration of non-chemical methods.

▲ Methods for controlling risks at source eg system of work, choice of application system; mechanical ventilation and extraction; interlocks and failsafe systems in design of pressure impregnation cylinders.

▲ Personal protective equipment: specification for effective personal protection to limit any exposure which cannot be completely controlled by hygiene engineering.

▲ Monitoring of the atmosphere and other parts of the environment, eg surfaces, site run-off, for pollution.

▲ Monitoring of the health of the workforce.

Under assessment of risk, for example, from 1 October 1989:

> 'An employer may not carry on any work which is liable to expose any employee to a substance hazardous to health unless a suitable and sufficient assessment has been made of the risks to health created by that work and about measures necessary to control exposure to substances hazardous to health. It allows an employer to show that all the factors pertinent to the work have been considered and that an informed

◁ Gray's Inn Road, October 1988: with bare hands, driver unloads shoring timber still glistening with arsenic pretreatment fluid.

judgement has been reached about the risks, the steps which need to be taken to achieve and maintain adequate control, the need for monitoring exposure at the workplace and for health surveillance'.
(**COSHH Regulation 6 – HSE summary**).

Part 2: Remedial treatment work

Official guidance

The HSE has given some thought to risk assessment in the remedial wood preservation industry. Its ideas were presented by Mr Greg Bungay at a meeting of the BWPA's Remedial Section and reported in a circular from the the association (BWPA 3 February 1988):

'1. RISK ASSESSMENT – BEFORE A WOOD PRESERVATIVE IS USED IT IS NECESSARY TO ASSESS THE RISKS INVOLVED.

This would seem to apply to pretreatment as well as remedial treatment. The risks cover risks to operatives, the environment, the general public and to the timber which is to be treated. There is a duty on the user of the wood preservative to make a judgement:
a) That treatment is necessary.
b) That treatment involves the least amount of risk to all the above categories.
c) That treatment involves the use of the least amount of active ingredients consistent with the need to eradicate and/or prevent attack.

It is advisable that a written record should be kept and it may be sensible to include such a record in the survey report which could also detail precautions which must be followed if treatment is to be carried out.

> When treating an insect infestation or fungal decay, then *only the treatment appropriate to the problem should be used.* So-called dual-purpose fluids should not be used in eradication or treatment unless both insect and fungal attack is present or in the judgement of the surveyor such attack may occur in the future. The decision as to whether or not protection against future attack is required must be made objectively and without concern as to the costs (or profits) involved.'

The HSE guidance note gives more detailed advice on assessment:

> 'Before resorting to any pesticide treatment a thorough and adequate survey of the site should be carried out by a trained and experienced competent person'.

and:

> 'A written assessment should be made before work commences outlining the method of treatment to be employed, the risks to the public, employees and environment and the precautions to be taken'.

The HSE lists the aspects of the job which must be considered at the assessment and planning stage and then implemented as the work progresses.

▲ Are chemicals needed at all?

The 'competent person' (whose level of competence is not specified) should, says the guidance note, identify

> 'the safest and most efficacious method of treatment (This may not always be treatment with chemicals and includes the removal of damaged timbers and replacement with pretreated timbers).'

▲ Can chemicals be used safely?

People engaged in remedial treatment should have sufficient training, says HSE to:

> 'Recognise conditions where pesticide use would pose a risk to people or the environment including water and wildlife (and avoid use in such circumstances)'.

▲ Which method can be used?

The method chosen must comply with the Conditions of Approval given to the product under the Control of Pesticides Regulations. If a method is not listed on the label then it is illegal to use that method.

The guidance note says: 'Select application equipment designed to minimise operator contamination'. It gives specific advice on two methods:

▲ Spraying:

'Allows the product to reach the more inaccessible parts of the work and the application rate is faster. This must be balanced against the greater risks posed to the health and safety of operators, the public and wildlife'.

▲ Pressure injecting of fluid into predrilled holes:

'Injection techniques reduce the exposure of persons to the formulation.'

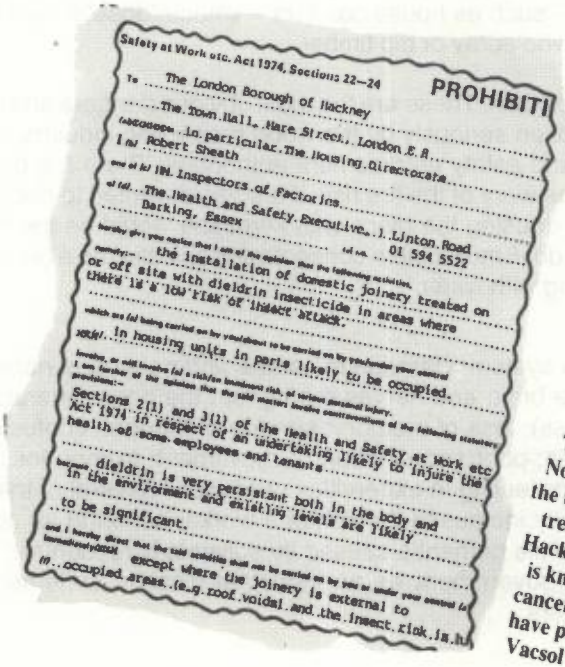
and

'Where injection techniques are employed then suitable splashback guards should be used to prevent contact'.

▲ Which chemicals can be used?

HSE GN says:

'The product which offers the lowest risk to the health and safety of users, members of the public, wildlife (eg bats) or the environment, consistent with effective treatment should be chosen. There is some evidence that permethrin and organo boron esters are less hazardous to human health than other insecticides and fungicides. Similarly water based rather than kerosene or white spirit based formulations present a lower toxic and fire and explosion risk.'



Safety at Work etc. Act 1974, Sections 22–24 PROHIBITI

To The London Borough of Hackney

The Town Hall, Mare Street, London E.8

Address In particular, The Housing Directorate

I/we Robert Sheath

one of the HM Inspectors of Factories

of (address) The Health and Safety Executive, 1 Linton Road Barking, Essex (tel no. 01 594 5522)

hereby give you notice that I am of the opinion that the following activities, namely:— the installation of domestic joinery treated on or off site with dieldrin insecticide in areas where there is a low risk of insect attack.

which are (or) being carried on by you/about to be carried on by you/under your control at/in/, in housing units in paris likely to be occupied.

involve, or will involve (or) a risk/an imminent risk, of serious personal injury.

I am further of the opinion that the said matters involve contravention of the following statutory provisions:—

Sections 2(1) and 3(1) of the Health and Safety at Work etc Act 1974 in respect of an undertaking likely to injure the health of some employees and tenants

because dieldrin is very persistant both in the body and in the environment and existing levels are likely to be significant.

and I hereby direct that the said activities shall not be carried on by you or under your control (or immediately/after except where the joinery is external to occupied areas. (e.g. roof voidal and the insect risk is h

Health & Safety Executive

This Prohibition Notice was put on the use of dieldrin-treated timber in Hackney. Dieldrin is known to cause cancer: where else have products like Vacsol been used?

Solvent hazards

Organic solvents are used to dissolve many of the pesticides found in wood preserving fluids. In organic-solvents (OS) fluids for remedial spraying and timber pretreatment the solvent may be more than 90 per cent of the formulation

The heavy use of solvents as 'carrier fluids' adds serious health and safety risks to the already unacceptable dangers posed by the 'active ingredients', the pesticides. Many solvents have been used over the years, mostly petroleum distillates, such as kerosene and white spirit. The latter is now the most common.

Health. Far more serious in the long term, solvents can seriously damage your health, at levels well below the explosion concentration in air. The Medicines Act recognises the potentially fatal health problems facing solvent and glue sniffers. The same kinds of damage have been found in people exposed at work, including groups – such as house painters – whose 'dose' is smaller than those who spray or dip timber.

Fire and explosion. These are the most obvious dangers and the only ones taken seriously by the wood preserving industry and the health and safety enforcement authorities. There are good reasons to be wary of the fire risk: if arsonists wanted to destroy your home, dousing the place with kerosene would be the first thing they'd do. Emulisifiable concentrates can also be a fire risk before mixing with water.

▲ Nervous system: Damage to central and peripheral nerves, affecting the brain and nerves throughout the body – narcosis (drunkenness); loss of memory; slowing of thought; confusion; slow reflexes; poor coordination of movement; tremor; loss of movement or feeling in extremities; addiction. Several of these effects greatly increases the risk of a worker suffering an accident. Pre-senile dementia caused by solvents is recognised by the Danish government as an industrial disease suffered by house painters.

▲ Liver, kidneys, digestive system can all be damaged, often irreversibly.

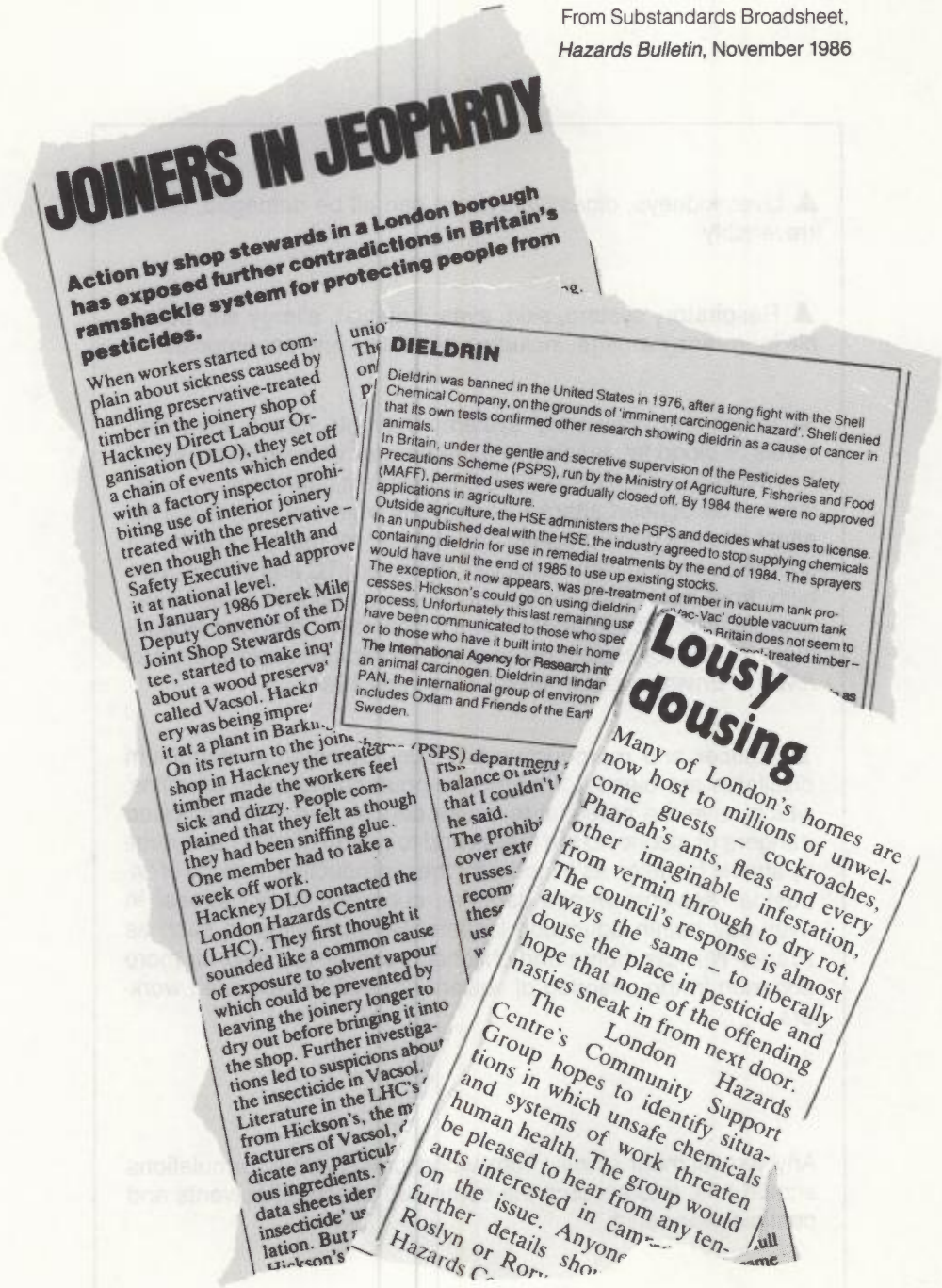
▲ Respiratory system, skin, eyes: Irritation, allergy and possible long-term damage, including dermatitis and pneumonitis.

▲ Heart and circulatory system: Solvents cause increased levels of blood fat, leading to a greater risk of heart attacks and heart disease. Can also cause irregular/fast heart beat, increasing the risk of heart attacks, particularly when under stress. This effect has not been properly investigated for many solvents. All should be treated with suspicion. (Wilcosky, TC and others. Mortality from heart disease among workers exposed to solvents, *Journal of Occupational Medicine*, December 1983. Also Rosenman, K. *Cardiovascular disease and workplace exposures. Archives of Environmental Health*, May/June 1984).

▲ Cancer and reproductive hazards: Commercial petroleum distillates are blends of many compounds, including paraffins, which have the potential to cause cancer. The well-publicised dangers of alcohol to the foetus and to sperm quantity and quality should be taken as a model for the reproductive hazards of 'industrial' solvents whose dangers, curiously, do not appear in everyday health education leaflets. Serious ailments such as Prader-Willi syndrome and childhood cancer are also far more common in the offspring of solvent or pesticide exposed workers.

Any assessment of risk from wood preservative formulations should take into account the combined effects of solvents and pesticide exposure.

From Substandards Broadsheet,
Hazards Bulletin, November 1986



JOINERS IN JEOPARDY

Action by shop stewards in a London borough has exposed further contradictions in Britain's ramshackle system for protecting people from pesticides.

When workers started to complain about sickness caused by handling preservative-treated timber in the joinery shop of Hackney Direct Labour Organisation (DLO), they set off a chain of events which ended with a factory inspector prohibiting use of interior joinery treated with the preservative – even though the Health and Safety Executive had approved it at national level.

In January 1986 Derek Mile... Deputy Convenor of the D... Joint Shop Stewards Com... tee, started to make inq... about a wood preserva... called Vacsol. Hackn... ery was being impre... it at a plant in Barki...

On its return to the join... shop in Hackney the treate... timber made the workers feel sick and dizzy. People complained that they felt as though they had been sniffing glue. One member had to take a week off work.

Hackney DLO contacted the London Hazards Centre (LHC). They first thought it sounded like a common cause of exposure to solvent vapour which could be prevented by leaving the joinery longer to dry out before bringing it into the shop. Further investigations led to suspicions about the insecticide in Vacsol. Literature in the LHC's ... from Hickson's, the m... facturers of Vacsol, ... dicate any particul... ous ingredients. ... data sheets iden... insecticide' u... lation. But ... Hickson's ...

DIELDRIN

Dieldrin was banned in the United States in 1976, after a long fight with the Shell Chemical Company, on the grounds of 'imminent carcinogenic hazard'. Shell denied that its own tests confirmed other research showing dieldrin as a cause of cancer in animals.

In Britain, under the gentle and secretive supervision of the Pesticides Safety Precautions Scheme (PSPS), run by the Ministry of Agriculture, Fisheries and Food (MAFF), permitted uses were gradually closed off. By 1984 there were no approved applications in agriculture.

Outside agriculture, the HSE administers the PSPS and decides what uses to license. In an unpublished deal with the HSE, the industry agreed to stop supplying chemicals containing dieldrin for use in remedial treatments by the end of 1984. The sprayers would have until the end of 1985 to use up existing stocks.

The exception, it now appears, was pre-treatment of timber in vacuum tank processes. Hickson's could go on using dieldrin ... 'Vac-Vac' double vacuum tank process. Unfortunately this last remaining use ... Britain does not seem to have been communicated to those who spec... -treated timber – or to those who have it built into their home...

The International Agency for Research into ... an animal carcinogen. Dieldrin and lindan... PAN, the international group of environ... includes Oxfam and Friends of the Earth ... Sweden.

(PSPS) department ... balance of ... that I couldn't ... he said.

The prohib... cover exte... trusses. ... recom... thes... use ... w...

Lousy dousing

Many of London's homes are now host to millions of unwelcome guests – cockroaches, Pharoah's ants, fleas and every other imaginable infestation, from vermin through to dry rot. The council's response is almost always the same – to liberally douse the place in pesticide and hope that none of the offending nasties sneak in from next door.

The London Hazards Centre's Community Support Group hopes to identify situations in which unsafe chemicals and systems of work threaten human health. The group would be pleased to hear from any tenants interested in cam... on the issue. Anyone ... further details sho... Roslyn or Ror... Hazards C...

Applying the rules

Pulling together all the HSE advice on use of chemicals, a seven-point list emerges. We believe these are the things a contractor must do to be sure of complying with the Food and Environment Protection Act, the Control of Pesticides Regulations and other current legislation:

▲ Use chemicals only when there is no other way to ensure the safety of a structure. Unnecessary spraying is illegal under the FEPA.

▲ Apply the minimum amount required to control any threat to structural safety.

▲ When an insecticide must be used, select permethrin or something safer.

▲ When a fungicide must be used, select only organoboron compounds or something safer.

▲ Do not use dual-purpose products.

▲ Do not use solvent-based formulations.

▲ Do not spray. Apply by brush or other methods.

The HSE is unlikely to agree that its guidance can be expressed in such clear terms. We would argue that any departure from the seven points increases risks to workers, occupants and the environment. A case for increasing the risk can be made only if compliance with the seven points would produce an ineffective treatment.

We think it is significant that Cornwall County Council's architect's department has, after the poisoning of children in schools treated by conventional methods, come to essentially the same conclusions. Its specification for treatment of roof timbers (see Appendix 1) follows the seven points with one exception. Spraying of insecticide (permethrin only) is permitted in roof spaces. Fungicide may not be sprayed (zinc octoate paste only).

The HSE has pointed out the hazards of current policies but has lacked Cornwall's courage in challenging the way the remedial treatment industry goes about its business. Even within its limited, industry-centred agenda, it falls short. On the need to choose the safest chemicals, for example, it does not look beyond permethrin and organoboron, the industry's chosen successors to lindane, PCP and TBTO. Our reservations about the large-scale introduction of these

relatively new nerve poisons into people's jobs and living spaces are covered in Section 4.

All the same, several companies aspiring to a 'green' image survive perfectly well using only permethrin and boron compounds. David Scobie of BWPA criticises the Cornwall specification as being 'over the top' but says that members in Cornwall can cope perfectly well. Rentokil implies that the choice of these chemicals is more political than technical (Bateman 1988) but Rentokil itself markets both materials in products for professional as well as household use. BRE research showed that permethrin outperforms lindane. (See Section 3.)

HSE doesn't tell us that even safer materials, the inorganic boron compounds, are available not only as solid rods but also as remedial treatment fluids; that they are effective fungicides approved for use in dry rot control; that they are effective insecticides and for that reason are approved for the mandatory pretreatment of new roof timbers against house longhorn beetle in the high-risk areas scheduled under the Building Regulations.

This leads on to the vexed question of application methods. The remedial treatment industry lives by spraying. This is the quickest and cheapest way to get the product onto the wood. For work overhead, eg rafters, it is more effective than brushing but both methods are unacceptably messy. Thick formulations applied by caulking gun should be safer. Rentokil is among those making a permethrin woodworm paste for professional use.

Spraying is the most convenient way to treat floorboards and joists – probably the most common job in the remedial trade – but it is not the safest. Only a few boards need be lifted so that the sprayer can, in theory, reach the sides of all joists and the undersides of all planks. In practice this is often a hit-or-miss application which leaves pools of pesticide on the ceiling. We have had numerous complaints about stained ceilings and electric light roses which drip preservative for days after 'the specialists' have left.

There are more serious dangers in this method. Unless every floorboard is lifted, it will be extremely difficult to remove dust and debris resting on the ceiling below. The BWPA Code of Practice for Remedial Treatment talks only of cleaning dust and cobwebs off all timbers. The Code does not mention dust on the ceiling, or the need

to use a vacuum cleaner. HSE's guidance note says 'dustless methods' are needed to protect workers from the 'suspension of wood dust, fungi or other material' which 'may cause respiratory disorders and skin complaints' and recommends use of a type-H industrial vacuum cleaner.

Only the Cornwall County Council Specification gets to the real point. It demands a thorough vacuuming before and after application. After spraying, the pesticide-wetted dust will dry out. Drafts and structural movement will lift it into the atmosphere. The hazards of contaminated dust are explained in Section 4, Chemicals and ill-health.

So, a proper clean-up after spraying demands the lifting of all boards. But once the floorboards have been lifted, spraying is no longer the only practicable application method. Thick formulations can be extruded in strips direct onto joists and onto the underside of planks. Or joists can be drilled and injected with thick preservative, and planks brushed with a water-based solution.

For studwork (timber wall frames) brushing on fluid or gunning on a thick preparation will be safer than spraying – providing the wood is to be covered over, eg by plasterboard and gypsum skim coat. Where studwork is to be left exposed any surface application will leave deposits which can rub off onto skin and clothing. BRE research showed that the concentration of pesticide on the surface of treated wood could be heavier after 28 days than on the day after spraying (Dobbs and Williams 1983).

All these factors need to be considered in any proper assessment of risk before timber is treated with chemicals. In constructing our seven-point agenda for this discussion from the HSE's guidance note and advice to the BWPA, we have, like the HSE itself, assumed that the remedial treatment industry will continue for some years to concentrate on putting pesticides into buildings. In Sections 3 and 4 we show that this approach is seriously flawed in both theory and practice.

Until these arguments become more widely accepted, workers will continue to be exposed to pesticides; and people who live and work in treated buildings will experience indoor pollution. In the short term both groups need protection from the worst excesses of remedial treatment as currently practised. That means knowing that the industry already has the products and the processes to achieve dramatic reductions in risk.

◁ **Applying permethrin preservative to timber studwork.** Photo courtesy of Renlon Group PLC

Safety in remedial treatment

The rest of this part deals with the practicalities of safety on sites where remedial treatment is to be done.

Planning

The hazard assessment of the job should produce a plan for the work which includes all the points below. HSE advises that risks from mould spores should be part of the assessment. We would add that the initial inspection should also look for asbestos which may need to be stripped out by a licensed contractor. Work should not start until each point has been dealt with, methods devised and written down and all necessary equipment assembled.

Notification/information

How will the work affect occupants, and neighbours; have they been warned in good time of any chemical or structural risks – or nuisance – which could be caused by the job? How is the site to be marked with warning signs and visitors kept out?

If work is likely to last six weeks or more, has the local office of the HSE been notified? (Factories Act 1961, S.127 and Construction (Notice of Operations and Works) Order 1965). Note that, however short the job, the Construction Regulations still apply.

Structural safety

If the work could involve removal of structural timbers, excavation below walls etc., have plans been made for shoring and support (Construction (General Provisions) Regs. 49 and 50). Is equipment available? Does the Highways Act 1971 (S.36 and S.37) apply?

Exclusion, decanting, tenting-off

Should people be moved out of the property or adjacent premises and for how long? Or can they be protected by tenting-off the work area?

If so, are the necessary heavy duty polyethylene, stapling equipment, battening, mastic and adhesive tape available? Will air pumps be needed to prevent leakage of contamination into occupied areas?

Training

Was the initial survey done by someone holding at least a Certificate in Timber Infestation Surveying? Does the organisation have the competent persons required under the Construction Regulations, Food and Environment Protection Act and its Pesticides Regulations to plan and supervise the work; are the spraying operatives trained as required under the Pesticides Regulations? Are they informed and trained as required under the Health and Safety at Work Act?

Power supply

How is an electricity supply to be provided? Whether solvent-based or water-based chemicals are used, the building's power (where available) will have to be cut off anyway in the spraying area. Because of the difficulty of identifying all circuits it is best to switch everything off and make other arrangements (see below). This subject and requirements for earthing and the safety of handlamps are covered well in the BWPA leaflet *Safety precautions for observance by firms engaged in remedial treatment.* HSE guidance note adds that all equipment should operate at low voltage or be supplied via a residual current device (RCD). It's important to remember that even 110 volts can kill.

Fire prevention

If your firm still insists on spraying solvent-based products, have you made the standard arrangements for cutting off all sources of ignition in the building – boilers, pilot lights, etc? If so you are taking precautions against the solvent vapour concentration reaching the lower explosive level – more than 1,000 parts per million, or three times the level that's supposed to be safe for workers to breathe. What

◁ **Neater than most, a Peter Cox van on the road in North London, a few streets away from the site in Cazenove Road which the firm sprayed in January 1988 (See end of this Section).**

safeguards are planned for them? See confined spaces/ventilation, below.

Transport

Are suitable vehicles available for transporting personnel, chemicals and equipment to the site in safety? Most firms will have to answer No to this question. A beat-up transit van with drums, spraying equipment and workers rattling around together in the back meets no requirement save cheapness. These are some of the essentials:

△ Separation of driver/passengers from load space by sealed metal bulkhead.

△ Load space to be separately ventilated; to have racks or locker, with straps, for carrying chemicals securely; proper storage for tools, especially sharp/heavy items which could pierce drums in a crash.

△ Lockable outer doors or internal storage space.

△ Warning labels on the outside of the van, complying with regulations on classification, labelling and packaging and conveyance of dangerous substances (HSE has guidance booklets and can advise). Outside of van should have an emergency telephone number so that the emergency services can get more information on first aid, spillage control and firefighting. Firms should have arrangements for handling/transferring calls, round the clock. Driver should have safety data sheets on all materials carried.

△ Separate locker for clean protective clothing, respirators, etc. Doors to have tight-fitting seals; ventilation to outside of vehicle. At least one change of protective equipment to be available per person. A purpose-built vehicle could have a 'clean' locker of this kind accessible from the cab or outside of the vehicle.

△ Locker or bin for soiled protective equipment. Items for disposal and items for cleaning/laundering to be bagged separately.

△ Water tank: ideally built in to van, to carry supply for sites with no mains water. Design should allow for: filling and draw-off from outside 'dirty end' of vehicle; drain-down and sterilisation. Even if only used for spraying, water should be of mains quality. Aerosols created from water containing micro- organisms can be a serious health hazard if inhaled. Legionnaire's disease is the worst risk. Just having a water supply on the vehicle will not enable the employer to comply with the Construction (Health and Welfare) Regulations. See Hygiene and welfare facilities, below.

△ Fire extinguisher: required by law on any vehicle carrying flammable materials. Mount on secure bracket – not in the back of the van. Halon gas extinguishers are commonly recommended but carbon dioxide produces less toxic fumes in a fire. A second extinguisher should be available for taking onto the site.

△ Portable low voltage (110 volt) electrical generator to power lighting, ventilation, vacuum and welfare equipment on sites which cannot be supplied off mains. Generator to be silenced to comply with the Control of Pollution Act and associated codes of practice. Generators must not be run indoors. Construction (GP) Regs 1961, Reg 22.

△ Transformer for stepping supply down to 110 volts where mains available. Firms should standardise on 110 volt equipment for all tools and lighting. See HSE guidance notes PM32, PM38 and GS24; and HSE guidance booklet (G)22.

△ Vacuum cleaner: for use in cleaning all surfaces before and after remedial treatment. Must be Type 'H', approved for use with hazardous dusts. Anything less efficient will pass spores and pesticide-contaminated dust back to the atmosphere.

△ Heavy-duty, double-wall polyethylene bags for collection and disposal of vacuum cleaner bags, contaminated waste, etc. Tape for sealing bags.

△ Hand pump for transferring chemicals during mixing.

△ Heavy-duty butyl sheeting to catch any spills during mixing and for use as spill-containment bund in event of road accident. Sack of absorbent material for use in cleaning up spills.

Handling chemicals

△ Chemical packaging and labelling: chemicals must not be decanted into unmarked or unsafe containers.

△ Chemical storage, handling and mixing: HSE guidance note says

> 'only the minimum amount of product required for the work should be taken to the site . . . If chemicals are to remain on site for longer than a working day or are to be left unattended then arrangements should be made for correct storage . . . eg by the use of locked enclosures, containers etc. Chemicals should be stored in a well-ventilated secure store, away from other chemicals, foods and water supplies. Arrangements should ensure that leaks or spillages cannot find their way into water courses and cannot damage wildlife . . . or the environment . . . Chemicals stored in a vehicle, eg in a van during work

damage wildlife . . . or the environment . . . Chemicals stored in a vehicle, eg in a van during work of short duration, should be segregated from other chemicals, protective clothing and sources of ignition and food. Again precautions should be taken to prevent spillage.'

First aid

Requirements for mobile workforces are given in the First Aid Regulations 1981 (see HSE guidance booklet (R)11). In view of the potential hazards a trained first aider may be required on each job. First aid in pesticide poisoning is covered in HSE leaflet MS(B)7. Eye wash equipment should consist of a plentiful supply of sealed sachet devices. Refillable eye-wash bottles are not safe.

Workers should know the location of the nearest casualty department – and of the phone they will use to ring for assistance or an ambulance.

Hygiene and welfare facilities

How are workers to clean up when contaminated during work, during meal breaks, and at the end of work, before going home? The remedial treatment industry, like the construction industry and its law enforcers seems unaware that the Construction Regulations apply to their operations. The Construction (Health and Welfare) Regulations. 1966 lay down (Reg.11) that every site must have:

△ 'Adequate and suitable accommodation for taking shelter during interruptions of work owing to bad weather and for depositing clothing not worn during working hours.' This accommodation must contain 'adequate and suitable means' (more than five persons employed) or 'such arrangements as are reasonably practicable'(five persons or less employed) for enabling workers to warm themselves and dry wet clothing.

△ 'Adequate and suitable accommodation for the deposit of protective clothing used for work [and kept there when not in use] with such arrangements as are reasonably practicable for drying such clothing if it becomes wet'.

△ 'Adequate and suitable accommodation . . . for taking meals, with facilities for boiling water' (and adequate facilities for heating food, where more than 10 are employed).

△ 'An adequate supply of drinking water at a convenient point or convenient points marked "Drinking Water" or patently intended to be used as such.

△ Washing facilities: Regulation 12 says that every site must have adequate washing facilities if more than one person is employed on site for more than four hours. Requirements increase with numbers of workers and length of contract. But if a lead compound or 'other poisonous substance' is used, even by one worker, hot and cold water and nail brushes must be provided.

△ Showers: HSE's guidance note says: 'Persons using timber preservatives should wash off immediately any chemical which comes into contact with their skin and always wash face and hands before eating, drinking or smoking and shower at the end of each working day. Showering facilities should be available on site if heavy contamination is foreseeable'. Heavy contamination is always foreseeable in remedial spraying work, not just from everyday splashes and drips, but from the mist which HSE's own research has shown leads to substantial skin doses of pesticide.

△ A contractor must provide at least one suitable sanitary convenience (not just a urinal) for employees on site. Two toilets are needed if more than 25 people are employed. (Reg 13).

It should be clear by now that the range of safety, hygiene and welfare equipment required by the law and the HSE guidance goes far beyond what the industry is used to getting away with. It will not all fit in the back of an ex-Telecom Escort van – or even a Transit. The time has come for the industry to move into the late 20th Century . With or without the compulsion which hit the asbestos strippers, it must recognise that the spraying of pesticides in confined spaces demands hygiene facilities in advance of those in agriculture.

While portable showers, toilets and other unheard-of safety and welfare equipment can be delivered to site on a pick-up truck, it would seem that the time has come to invest some of the profits in mobile hygiene and welfare facilities. The asbestos industry buys or hires trailer-mounted decontamination units. Remedial treatment should adapt these to its own needs, bearing in mind the different nature of the risks: for example a heavy splash of PCP or TBTO on skin and clothing demands an emergency deluge shower. By moving hygiene and welfare into a trailer, firms should have space on the van for equipment that is now rarely carried, such as generators and ventilation gear.

Access

Safe means of access to all parts of the job are required under the Construction Regulations and the Health and Safety at Work Act. Any scaffolding must be inspected by a competent person and the

inspection recorded in the register required under the Construction Regs. The HSE guidance note says:

> 'A safe place of work should be provided for treatment operatives wherever work is to be undertaken. If there is a risk of falling more than two metres or through fragile materials a suitable and stable working platform with guardrails and toeboards should be provided. Roof spaces and attics with fragile floorcoverings should be provided with suitable boarding across the area to be worked.'

Confined spaces/ventilation

The HSE guidance note says that a competent supervisor or manager must draw up a safe system of work before work begins in lofts and other locations which are restricted in size and which lack ventilation. Specifically, 'the working area should be ventilated adequately by natural or mechanical means' and where flammable formulations are sprayed 'the trunking of any ventilation system . . . should be fire resistant and the fan motor either flameproof or situated in a safe place and in any event not sited within the trunking.' The Construction (GP) Regulations, unmentioned as usual, are rather more forceful. Reg. 21 (edited for brevity only) says:

> 'Effective steps shall be taken to secure and maintain the adequate ventilation of every . . . enclosed or confined space and of every approach to any such working place so as to maintain an atmosphere which is fit for respiration and to render harmless, so far as is reasonably practicable, all fumes, dust or other impurities which may be dangerous or injurious to health . . .'

Paragraph 2 of this regulation says that where there is any reason to suspect the atmosphere in a confined space may be dangerous it must be tested and shown to be safe before anyone may work in it.

Protective clothing and equipment

How is this to be selected, issued, cleaned, laundered and disposed of?

△ Selection: HSE insists that workers must be consulted about the choice of equipment. See Labour Research Department booklet, *Protective clothing* (LRD 1986)

△ Overalls: HSE research, nearing completion at the time of writing, shows that the industry's standard workwear, cotton overalls, do not give adequate protection. Although other investigators, including Lambeth pest control department (*Pesticides Action Bulletin* 3), reached this conclusion some time ago, HSE researchers were surprised and concerned by the high doses of

pesticides they measured beneath ordinary overalls. They are likely to recommend that the industry switches to impervious clothing and institutes stricter laundering procedures. We do not know if this advice has been included in the final version of the new guidance note. At the time of writing it is at HMSO's printers and therefore, apparently, an official secret! The draft GN recommends:

> 'a coverall with hood that the chemicals will not penetrate in the form in which they are applied. The most practical garment is a laminated disposable paper overall'.

Sizes should be available to fit all workers; zips to have impervious covers; sleeve and trouser design to be compatible with boots and gloves selected.

△ Gloves: HSE recommends those made of viton, neoprene or nitrile rubber or 1mm thick PVC and adds: 'Unlined gloves used with separate cotton liners are preferable to those which are lined.'

Correct size is essential: loose fit causes accidents; tight fit leads to hand cramps, sweating and bacterial or fungal infection. Inspect daily and discard immediately they are damaged, contaminated internally or smelly. As even the best protective gloves absorb chemicals, weekly replacement is advisable. Cleaning and re-use should not be attempted. If cleaning succeeded in removing contamination from the outside it would transfer some of it to the inside.

Barrier creams are useless for skin protection against solvents and toxic substances.

△ Footwear: HSE specifies protective footwear suitable for use in wet conditions, to British Standard BS 1870 Part II or III. The standard gear of the cowboy sprayer is frowned on: 'Leather shoes and trainers are not suitable.'

△ Respirators: the popular gauze masks and disposables are useless. HSE recommends a full facepiece respirator fitted with a type CC canister, which will also give effective eye protection. Manufacturers' instructions on fitting, testing, maintenance and replacement of canisters should be followed. Because workers are often exposed to dust hazards at the same time we believe the respirator should also have a dust filter. Because of the high breathing resistance that results from combined vapour and particle protection, it is better to go for positive pressure respirators powered from a battery pack. Airstream-type helmets

seem to be a neat way to protect head, eyes and breathing in one go, but we are not satisfied that protection against pesticides is good enough.

Whatever respirator you've got, if you can smell or taste the substance you're working with, it's time to change the cartridge or demand better equipment.

Respirators don't work properly if you've got a beard or a face that is unusual in almost any way. The fault is in the job, not your face. The COSHH regs will consolidate previous law, and advice from HSE: personal protection comes after the employer has done everything reasonably practicable to control exposures by other methods.

△ Laundering/cleaning: HSE guidance note says coveralls and other personal clothing which have been contaminated should be laundered before they are worn again. 'This is best carried out by professional cleaners who are aware of the hazards'. Since many of the common preservative formulations are not water-soluble, dry cleaning may be needed instead of laundering. The employer should set up an effective system and pay for it. No protective equipment should be taken home, let alone be washed there.

△ Heat stress: employers will have to recognise that impervious clothing and high-efficiency respirators can impose severe thermal stress on workers, especially when work is done in confined spaces, such as lofts, in hot weather. Additional rest breaks may be needed. Occupational hygienists can measure heat stress and recommend a work/rest regime to control it.

Occupational hygiene monitoring and medical monitoring

These will be required under the COSHH regs. They are covered later in this section, as these requirements cover workers in all parts of the industry.

Clean-up

See Section 8, Cleaning up, and Cornwall County Council specification, Appendix 1.

Waste disposal

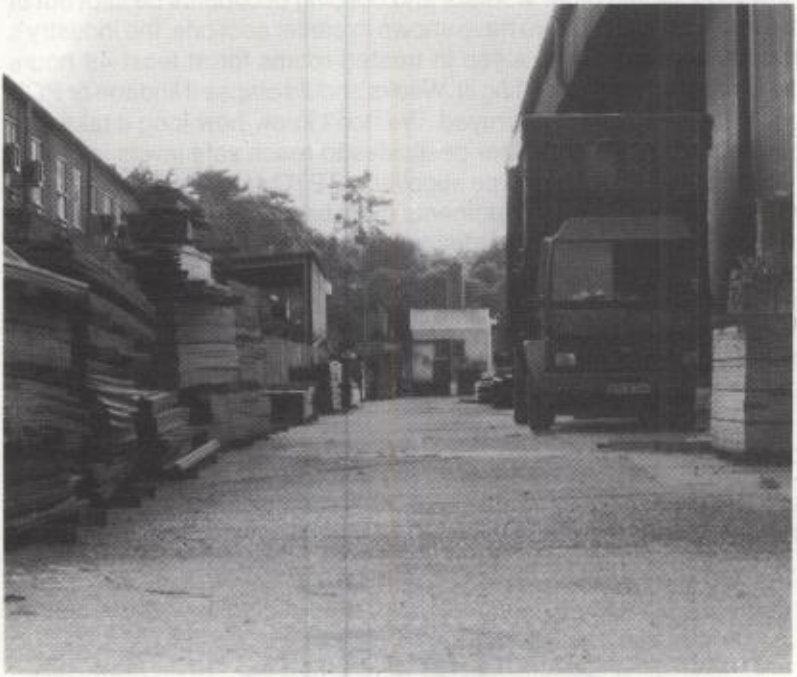
See Section 7, Community and environmental hazards.

Exclusion periods

How long should other workers and building occupants be kept out of the treated areas? As we have shown in earlier sections, the industry's standard advice not to sleep in treated rooms for at least 48 hours does not stop people getting ill. Weeks should elapse if lindane or PCP have been extensively sprayed. We don't know how long it takes for permethrin, TBTO and other pesticides to reach safe levels in the air and on treated surfaces. One supplier of TBTO says that maintenance workers coming in after treatments must be warned of the dangers of lying or kneeling on wet surfaces must be equipped with adequate protective clothing. After spraying permethrin, on roof timbers in schools, the Cornwall County Council specification requires a week to ventilate and thoroughly clean treated lofts and the classrooms below. The HSE guidance note says that air tests may be needed in deciding when it's safe to let people back in.

Labelling the finished job: We know of only one company, Remtox Chemicals, which has done anything about marking treated premises so that they don't get treated again. Its 'treatment tag' can be nailed to the wood in a place where the next potential sprayer is likely to see it.

Part 3: Pretreatment work



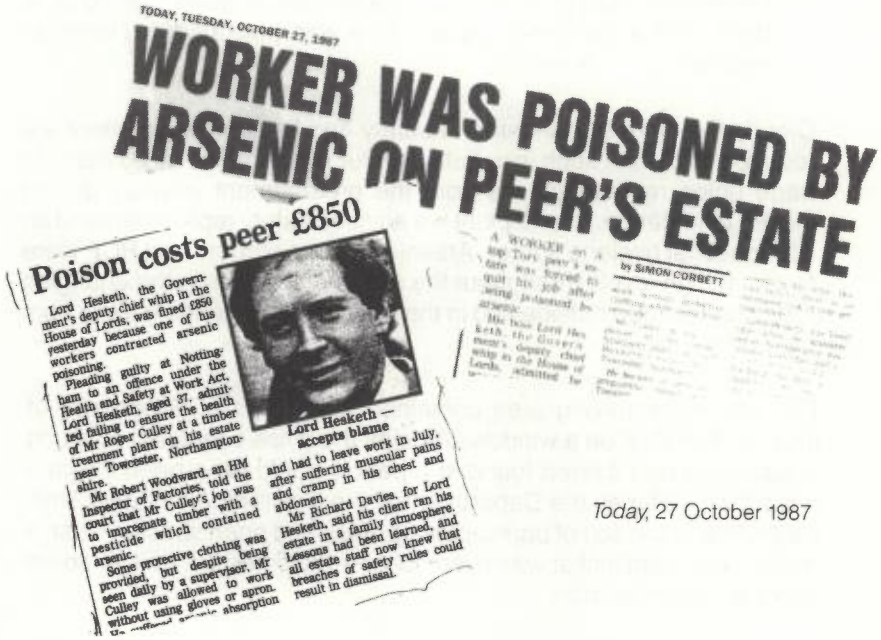
△ **Beyond the typical wobbly stacks is the Protim pretreatment plant. No amount of chemicals will make this warped timber suitable for use in construction.**

The pretreatment industry

Because it can be done in factory-like conditions, pretreatment should be safer than remedial treatment. In practice it doesn't always work out like that. As well as the extremely toxic chemicals employed in remedial treatment – PCP, TBTO, and lindane – the industry also uses thousands of tons of the deadly compound arsenic pentoxide in more than 250 'CCA' pressure treatment plants. Creosote is handled in a dwindling number of creaky old cylinders.

To the obvious toxic risks, documented in previous chapters, pretreatment plants add two extra dimensions – the huge quantities of chemicals being handled and the high operating pressures which drive them into the wood.

While airborne pollution is generally less serious than in remedial treatment, handling wet timber can easily lead to acute or chronic poisoning, as Roger Culley found to his cost:



TODAY, TUESDAY, OCTOBER 27, 1987

WORKER WAS POISONED BY ARSENIC ON PEER'S ESTATE

by SIMON CORBETT

Poison costs peer £850

Lord Hesketh, the Government's deputy chief whip in the House of Lords, was fined £850 yesterday because one of his workers contracted arsenic poisoning.

Pleading guilty at Nottingham to an offence under the Health and Safety at Work Act, Lord Hesketh, aged 37, admitted failing to ensure the health of Mr Roger Culley at a timber treatment plant on his estate near Towcester, Northamptonshire.

Mr Robert Woodward, an HM Inspector of Factories, told the court that Mr Culley's job was to impregnate timber with a pesticide which contained arsenic.

Some protective clothing was provided, but despite being seen daily by a supervisor, Mr Culley was allowed to work without using gloves or apron.

Lord Hesketh — accepts blame

and had to leave work in July, after suffering muscular pains and cramp in his chest and abdomen.

Mr Richard Davies, for Lord Hesketh, said his client ran his estate in a family atmosphere. Lessons had been learned, and all estate staff now knew that breaches of safety rules could result in dismissal.

Today, 27 October 1987

The *Guardian*, 27 October 1987

The combination of high pressure and large volumes allows ample scope for disastrous injury to workers and the environment. The HSE reported:

> Poisoning incidents investigated in 1987
> Ref: 05/67/19
> Date: 05.II.87
> Activity: Pressure testing creosote tank
> No. and sex: 3 men
> Summary of Incident: Whilst tank was being pressure tested the end door fractured, and they were contaminated with creosote.
> PIAP decision: Confirmed.
> ***Pesticides incidents investigated in 1987*, HSE.**

It seems that even the market leaders Rentokil and Fosroc (Protim) are not immune to an occasional slip up involving their chemicals. In 1987, Factory Inspectors investigated two incidents:

△ In April a pretreatment plant lost 500 litres of Protim 80 (PCP, TBTO and dieldrin) to the drains. The loading door seal failed and the bund wall was not properly mortared.

△ In October they investigated the loss of 3,000 litres of Rentokil's Celpruf PK (TBTO, PCP and lindane) from another plant over a three and a half week period. This was put down to 'error by engineer'.

Clearly the highest standards of safety and health management are required to control such installations. Our experiences as advisers to trade union representatives from the pretreatment industry do not inspire confidence. At one plant we advised safety reps to demand an occupational hygiene survey. Arsenic, copper, chrome and PCP were found at high levels throughout the site, in the office, in the changing room, on the road outside and in the drainage ditch leading away from the plant.

The soil in the mixing area contained more than 0.75 per cent of arsenic. The dust on a windowsill inside the office contained so much arsenic that had it been found in a park it would have been illegal – more than 30 times the Department of the Environment 'trigger limit' for arsenic in the soil of parks, playing fields and open spaces. Dust in a changing room locker was even richer – 100 times the limit for soil in parks and open spaces.

The survey showed that dust was being carried into the buildings on the air and on people's clothes. Inevitably it would also have been carried into the community and into workers' homes by the same routes. High concentrations found in the drainage ditch showed that groundwater and eventually drinking water were at risk.

The occupational hygienist noted in his report that 'there is some conflict between between procedures recommended by Rentokil and current practice' and 'it was possible to identify a number of points where containment was not perfect'!

Thanks to the persistence of the shop stewards in that company, the workplace and its management systems were cleaned up. The hygienist's recommendations have been included in our checklist, later in this section.

We don't know whether the HSE has done any investigations to find out if other plants operate at the same level of 'conflict' between recommended and actual practice. In the USA the National Institute for Occupational Safety and Health surveyed a selection of pretreatment plants. Its report (NIOSH 1983) suggests that even in plants owned by big corporations there is that same old 'conflict':

'. . . at the smaller plants . . . protective equipment and the training of personnel tends to be less elaborate or non-existent . . . Larger plants . . . generally have adequate emergency equipment for unique exposure situations, whether they are entry of tanks, major maintenance of equipment, or pump leaks and spills. During both survey phases, however, it was noted that personal protective equipment, even in large plants, is not always utilized when needed for exposure control. This is more evident with skin protection than the use of respirators, etc . . .

△ **USA 1987: a West Coast timber yard and pretreatment plant lets it all go down wind.**

'Of most concern is the handling of freshly treated or wet wood . . . In some instances, the cloth gloves appeared significantly soaked from the treated wood and skin staining was observed . . .

'At other other facilities, the general level of safety awareness is more typically aligned to the general saw mill wood processing industry. Most have a general cognizance of the need for safety and equipment guarding, etc., but no significant orientation to the basic chemical or other health aspects of the treating process or materials . . .

'In a few plants, eating and coffee breaks are taken in treatment areas . . . Some plants lack sanitary facilities immediately adjacent to break areas . . . Many of the plants . . . have no medical surveillance. Some do not even conduct pre-employment physical examinations to determine the suitability of prospective candidates for exposure to the treatment chemicals. Many pre-employment exams address only the prospective employees' suitability to lift heavy objects and general physical condition'.

That was America, 1983. There is no reason to think that the situation is any better in Britain.

Health and safety in pretreatment

In 1988 the industry published its own rules for operating pretreatment plants (BWPA *Code of practice for the safe design and operation of timber treatment plants*). There is nothing in this modest eight-page document which plant owners should not have been doing for years, just to comply with established good practice, the Factories Act and the Health and Safety at Work Act. Yet the BWPA asked the Factory Inspectorate for 'time to meet the increased standards'. The HSE gave them a time limit of two years. This is for the full implementation of a code which permits, in para 2.1.2., a warning notice instead of a fail-safe interlock on the door of a pressure treatment vessel; which says nothing about showering facilities for workers and neglects to prescribe the monitoring of workers' health, the air they breathe – or the dust in the lockers in the changing room.

We have incorporated the better parts of the BWPA code in our checklist. They are marked BWPA. Recommendations from the NIOSH report are marked NIOSH. We have concentrated on aspects that are most neglected – prevention of pollution and the protection of health – rather than the usual accident and fire-prevention matters on which guidance is more readily available.

Checklist

Legal

△ Has the plant, however small, been notified to the Health and Safety Executive as a factory and, where arsenic is handled, as a 'Major Accident Hazard' under the Control of Industrial Major Accident Hazards (CIMAH) Regulations? Does the Fire Brigade know the toxic and fire risks of the site ('Operating companies should consult with the Fire Brigade to ensure that water is not applied indiscriminately in the event of a fire' (!) – BWPA).

△ Has the employer carried out a risk assessment? (See Remedial treatment work: official guidances above).

Site design

△ Are the whole plant and yard concreted, including stacking areas for treated timber? Are gradients arranged so that rainfall on 'clean' areas goes to storm drains via large traps? Could this 'clean area' contain the 'worst case' spillage – eg from a road tanker leak?

△ Are the treatment plant, storeroom, control room and stacking area roofed over, and rainwater carried to storm drains?

△ Is there an emergency sump beneath the treatment area in which spillage from the cylinder, storage tank, pumps, or other parts of the plant will automatically collect?

△ Does the standing area for treated timber have its own drainage to this tank?

△ Could the sump contain the largest spillage of chemicals possible in conjunction with heavy rainfall? If not, is there an automatic pump feeding into a back-up tank? Are there level-indicators on these sumps? Are they kept empty in normal operation, by recycling or by disposal to a licensed tip under the Control of Pollution Act 1974?

△ Would this or any other safety system be knocked out by an electric power failure? Are there back-up systems?

△ **A well-laid-out high-pressure treatment plant. All surfaces are concrete and designed for correct drainage.** Photo: Fosroc Ltd., Timber Treatments Division

△ Is there adequate equipment for cleaning the site and preventing the spread of contamination – eg wet-type vacuum road sweepers and vehicle wheel washing equipment at exits from site? Are all sweepings, sludges, etc., recycled or disposed of as Special Wastes?

△ Are all chemical storage and treatment areas clearly marked off, ideally with physical barriers and is access restricted to authorised workers only?

△ Is all pedestrian and vehicle traffic routed round these areas?

△ Are emergency showers and eyewash fountains installed in all chemical handling areas?

△ Are the emergency spill procedure and phone number displayed on placards around the plant?

△ Is the complete site secure against entry of children, vandals, etc? Are all pesticides kept in locked stores?

△ Is there adequate ventilation of all areas – especially when solvent-based fluids are used and where timber treated with them is stacked? Is extraction ventilation needed, eg in mixing areas (S.63, Factories Act 1961)?

The plant

△ Are the doors on all pressure/vacuum vessels equipped with interlocks which prevent door opening, as on a domestic washing machine, until the tank is completely emptied of fluid? And prevent the cycle starting until the door is fully closed and locked? Are the systems tamper proof? Do they fail safe? Are there back up systems?

△ Are the pressure relief valves adequate? BWPA calls for two, one to cut out at treatment pressure, the second to blow if this is exceeded. In addition a pressure switch should cut off power to the pump before the second valve blows. Discharge from both valves is to be recirculated within the plant.

△ Is the vessel fully instrumented, to show pressure/vacuum and liquid level?

△ In vacuum equipment has an extra valve for release of final vacuum been fitted close to the cylinder door to reduce mist released when the door is opened? Has the vacuum pump been fitted with a system for carrying vapour away from the work area, ideally into a condensing/recycling unit?

△ Is there a syphon break in the water supply with an air gap of at least 150mm to stop preservative solution being sucked back into the mains? (BWPA)

Design of new plant

△ Are there plans for fitting hydraulically operated doors, ideally with automatic bridge rails? And relocating door seals on the doors where they are less likely to be damaged than on the cylinder itself? (NIOSH).

Training

△ Does everyone know the hazards of this work to themselves, the community and the larger environment? BWPA says:

> 'All operators must be fully trained and hold a certificate of training specific to the products being used.'

Welfare and hygiene

△ Are there 'conveniently accessible washing and changing facilities within the treatment plant area'? (BWPA) NIOSH sets a higher standard: 'Shower and wash-up facilities are needed adjacent to eating and locker change areas'. See also our recommendations under Remedial treatment, earlier in this section. These sites are covered by the Factories Act which lays down minimum standards for toilets and washing facilities.

△ Is there a clean room where workers can take meals? BWPA says nothing on this, except 'eating drinking and smoking should also be prohibited within the working area'. NIOSH says 'We recommend positive pressure control rooms for those facilities where operators must eat while on duty'.

Protective clothing

△ Is the correct equipment issued, used, changed regularly, properly cleaned? BWPA Code is almost useless here. NIOSH is better:

Respirators (PCP and creosote plants): 'chemical cartridge, full-face respirator for emergency spills, and pump leak correction' with 'self-contained breathing apparatus or air line respirators for cylinder entry tasks.'

Coveralls: disposables, or types which can be laundered, for short-term cylinder entry tasks, and impervious gear for shutdown, clean-up and maintenance. NIOSH warns of the risk of heat stress with impervious clothing. See Remedial treatment checklist for more information on this.

NIOSH warns that yard personnel also need protection against contamination by wet timber.

△ How is clothing to be laundered? 'Protective clothing must be kept in good repair and overalls regularly laundered' (BWPA). 'We recommend that coveralls be provided and laundered commercially to avoid taking the material home resulting in household contamination. There should be a required change of work clothes when they show obvious signs of contamination and on a scheduled basis. Only street clothes should be worn to and from the plant' (NIOSH).

The chemicals

△ Have dusty formulations been replaced with pastes, concentrates etc? Could sealed delivery systems be introduced with direct transfer of concentrate to storage or mixing tank?

Monitoring

△ Is there a system for monitoring contamination of the air in the workplace and in the community nearby? What about soil and water?

△ Is there a system for monitoring workers' health? BWPA has nothing to say on this. We have some recommendations under Remedial treatments, above. NIOSH establishes general principles and lays down good procedures for creosote,arsenic and PCP workers:

> 'The medical physical examinations should be oriented to detect both the specific treatment chemical in biological fluids, where possible, and evaluate the more sensitive indicator systems for signs of early reversible health changes.'

For PCP workers NIOSH recommends measuring urinary PCP and blood, liver function tests, plus skin examination.

For creosote workers, NIOSH recommends three- to six-monthly skin examinations, paying particular attention to any skin lesions (and recording them on a body outline form). Lesions to be recorded include 'warts, pigmented nevi, scars, etc'. The physician 'should be trained in the identification of skin lesions that could be cancerous or pre-cancerous, such as melanomas'.

For arsenicals, NIOSH recommends analysis of hair samples, urinalysis and 'SMA-12 blood profile'.

NIOSH has a last recommendation which the HSE should take up:

> 'We also recommend that either the wood preserving industry or EPA consider computerizing medical data for retrospective determination of acute and long- term health effects. This compiled data would be useful in answering questions regarding the carcinogenicity and teratogenicity of the treatment materials.'
>
> 'You what?!' (BWPA/HSE).

Part 4: Successful action

It will be a long time before the hazards of the pretreatment industry get the laws and the law enforcement they deserve. Meanwhile trade unionists have moved ahead of the law. In more enlightened boroughs they have taken the employers with them in changing local authority attitudes to pretreated timber and in controlling the worst excesses of the commercial pretreatment firms.

Birmingham

After seeing a programme on wood preservative hazards DLO shop stewards sent the Housing Department safety officers down to Central TV's studio for a special viewing. The safety officers came back in full agreement with the stewards and began a complete audit of the department's use of wood preservatives. They are looking for safer chemicals to use in their own pretreatment plant and also examining every job for exposure risks – including the dust generated by treated wood.

Harlow, Essex

Unions and management have begun a similar review. UCATT wants the council to bring in building design consultants to advise on conservation of timber by good design and other non-chemical methods.

Ashby and Horner, Essex

After its members complained of symptoms similar to those affecting the Hackney joinery shop workers, UCATT Regional Office enlisted the help of the London Hazards Centre. We were able to challenge the 'occupational hygiene exercise' with which Hicksons sought to reassure the union about the safety of its Vac-Vac-treated timber. Both Ashby and Horner and Hackney DLO got their joinery treated in the same Hickson plant at Barking.

Lewisham, London

Questioning by FELTRA (Federation of Lewisham Tenants and Residents Associations) led the borough to examine its uses of pre-treated timber. It turned out that all joinery was routinely treated with Vac-Vac. The rationale and hazards of this practice will now be examined. FELTRA's campaign has brought to light the case of a housing association worker who, according to FELTRA Fax September 1988, became ill for several weeks after using Cuprinol. 'What really worried him was the fact that he was using this stuff in people's homes when the residents were still living there because the housing association does not have enough empty properties to move people to temporarily.'

There is more on community action against wood preservative hazards in the next section.

Australia

Telecom workers in Australia are among those who have taken vigorous action against the hazards of pretreated timber. They got a ban on PCP-treated crossbars on telegraph poles. Their action is written up in the excellent Australian 'TUC' *Health and Safety Bulletin* (ACTU 1982).

Sweden

Trade union bans won eventual tight regulation of creosote and recognition of the extra hazards of wood dust when contaminated with preservatives.


Site spray prompts poison alert

...DING workers were ...ril repair pro-

the builders' union UCAT... " and they've kept unions o... ...committee that ve... ...h we wer...

Hackney Gazette 29 January 1988

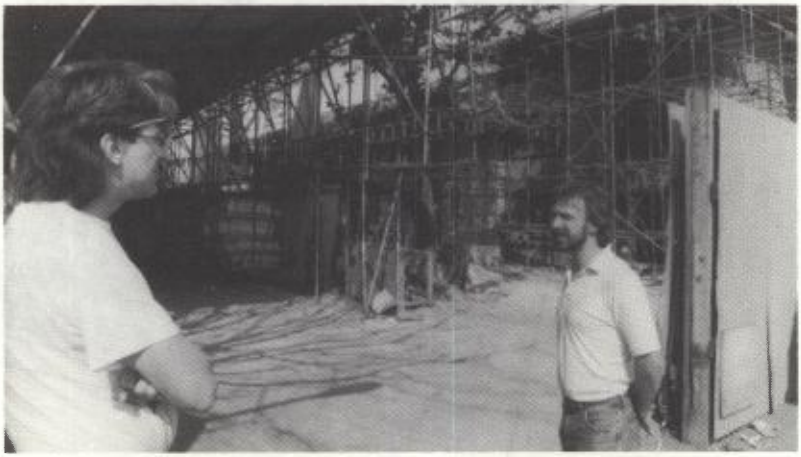
Action in Hackney

Shop stewards and safety reps in Hackney's Direct Labour Organisation (DLO) were alerted to wood preservative hazards in January 1986 when workers handling treated timber in the joinery shop complained of feeling sick and dizzy. The unions put a ban on working with the treated timber until the problem was fully investigated. An HSE inspector backed their stand.

Workers on DLO sites also complained of sickness after handling timber which arrived wet from pretreatment with CCA or 'Vascol'. After they had turned away lorries arriving at sites with wet loads, the Borough Safety Officer agreed that this should be standard practice.

As other incidents followed, the unions wrote their own *Pesticides Report* (Hackney DLO 1987) and the council moved towards a total review of their policies on chemicals throughout the borough (See Appendix 3).

The difficulties of devising effective policies and policing them were illustrated again in November 1988 when eight carpenters and painters on the Stonebridge site began to suffer from nausea and narcotic effects while working with internal and external doors from two suppliers. UCATT steward and safety rep Mick Holder took them off this job while the union and management investigated. Both sides were amazed when they found out that even the internal doors had been treated with PCP and TBTO. The council is expected to stop all pretreatment of doors and internal joinery.



△ **Hackney Direct Labour Organisation workers prevent entry of dangerous chemically treated timbers to local building site.**

PESTICIDES

HSE backs union stand on dieldrin

Shop stewards in Hackney's Direct Labour Organisation (DLO) have helped to reveal further contradictions in Britain's ramshackle system for protecting people from pesticides.

The story began in January when Derek Miles, Deputy Convenor of the DLO Joint Sh... Stewards C... the Cen... preserva... Hackney ... impregna... Barking. ... window f... wards in ... shop were ...

At first ... ple case of ... vent vapou... files from ... ufacturers ... indicate any ... ous ingredie... tify the "e... used in the ... phoned Hicks ... Castleford, Y... shocked to lea... ticide is dieldri...

... the union's ... Centre's inform...

On 25 Ma... HSE office p... notice on any ... sol-treated ... Hackney's ... Robert S...

... Hazards

● **Dieldrin** was banned in the United States in 1976, after a long fight with the Shell Chemical Company, on the grounds of "imp... ent carcinogenic haza...

...nder the gentle ...ervision of the ... Precautions ...n by the ...riculture, ...MAFF), ...dually ... were ... in ...

Hazards

JOINERS IN JEOPARDY

CENTRE PAGES

TREATING TEXTILES

7

Community and environmental hazards

Pollution and the politics of wood

The timber treatment industry presents itself as a force for conservation. The British Wood Preserving Association tried on its new green clothing in a press release sent out to 61 national papers and trade journals in the autumn of 1988. There was no reaction from the media. *BWPA News*, October 1988, was the only paper to publish it in full. Here are some edited highlights:

> 'Concern for the environment is not restricted to those who chose to make what are mostly unfounded allegations in the media on the officially approved chemicals used in the preservation of timber. From the same sources come complaints about the denuding of some of the important forests in the world which causes distress to many.
>
> '. . . The objective is to provide, through the safe use of preservatives, a positive resistance in timber to attack by fungi and insect and so increase the life span of timber in the service of man.
>
> 'Over the years, this objective has been met successfully by those engaged in the timber preservation industry with an admirable record of safety and care'.

To demonstrate the safety of the industry, the press release draws on the HSE report on pesticides incidents investigated in 1987: 'Only seven of the 145 incidents investigated . . . involved timber treatment chemicals, all of which were of a very minor nature'. (Three of these 'minor' incidents are described in the previous section of this book).

> 'Regarding the second matter of concern, the excessive removal of timber from the forests, research in the USA has shown that the use of wood preservatives is credited with savings of about 12 percent of the total timber harvested each year in that country . . . By using properly applied preservatives to conserve timber, the durability and life span of many timber species can be extended and by so doing, assist in the conservation of the forests.
>
> 'The British Wood Preserving Association firmly believe that the preservation of timber should be encouraged rather than criticised by those who publicise concern, real or otherwise'.

So, now you know, the wood preservers and their merry chemicals will save the rain forests – if only the 'media scaremongers' will shut up and let them get on with it. This sounds quite plausible if you don't think about it for too long, or know too much about the way the industry gets its chemicals.

The wood preservation industry is the last heavy user of pentachlorophenol. The chemical hasn't been made in Britain since 1978 when Monsanto shut down its aged plant at Newport in Gwent. It had been making workers ill since it opened in the 1930s. What finally drove factory inspectors to press for closure was a report from the World Health Organisation about health hazards from the dioxins and other by-products of PCP manufacturing.

Manufacturers had the choice of leaving the dioxins in the product – and knowingly endangering those exposed to it at work and in the community – or taking them out and having to find a safe way to dispose of one of the most toxic wastes ever created.

Monsanto eventually gave up on PCP. Even Dow Chemicals, makers of Agent Orange, the dioxin-rich defoliant dumped on the forests and people of Vietnam, gave up on PCP.

In Germany the last plant closed in 1987. The German closure was explained by Patrick Nicholls, Parliamentary Under Secretary at the Department of Employment, in a letter to MP Dale Campbell-Savours in September that year:

> 'I am advised pentachlorophenol is banned in the USA for uses other than wood preserving. In West Germany it has also been subject to prohibition following closure of its sole manufacturing plant as a result of concern for the handling of certain toxic impurities extracted in the process. The substance is not manufactured in this country where conditions of approval require high standards of purity and a British Standard Specification exists'.

Mr Nicholls did not explain how this very British standard of purity was to be achieved – or where. Rhone-Poulenc could have told him. This French multinational is the last manufacturer of PCP in Europe. In the forest region of Cubatao in Brazil it has solved the problem of cleaning up PCP sufficiently to meet the standards required by the wood preservers and their governments without spending a fortune on waste disposal. Cubatao is a good place to resolve such contradictions. Union Carbide is just down the road from the Rhodia factory. The Brazilian embassy informs us that Rhodia SA is listed as a wholly-owned subsidiary of Rhone-Poulenc.

The waste dump is not far away in the forest - more than 2,000 tons of residues from making PCP. Ground and drinking water are contaminated. Children have PCP in their urine. The forest itself is damaged by pollution. In a harrowing TV documentary shown in Britain in 1987 (Valley of Death, produced by Bo Landis, Scandinature Films, Sweden, 1987), workers and villagers told what the chemical they call 'the Chinese powder' had done to their community.

> Workers: 'My liver and kidneys are bad but the company doesn't care' . . . 'On my knees I address the world. God help us!' . . . 'Rhodia dumps it in the forest . . . the whole village is being poisoned.'
>
> Parent of a 20-month old child taken to the local health centre: 'It's a very serious disease . . . it's terrible . . . I think the health problems are caused by waste from Rhodia . . . it's dumped 300 metres away . . . the wind blows the chemical dust and we all get very itchy.'
>
> The doctor, whose life was threatened for speaking out: 'It should be called Cubatao powder. The workers are exposed without knowing what diseases it can cause.'
>
> The local priest: 'There are sick people all through our community . . . Their lives have been ruined by contact with chemicals.'

If the wood preserving industry really wants to save the forests and benefit humanity, its first good deed must be to give up the addiction to PCP. When the timber treaters stop buying, the plants will close.

Instead the industry drives onward into the developing world in a hypocritical crusade to persuade people that wood is no good unless it's stuffed with chemicals. This chemical imperialism, echoing the spurious philanthropy of the pesticide-dependent 'Green Revolution' in agriculture, is led by the pretreaters. Property values and family incomes are not yet high enough for the remedial sprayers to get a foot in the door.

Where real philanthopists would carry Building Research Station guides to improved building methods based on indigenous designs, or intermediate techology guides such as the *Lik Lik Buk* from Papua New Guinea (Lik Lik Buk 1977), the pretreaters bring pressure cylinders and order books for PCP and dieldrin, copper, chrome and arsenic.

They will argue that although pretreatment adds about 10 per cent to the cost of wood this will soon pay for itself in the increased life of buildings. And once the chemical is in the wood, it will of course be perfectly safe. The PCP is 'purified' and the ingredients of CCA formulations 'lock together in the wood', so that the arsenic cannot escape.

Blood and urine tests on people in Hawaii and other tropical countries demonstrate the consequences of 'widespread use of PCP-treated timber'. People who do not work with the chemical have far more of it in their bodies than non-exposed US citizens (ACGIH 1986).

Developing countries also pay a high price for arsenic. Like PCP, it has been banished from agriculture. The timber preservation industry is the last bulk user. Someone has to make it in bulk, which is a messy business. Smelter workers get cancer; pollution from the plant endangers local communities. Unable to meet new US standards for protecting workers from cancer, American arsenic makers skipped across the border into Mexico (Rebhan 1980).

As other countries follow Germany's lead in restricting the uses of CCA-treated timber, less developed parts of the world can expect the sales pressure to increase.

Arsenic

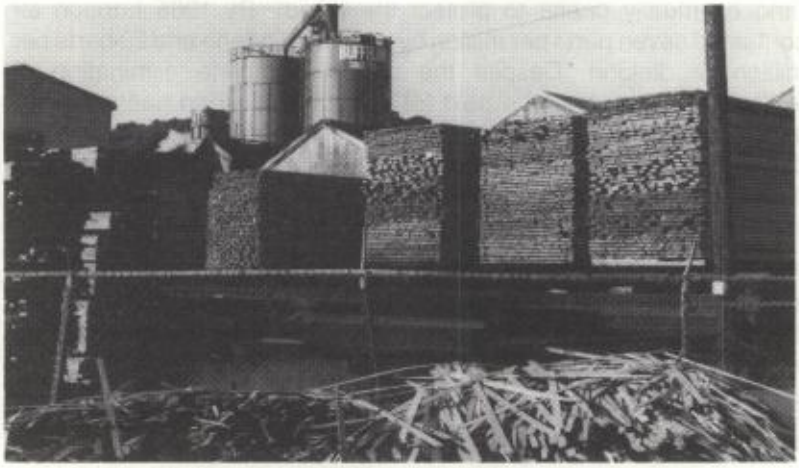
Tacoma, Washington State. This centre of the West Coast timber industry is also the site of the USA's last arsenic producer. The Asarco copper smelter is uniquely designed to process ore containing unusually high levels of arsenic. Government-funded studies showed that former workers were dying from lung cancer at a rate three times that of the rest of the population. Tests carried out on children living near the smelter showed unacceptable levels of arsenic in their urine. As the government tightened up its workplace and environmental pollution standards in the late 1970s, Asarco began to reduce production in the US and increase it in developing countries with relaxed or non-existent pollution laws, especially in Mexico. Industrial Minera of Mexico (IMM) is 34 percent owned by Asarco. (Extracted from Rebhan 1980).

'According to a 1975 Presidential report, the cost of pollution control for copper smelters was 6.6 cents per pound of copper in the United States and only half a cent per pound of copper in Peru or Chile. That is to say, it is 13 times more expensive to protect the local population and the workforce against arsenic pollution in the United States than it is in Chile.' (Rebhan 1979).

The American Wood Preservers Institute was one of the main protagonists in industry's defence of arsenic against stricter regulation. The Occupational Safety and Health Administration (OSHA) wanted all forms of inorganic arsenic to be designated as cancer agents. AWPI's medical experts argued that arsenic pentoxide (the compound used in timber pretreatment) should be excluded from this classification, as the evidence was not strong enough. OSHA won the argument. (*Federal Register*, 5 May 1978).

None of this will help to save the rain forests. Their accelerating destruction has nothing to do with any increase in the use of timber for building. There are more homeless than ever in the slums of Rio and Sao Paolo. Finding any material with which to build a shelter is the priority. No one cries out for wood preservatives.

Meanwhile Brazil's rain forest goes up in smoke at a rate of 1,000 square miles a month. Enough tropical hardwood to supply whole nations with building material is burned to make way for ranching which will destroy the soil within a year. Some kind of wood preservative is needed but it doesn't come in drums and tankers. The rotting structures are social and economic.



△ **Timber yard in Tacoma, Washington State, USA.**

No-one would suggest that the squandering of the rain forests justifies wasteful use of wood. Conservation is vital but it is hypocritical of the chemical preservation lobby to pretend that it has much to contribute. After all, their business can't begin until someone has felled a tree and been persuaded that its value will be enhanced by pesticide treatment. The preservation industry and the timber industry work together to promote the use of pretreated wood in applications for which ordinary timber would traditionally have been rejected.

According to a recent estimate (*The Guardian*, October 18 1988) tropical countries need immediate planting of at least 800,000 square miles of trees. The largest part of that area is for protection against soil erosion, then comes firewood and lastly timber for construction. The area required for commercial timber is a fifth of that required for fuel wood. It costs less than £100 to plant an acre of tropical forest.

Polluters, not conservers

The first rule of environmental pollution is that nothing disappears. The carbon now going up in smoke over Amazonia has linked to the oxygen which the burning trees put into the air in the first place. The disappearance of the carbon is an illusion. Only trees and plants do the trick in reverse, on the scale needed to save the planet from disaster.

Most of the millions of tons of pesticide put into the environment by the wood preservation industry are still there. A lot of it never reached the wood – see box below. A lot has already left. Dieldrin, lindane and PCP all evaporate from the wood, which is how they cause indoor pollution (and eventually cease to protect the wood). By 1965 London air contained seven parts per million by weight of lindane and 20 parts per million of dieldrin. Despite the almost complete elimination of agricultural uses over the next 20 years, the dieldrin has not gone away. Many of Britain's rivers are now so contaminated that eels are dangerous to eat. Some fish from Scotland contain 1 milligram per kilo of flesh – 10 times the Department of Health's upper limit. (*Observer*, 16 October 1988).

The Ministry of Agriculture, Fisheries and Food, which is also the ministry responsible for approving pesticides (see Section 2) sat on this information for six months while trying to prevent the EEC setting a standard damaging to Britain's 500-ton a year export trade.

There is no way to tell how much of the dieldrin in the rivers came from agriculture and how much from wood preservation.


4 HOME NEWS

The Day in Politics: Water pollution debate

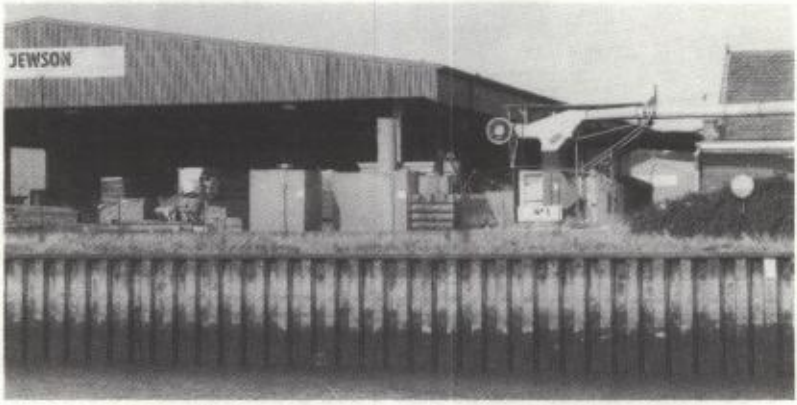
Ridley derided over clean rivers claim

Mr Roberts said the Conser- ... had put investment fur- ... of sewage discharge

△ **Report on the water pollution debate** (*The Guardian*, 5 November 1988).

Spills from timber treatment plants

- Ohio 1970. Major spill of PCP into the river. Two million fish killed (Wilkinson 1979).
- UK 1975. 200 gallons of 3 per cent CCA solution lost to stream and pond. Rentokil cleaned up by draining pond into waste container and removing 20 tons of soil (Wilkinson 1979).
- 'Major inputs of TBT to freshwaters may also arise from spills of timber treatment formulations which often contain TBT and usually dieldrin and pentachlorophenol. Spills from processing plants have been monitored on several occasions and a detailed study was carried out after a spill contaminated a 5km stretch of the Newmill Channel in Kent. There was a major fish mortality and all macroinvertebrates except oligochaetes, chironomids and elminth beetles were killed . . . The incident was one of five major spills at timber treatment facilities brought to MAFF's attention in the last two years (Waldock, Waite and Thain, 1987).



△ **The location of the Protim pretreatment plant at this timber yard in Colchester, Essex, is fairly typical – down in the docks, beside the river. Careful management is needed to ensure that the oyster fisheries of the nearby Colne and Blackwater Estuaries, already damaged by TBTO from marine paints, run no extra risk from a spill of wood preservatives.**

Disposal of treated wood can speed up the release of wood preservatives into the environment. In Germany wood treated with PCP is treated as toxic waste and can only be buried in a licensed tip (*Stern* 1984). In Canada treated timber has had to be wrapped and sealed for transport and disposal. Even the relatively stable CCA gradually leaches out into water.

In September 1985, 15 people including three children, were taken to hospital after copper, chrome and arsenic fumes from burning demolition timber swept through three villages near Selby in Yorkshire. Thirty tons of timber taken from a power station cooling tower had been dumped in a quarry with no protection from fire (*Yorkshire Post*, 30 September 1985).

HOME NEWS

Poison fear as dump blazes

THE population of three villages near Selby was told to stay indoors last night when fire in a quarry used as a dump sent clouds of poisonous fumes into the atmosphere.

[illegible]

A pall of smoke blots out the scene as firemen fight the blaze at the bottom of the quarry.

Treated timber cannot be disposed of safely by incineration. It must be buried with care so that it can neither burn nor release its pesticides into ground water.

The UCATT survey (see Section 6) found that the most common waste disposal methods for treated timber were by skip and burning. One respondent reported that surplus wood preservatives were poured down the drain.

Shavings and sawdust from treated wood can cause illness or death in treated animals. Dieldrin-contaminated litter is thought to have distorted animal toxicology tests by giving the animals cancer. The BWPA has a code of practice for the disposal of this waste.

The Food and Environment Protection Act makes it an offence to use pesticides in such a way as to endanger people, wildlife or the environment. The government approves chemicals which present severe hazards in all three categories. Despite complaints of ill health at work and in the community, all the approved chemicals are officially

△ **Exeter, November 1988: Empty drums of dampcourse and wood preservative fluids left in an open skip in the street. *Left*: Close-up of the label. Profex contains lindane, TBTO and solvent. UCATT survey showed that the skip is the most common waste disposal method.**

'safe' – except when it comes to bats. Bats die if they roost in lofts treated with dieldrin, lindane, pentachlophenol or TBTO. Under the Wildlife and Countryside Act 1981 heavy fines can be levied for using these chemicals where bats roost.

The Oxfam/Pesticides Action Network 'Dirty Dozen' list

1. **Camphechlor* (Toxaphene)**
2. **Chlordane* (Heptachlor)**
3. **Chlordimeform**
4. **Ethylene dibromide**
5. **DDT***
6. **Dibromochloropropane (DBCP)**
7. **Aldrin, Dieldrin*, Endrin (the 'drins')**
8. **Lindane***
9. **Ethyl parathion (Parathion)**
10. **Paraquat**
11. **Pentacholorphenol***
12. **2,4,5-T (Trichlorophenoxyacetic acid)**

* ***These chemicals have all been used as wood preservatives***

Action

Oxfam and other agencies in the worldwide Pesticides Action Network have put together a list of pesticides they want governments to ban immediately. See box. Those used as wood preservatives are marked with an asterisk.

WOOD PRESERVATION

Issued by The British Wood Preserving Association

TEL: 01-837 8217

150 Southampton Row, London, WC1B 5AL

RECOMMENDATIONS GOVERNING THE USE OF WOOD WASTE AS ANIMAL LITTER

1. All wood preservatives marketed in the U.K. are covered by the Pesticides Safety Precautions Scheme, and recommendations for their safe use appear on the product labels and data sheets.

   Wood preservatives in wood waste used as animal litter have recently been implicated in animal deaths. The aim of these recommendations is to prevent any future occurrences by ensuring that wood waste containing wood preservatives applied in the U.K. are not supplied for animal litter and bedding.

2. ACTION BY WOOD PRESERVATIVE MANUFACTURERS

2.1 Clear instructions must be given to woodworking firms on the need to avoid post-treatment machining as far as possible and the necessity for safe disposal of any contaminated waste.

3. ACTION BY WOODWORKING COMPANIES

3.1 All machining, forming and finishing should take place before preservative treatment. Post-treatment machining produces toxic waste, and any such waste should be separately collected and disposed of.

3.2 Wood waste used to mop up spills of preservative fluid must be disposed of as toxic waste.

3.3 If there is any likelihood of contamination of untreated wood waste by either accidental or deliberate addition of treated material, the entire waste should be considered contaminated.

3.4 Only wood waste from untreated material should be supplied for use as animal bedding or litter.

3.5 The receiver of contaminated or suspect material must be notified that the waste is contaminated with wood preservative.

4. ACTION BY WOOD WASTE CONTRACTORS

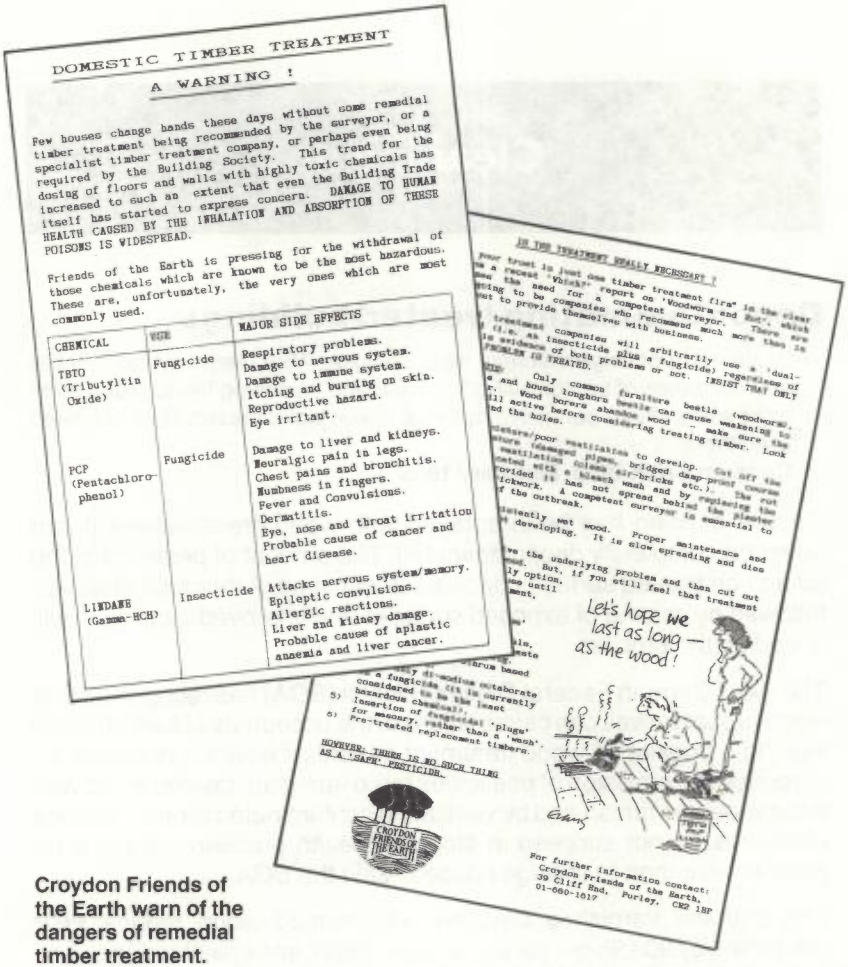
4.1 Only wood waste from untreated wood should be supplied for use as animal bedding or litter. Contaminated or suspect material should on no account be supplied for this use.

4.2 In cases of doubt the wood waste contractor should clarify with the supplier that the waste was collected according to the above recommendations and does not contain treated waste.

August 1978

These recommendations were drawn up by a Working Party consisting of representatives of the British Woodworking Federation, the British Wood Preserving Association, Princes Risborough Laboratory, the Timber Research and Development Association, the Timber Trade Federation, and the Processed Wood Chip, Sawdust and Wood Flour Association.

△ **BWPA recommendations on the disposal of preservative-treated wood waste.**



DOMESTIC TIMBER TREATMENT

A WARNING !

Few houses change hands these days without some remedial timber treatment being recommended by the surveyor, or a specialist timber treatment company, or perhaps even being required by the Building Society. This trend for the dosing of floors and walls with highly toxic chemicals has increased to such an extent that even the Building Trade itself has started to express concern. DAMAGE TO HUMAN HEALTH CAUSED BY THE INHALATION AND ABSORPTION OF THESE POISONS IS WIDESPREAD.

Friends of the Earth is pressing for the withdrawal of those chemicals which are known to be the most hazardous. These are, unfortunately, the very ones which are most commonly used.

CHEMICAL	USE	MAJOR SIDE EFFECTS
TBTO (Tributyltin Oxide)	Fungicide	Respiratory problems. Damage to nervous system. Damage to immune system. Itching and burning on skin. Reproductive hazard. Eye irritant.
PCP (Pentachloro-phenol)	Fungicide	Damage to liver and kidneys. Neuralgic pain in legs. Chest pains and bronchitis. Numbness in fingers. Fever and Convulsions. Dermatitis. Eye, nose and throat irritation Probable cause of cancer and heart disease.
LINDANE (Gamma-HCH)	Insecticide	Attacks nervous system/memory. Epileptic convulsions. Allergic reactions. Liver and kidney damage. Probable cause of aplastic anaemia and liver cancer.

IS YOUR TREATMENT REALLY NECESSARY ?

Let's hope we last as long — as the wood!

CROYDON FRIENDS OF THE EARTH

For further information contact:
Croydon Friends of the Earth,
39 Cliff Rd. Purley. CR2 1BP
01-660-1617

Croydon Friends of the Earth warn of the dangers of remedial timber treatment.

In their local community, Croydon Friends of the Earth wrote a leaflet on the dangers of remedial treatment and put it through the letterboxes of houses with estate agents signs outside. They hoped that house-buyers would ask whether pesticide spraying demanded by building societies was really necessary or at least insist on the safest methods.

By changing attitudes in this way the heavy burden of toxic wood preservatives being loaded onto the environment can be dramatically reduced. Whereas a 30-year 'guarantee' of timber treatment is now thought of as a valuable document it may soon become a thing to be hidden from prospective purchasers seeking a pesticide-free home.

8

Cleaning up

Decontaminating treated buildings

> 'In the town of Engelskirchen, near Cologne, West Germany, tests of the dust in homes of persons who have suffered poisoning found dioxin even eight years after a pentachlorophenol-based wood preservative had been used there'.
> **Consum Critik-BBU, February 1985**

Once a building has been sprayed with wood preservatives it can never be completely decontaminated. The amount of pesticide in the air and on treated surfaces decreases with time. A thorough clean-up followed by sealing of exposed surfaces and improved ventilation will speed up the process.

The West German Federal Office of Health (BGA) has recognised that wood preservatives can cause illness in the occupants of treated buildings. In a booklet on wood treatment hazards it advised victims to try to reduce the emission of pesticides by covering the treated wood with impermeable varnish and by ventilating contaminated rooms. 'If these measures do not succeed in stopping health problems, there is no other course than to change houses,' said the BGA.

Polyurethane varnishes brushed onto treated wood reduce PCP emissions by 90–95 per cent (Cammer 1982); latex paint reduces it by 84 per cent (Ingram 1981). On the other hand, ordinary gloss paint does not hold PCP in the wood; it actually dissolves it out into the paint film (see Section 3). But in most cases the problem cannot be solved by a lick of paint.

Belgian scientists examined emissions of PCP and other wood preservatives and concluded:

> 'The deterioration of severely contaminated houses presents many practical problems. PCP is everywhere present in the house and distributed over the whole contents of it. Only in the case where a limited amount of preservative has been used, and providing the woodwork is easily accessible, can [painting or varnishing] be an efficient countermeasure. If this is impos-

sible the only remedy is to remove the emission source. This means removing all treated wood and cleaning the house thoroughly with soda soap.'
Janssens and Schepens 1985

Dust – learning the hard way

Cornish schools

The advice quoted so far misses out one important operation – removal of all dust from the structure by vacuum cleaning. This should of course be the first stage of any remedial treatment, as pointed out in Section 6. The Cornwall County Council Specification requires vacuuming before and after the job, and a thorough wet cleansing of all surfaces throughout the building. 'Our main worry is dust,' admitted Cornwall's Deputy County Architect Peter Richardson. 'It is a vehicle for mobilising dry chemical into the air. We discovered this by accident when staff were removing debris with dustpan and brush in the roof space of a treated school. One of them developed the same symptoms as the children had two months earlier when we had to close the building – headache, nausea, irritation of the membranes of nose, lips and eyes.'

△ **Carnkie County Primary School, one of two Cornish schools evacuated after children and staff were made ill by timber treatment**

Previously dieldrin had been suspected as the culprit but tests on swabs from floors and walls had not found it. Now the search was on again, this time for TBTO. Its known potency as an acute irritant was a better match for what happened to the staff and pupils. 'At the time everyone was yelling dieldrin, but I think the wrong chemical got the blame,' said Peter Richardson.

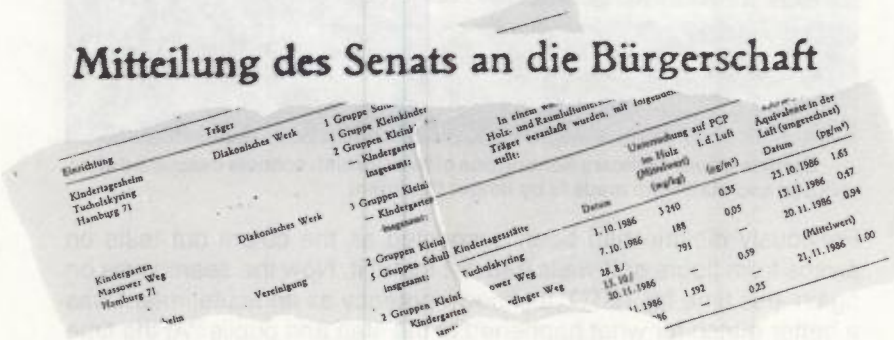
The public analyst from Exeter found TBTO in dust on horizontal surfaces such as the chalkboard rails. When the same thing happened to staff in a second school, the Cornwall architects knew that the clean-up was the key to their specification. 'I have had two schools closed. It mustn't happen again or my head is on the block', said Peter Richardson. 'But I think we have won this particular battle in Cornwall'.

An old people's home

Contaminated dust was a crucial factor in the epidemic of wood preservative poisoning which hit staff and residents at an old people's home in Essex in the autumn of 1987. The 90-year old building at Westcliff-on-Sea was treated for woodworm and dry rot between 18 and 24 September. The 63 residents were not evacuated while walls were drilled and injected with dry rot fluid and timber was sprayed for woodworm.

People began to complain of minor symptoms on the first day but some time passed before staff realised they were in the middle of a disaster area. Several of the staff are convinced that the deaths of two old people at that time can be blamed on chemicals. Post-mortems found 'no connection' between chemicals and cause of death. Although pneumonia was given as the cause of death, the reasons for people developing pneumonia are rarely investigated.

Because of controversy surrounding the deaths and legal actions being taken by NALGO and NUPE on behalf of eight members of staff, it is impossible to give detailed descriptions of individual cases. One person suffered an epileptic-type fit (which made their body go totally rigid) and was taken into intensive care. Months later two people in their early fifties were still suffering 'constant malaise, chesty breathlessness and weakness'. Another had weak legs, and poor circulation. 'He went from a very healthy man to a physical wreck – an old man. His GP said it was a virus.'


Mitteilung des Senats an die Bürgerschaft

△ **Germany, October 1987: Hamburg Council reports on the closure of four nursery schools because of contamination by PCP and dioxins.**

Old people's home, Essex

Lindane concentrations in dust (wipe samples)

Location of sample	Concentration (parts per million by weight)
2nd floor, west end bathroom, pendant ceiling electric light fitting.	120
2nd floor west end bathroom frame over double cupboard door	2,400
2nd floor west end bathroom, top of entrance door	540
2nd floor, central toilet, inside metal case of wall light switch	440
1st floor, east bathroom, top of overhead plastic pipe	9,200
1st floor, central bathroom, top of overhead plastic pipe	9,200
Ground floor, district nurse's office, internal window ledge	400
Ground floor, district nurse's office, hot water pipes overhead	140
Room 5, picture rail	20
Room 8, picture rail	25
Room 18, picture rail	40
Ground floor laundry. Junction box to right of window opening onto courtyard	15

Local factory inspector Gillian McCutcheon did a commendable job in sorting out what had gone wrong and specifying clean-up procedures. On her recommendation an HSE occupational hygienist was brought in to collect wipe samples and bulk samples. Laboratory analysis found lindane at high levels in dust and debris throughout the building.

The factory inspector's report provides an important supplement to the Cornwall specification – and shows up the inadequacy of the guidance note which HSE devised at national level (see Section 6: Hazards at work). Below we reproduce some of the main points:

- It is apparent that lindane is likely to be present in the air whenever the dust is disturbed.
- It is impossible to say whether the ill-health experienced by both staff and patients was directly due to lindane in the atmosphere, as air samples were not taken immediately after the wood treatment was done, but the fact that symptoms were reported long after the volatile elements of the treatment should have dispersed indicates that the lindane-contaminated dust may have been a factor.
- In the light of this [the building] should be thoroughly de-contaminated. This requires the removal of dust on all surfaces. Carpets and soft furnishings should be shampooed, and curtains and bedclothes washed. Hard surfaces should be thoroughly cleaned by wiping with damp cloths, and the cloths should be collected and disposed of in a safe manner. Dusty cleaning methods – eg sweeping – should be avoided, but if this is not possible suitable respiratory protection should be worn – eg a minimum standard of hald-mask or ori-nasal respirator fitted with both dust and type CC cartridges. Other people should not be allowed to enter the area being cleaned unless they are similarly protected.
- The method of work of wood treatment contractors should also be considered, and detailed method statements should be obtained from contractors before the work starts. The method statement should include the following considerations:

  1. They should avoid the raising of dust contaminated with wood treatment chemicals. This can be achieved by removing all dust from the area to be sprayed before the treatment commences, but after walls etc have been drilled.

This precaution should be taken for all such works, but where the resident population is particularly susceptible to fumes (eg the elderly, the sick and the very young), you should consider evacuating all or part of the building for the duration of the work. If the building remains occupied, secure barriers should be erected before work starts to prevent the access of residents and staff to the area being treated. If plastic sheeting is likely to be damaged, plywood partitions should be used. Staff should be instructed not to enter the area being treated.

2. When walls are drilled for injection of dry-rot chemicals, care should be taken that walls into living areas are not breached. A thorough inspection of the other side of the drilled wall and the sealing of any breaches should be carried out before the injection of chemicals. At [the Home] the wall to the stairway between the first and second floors was punctured and fragments of lindane-contaminated plaster were found on the living area side.

3. Containers used for pesticides should be properly labelled, including those which are used for the diluted chemicals. The presence of lindane in the plaster sample mentioned at 2 above implies that the walls were injected with Wykamol Plus (the wood treatment) rather than Murasol 20 as, according to the manufacturer, Murasol 20 does not contain lindane.

4. Adequate supervision of contractors should be provided to ensure that the procedures laid down in the method statement are followed.

▲ The Council should ensure that members of staff are kept informed of what is happening at their place of work. I was concerned that the staff . . . knew so little of what had been done. While I appreciate that the contractor reports to the appropriate department at County Hall, I feel that it is important to involve the staff at premises where work is to be done so that they know what to expect and what precautions are necessary.

Fungal debris after ▷ timber treatment spraying at Birkbeck College shows extent of failure of clean-up. Unions refused to return to their workplace until a full clean-up operation was carried out including disposal of contaminated items

Vacuum cleaning only

The London Hazards Centre believes that industrial vacuum cleaners with Type-H, high efficiency exhaust filters should always be used for this kind of clean-up, however inconvenient it may be to obtain them. Dusty methods should not be an option. Sweeping or hoovering with a normal domestic vacuum cleaner can make the situation worse by raising levels of dust.

Ventilation

Most modern buildings are too 'tight' to give good rates of air changes. Everyday pollutants such as the formaldehyde gas emitted by chipboard furniture and cavity foam are not diluted sufficiently – let alone the more toxic pesticides. Higher ventilation rates cost money and extra heating. Better insulation (vermiculite in preference to irritant, resin-coated mineral fibre) can enable people to afford more ventilation for the same fuel bill. This will also help prevent excessive condensation, which leads to mould growth and attendant health hazards, and to timber decay.

Small ventilation systems with flexible ducting and built-in heat-recovery systems may also be effective and economic. The exhaust should discharge to the outside air, not into a roof space, and there should be no recycling of extracted air.

Entry hatches into treated roof spaces should close onto rubber sealing strips. Cracks in plaster ceilings should be filled and the surface painted with at least two coats of thick emulsion. The concentration of pesticide in the air below a treated loft is likely to be about one tenth the level in the roof space. (Dobbs and Williams 1983).

Clothes and clothes storage

Clothing cupboards should be vacuumed out, and clothes vacuumed and washed or dry cleaned separately from uncontaminated items. As you cannot do this all at once, you could bag them all up and work through the cleaning in batches.

Cleaning up water

If the storage tank in the treated space was not properly sealed during spraying and the cover was not left in place, drain down and refill tank twice, wiping the inner surfaces and removing all deposits each time.

Getting chemicals out of the body

Toxicologists at the University of Antwerp found that patients who took 'countermeasures' rapidly reduced the amount of PCP in their bodies. Countermeasures included removing treated wood, leaving home, avoiding treated areas, and painting the ceiling with latex emulsion.

> 'When countermeasures were introduced, the PCP serum level went down below 30 micrograms per litre and the PCP level in urine went, in most cases, lower than four micrograms per litre. These are the exact concentrations which were also found in patients with no or hardly any health complaints.'
> **Janssens and Schepens 1985**

PCP clears from the body quite rapidly when exposure stops. Lindane clears fast from the blood but it may be stored in the body's fat where it remains for a long time (see Section 4). Anyone experiencing health problems which they think may be caused by exposure to wood preservatives should try to get away from the contaminated home or workplace for at least a week to see if symptoms improve. But don't panic – it may be nothing to do with wood preservatives. Take only cleaned clothes and possessions. Since even the careful countermeasures may lead to increased exposures, anyone feeling ill should stay away from this work.

Healthfood diets may help your body get rid of toxic substances. Large doses of Vitamin C, orally or intravenously are also claimed to be effective. Vitamin B does not help. Sudden heavy exercising is not good as it can release high levels of toxins stored in the fat into the blood.

Information on therapies can be found in *The Residues Report* (Lashford 1988).

Ask your doctor to arrange for blood, urine or fatty tissue tests, as appropriate, for all the chemicals suspected of causing your illness – as soon as possible after exposure. If you were exposed at work your GP can refer you to the Employment Medical Advisory Service (EMAS – address in local phone book, or ask local office of HSE). Or you can make an appointment yourself direct with the EMAS office.

Report any illness you think was caused by wood preservatives at work or in the home. Do it in writing if you can, to the local authority's environmental health department and councillors, to the HSE, BWPA Ministers, MPs and anyone else you think may need convincing that 'Government-approved' pesticides are not always perfectly safe.

9

Demands

1. Control the chemicals

Ban immediately:

- PCP, lindane and TBTO.
- Solvent-based formulations.
- Dual-purpose formulations for remedial treatments.

Phase out:

- Organic insecticides and fungicides.
- Arsenic formulations for pretreatment, with strict controls, as in West Germany, in the meantime.

Phase in:

- The inorganic boron compounds as the only approved wood preservatives for remedial treatment and pretreatment.
- Rewrite outdated British Standards to include environmentally acceptable chemicals and types of formulation, such as boron rods.

2. Control the 'approvers'

- Take the control of pesticide approvals away from the Ministry of Agriculture, Fisheries and Food and transfer it to the Health and Safety Executive.
- End official secrecy in the approvals process. Open it up to public scrutiny and active participation.

3. Control the operators

- Introduce licensing of all remedial treatment operators and pre-treatment plants, as in the asbestos removal industry, but with proper enforcement.
- Introduce a mandatory code of practice for remedial work with the status of an approved code under the *Health and Safety at Work Act*. The code would lay down mandatory qualifications for inspectors, surveyors, managers and sprayers and specify non-chemical as well as chemical methods.

4. Control the cowboys

- Develop a mandatory quality control scheme, perhaps under the British Standards Institution.
- Restrict remedial treatment work to firms able to meet the standards in the code.
- Registration of remedial firms to be independent of BSI product approval.
- Investigate all complaints with a view to prosecution of dangerous contractors.

5. Control the building societies and banks

- Stop them demanding absurd guarantees.
- Introduce instead a standard inspection certificate covering the essentials of protection for structural timbers – a 'certificate of timber integrity'. Inspection to cover rising damp, penetrating damp, leaks in fabric and plumbing, ventilation of timber and any wood-boring insect infestations which threaten structural strength.

6. Control hazards to workers

- Fund the HSE as though it could have an important role.
- Recruit and train the extra inspectors needed to enforce the old legislation, such as the *Construction Regulations* together with the new laws – *Control of Pesticides Regulations* and *Control of Substances Hazardous to Health Regulations*.
- Give the local authorities enough money to repair the cuts in Environmental Health Departments.

- Publish HSE research on worker exposure and indoor pollution from wood preservatives immediately – before it gets lost in the MAFF committee system.
- Begin real research into the health and long-term mortality of workers using wood preservatives. Trade unions to be involved in design and supervision of the study.
- Make it a condition of the new licensing system that all registered firms must give workers information produced by the trade unions on their rights to join unions and be involved in controlling work hazards.

Tommy Harte/BRUSH

△ **A Birmingham fork lift truck driver shifts wood preservative-treated timbers**

10

Directory of chemicals

Explanations of terms

Acute: Immediately detectable or short-term effects.

Chronic: Effects in, or only detectable over, the long term. 'Acute' and 'chronic' don't imply anything about the severity of effects.

LD50: Lethal dose 50 per cent. The amount of a chemical sufficient to kill half of a group of laboratory animals. A rough guide to toxic effects. Measured in milligrams of dose per kilogram of body weight, mg/kg. 10mg/kg is more poisonous than 100kg/mg.

Guidelines for LD50 values in relation to toxicity to humans		
oral LD50 (mg/kg)	**level of toxicity**	**fatal dose for an 'average adult'**
less than 5	super-toxic	a few drops
5–50	extremely toxic	up to 1 teaspoon
50–500	highly toxic	up to 2 tablespoons
500–5,000	moderately toxic	1–12 ounces
5,000–15,000	slightly toxic	12 ounces to ½ gallon

Source: *Pesticides don't know when to stop killing*, (kit) Pesticide Education and Action Project, San Francisco, 1985.

mg/m^3: Milligrams of a chemical per cubic metre of air: unit for measuring exposure. One cubic metre is very roughly the volume of air breathed by an adult in one hour during moderate exercise.

Carcinogen(icity): Able to cause cancer.

Mutagen(icity): Able to damage the genes.

Teratogen(icity): Able to cause abnormal development of the foetus, eg the drug thalidomide.

ACGIH: American Conference of Government Industrial Hygienists. US voluntary agency which draw up exposure limits for chemicals in the air and in workers' bodies – Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs).

NIOSH: National Institute for Occupational Safety and Health, United States. Government agency responsible for occupational health and safety research and investigation.

OSHA: Occupational Safety and Health Administration. US government agency responsible for enforcing health and safety laws in the workplace.

Pesticides 1988 : UK government list of pesticides, including wood preservatives, approved for use in the UK. Wood preservatives may be approved for household, professional or industrial use. Approval for household use includes the other two categories; approval for professional use includes industrial approval.

Metric units

Reading from top to bottom, each unit is one-thousandth of the unit above it.

Length
metre (m)
millimetre (mm)

Volume
cubic metre m^3
litre (l)
millilitre(ml) or cubic centimetre (cc)
microlitre (μl)
nanolitre (nl)

Weight (mass)
kilogram (kg)
gram (g)
milligram (mg)
microgram (μg)
nanogram (ng)

Chemical name(s): **Acypetacs zinc**
Description: Recently introduced to its products by Cuprinol. There seem to be no significant data publicly available on this chemical.

Chemical group: **Alkylammonium** or **Quarternary ammonium compounds (AAC)**
Chemical name(s): **Alkyldimethylbenzyl ammonium chloride, Dialkyldimethyl ammonium chloride** and **Alkyldimethylbenzyl ammonium acetate**.
Description: Found in DIY, professional and industrial products from 19 manufacturers. The chemical by itself is a clear liquid.
Summary of toxicity: Highly toxic: oral-rat LD50 is 280 mg/kg. Severe eye irritant.

Chemical name(s): **Ammonium bifluoride**: see fluorides

Chemical name(s): **Anthracene oil**
Description: Used to be found with creosote in some Solignum products. *Pesticides 1988* shows these products now only contain creosote but no information on withdrawal.
Summary of toxicity: See Creosote

Chemical group: **Arsenic compounds** (See also CCA)
Description: Most are colourless or white powders or crystals without distinctive smell or taste. Some less common compounds are liquids. Arsenic is used in agricultural pesticides (not approved in the UK), wood preservatives, doping agents in transistors and integrated circuits; lasers (gallium arsenide) and sealants. It is an unwanted contaminant of metal ores especially lead, zinc, tin and residues from their smelting. Factory inspectors found the highest exposures in factories manufacturing arsenic compounds, wood preservatives and sheep dips. High concentrations of dust were frequently found in tipping, bagging and weighing (Factory Inspectorate 1974). The UK control limit was held at twice the current level for two years during 'consideration of the economic impact on the industry' of setting a safer limit (HSC News release, 25 Oct 1988).
Summary of toxicity: Deadly poison which accumulates in the body and remains long after exposure ends. Entry by inhalation or swallowing.
Acute toxicity: Acute effects include irritation of skin, eyes and respiratory system. Arsenic causes itching of skin, dermatitis and loss of pigment. Acute poisoning causes irritation of the digestive system, nausea, vomiting, diarrhoea and, in later stages, blood in vomit and excrement, sweating, cramps, coma and sometimes death.
Chronic toxicity: Chronic poisoning can affect most of the body's systems causing a wide range of complaints including skin troubles, digestive disorders, loss of appetite, lethargy, apathy, damage to the brain causing slowness and intellectual loss, and damage to peripheral nerves, causing paralysis or loss of feeling in hands, arms, feet and legs. In Germany, cirrhosis of the liver was a recognised occupational disease among vineyard workers. Although the arsenical insecticide were banned in Germany in 1942, cases continued into the 1950s, partly due to the effects of damage in earlier years and partly due to the persistent effect of arsenic stored in the body (Lutrach 1972). Cirrhosis of the liver was increased among Swedish copper smelters

exposed to arsenic; the study also found five times the expected rate of cardiovascular (heart) disease (*British Journal of Industrial Medicine*1978).

Cancer hazard: High rates of cancer of the skin, lung, liver and lymphatic system (eg. Hodgkin's disease) have been found in workers in many trades exposed to arsenic. Increased leukaemia as well as lung cancer was found in the Swedish copper smelters (reference above). Skin cancer in persons exposed to arsenic is a prescribed disease in the UK.

Reproductive hazard: Arsenic compunds are toxic to the foetus and have been recognised as teratogens by the US Environmental Protection Agency.

Fire/disaster: Contact with acid will release arsine gas. Liquid solutions and sludges can release it in contact with metals, smelter residues in contact with water.

Control: UK Control limit (1988): 0.2mg/m^3; (1 Jan 1989): 0.1mg/m^3; NIOSH: 0.002mg/m^3, cancer causing; ACGIH: 0.2mg/m^3, suspected cancer agent; Sweden: 0.03mg/m^3, cancer causing, 0.01mg/m^3 for new facilties (since 1987).

Chemical name(s): **Arsenic pentoxide, arsenic oxide**

Description: White amorphous solid

Summary of toxicity: Deadly poison – oral LD50 8mg/kg of body weight – a few drops could kill. See arsenic compounds.

Chemical name(s): **Arsenic trioxide, white arsenic**

Description: Rhombic, efflorescent crystals

Summary of toxicity: See arsenic compounds

Cancer hazard: Experimental and human cancer agent

Reproductive hazard: Experimental teratogen

Chemical name(s): **Azaconazole**

Description: Recently introduced, and found in a few Janssen Pharmaceutical wood preservatives approved for professional use.

Summary of toxicity: Few data available. Temporary effects on the liver observed in animal experiments.

Chemical name(s): **Boliden salt, chromated zinc arsenate**

Description: See arsenic compounds and chrome compounds

Summary of toxicity: Very poisonoous to swallow or breathe.

Cancer hazard: Experimental carcinogen

Chemical group: **Boron compounds**

Chemical name(s): **Boron oxide, boric (boracic) acid, borax, sodium tetraborate, Borester. 'Timbor' is disodium octaborate tetrahydrate.**

Description: Most boron fungicides and insecticides are white odourless powders or crystals. Wood preservative formulations include water-soluble rods and pellets for insertion into drilled spaces. As a pretreatment wood preservative of green timber, Timbor is one of the least hazardous methods of preservation. 'Timborised' wood is approved under by-laws requiring all roof timber to be pretreated in the scheduled areas of house longhorn beetle activity (mostly in Surrey). Sawmill and joinery workers have complained about irritation from the increased amount of dust given off when treated wood is machined. Good exhaust ventilation is required on woodworking machinery, especially sanders (*Factories Act 1960*, S63). Hand protection should prevent abrasion and absorption when handling treated timber.

Summary of toxicity: The familiarity of these materials has often led to underestimates of their

toxicity. Medical use of boric acid solutions on burns and wounds has resulted in serious poisoning absorption. They readily penetrate broken skin but absorption through intact skin is slight and not thought to be a problem – though Sax in *Dangerous Properties of Industrial Materials* warns against 'careless use of borax as a skin cleaner'. Organic boron compounds (boron esters) such as borester are more toxic than inorganic boron compounds and like all organic metal compounds should be treated as nerve poisons.

Acute toxicity: Fatalities have been caused by accidental swallowing. Five or six grams of boric acid can kill a child, 10-25 grams an adult. Target organs are the brain, liver and kidneys but effects may be more widespread, including the lungs. A fall in body temperature is reported in humans and animals and there may be a bright rash all over the body.

Chronic toxicity: Little is known. Boron accumulates in brain, liver and body fat and is stored in the bones. Workers inhaling boric acid at high levels have suffered damage to the nervous system with complex changes in body chemicals, including enzymes and hormones, and allergic effects.

Reproductive hazard: Animal experiments show that boric acid affects reproduction in females, with sterility at large doses. It can cross the placenta and therefore may also affect the foetus.

Control: UK recommended limits (1988): Borax 5mg/m^3; sodium tetraborate 1mg/m^3; boron oxide 10mg/m^3. Where treated wood is worked, the Hazards Centre recommends a five times reduction in control limits for wood dusts. At all times exposure should be kept as low as practicable.

Chemical name(s): **Carbendazim, MBC, BCM, carbendazol**

Description: Found in numerous fungicidal wood preservatives most of which are approved for household use. May also be found in combination with other fungicides including Lindane (in ICI's Gammalex liquid) and Maneb (in several products).

Summary of toxicity: Found to cause genetic damage in experimental animals.

Chemical group: **CCA, copper/chrome/arsenic**

Chemical name(s): **Copper sulphate sodium dichromate, and arsenic pentoxide**

Description: Pre-treatment products, most appear as white fluffy salts on the surface of treated timber. CCAs leach out of exterior treated wood into the ground or sea. In Australia, CCA-treated timber which is to be used for children's playgrounds has to be 'left for six weeks after efflorescence has ceased and then scrubbed and hosed before installation so that there is no likelihood of a health hazard' (Wilkinson 1979). In Germany, 'CCAs are not allowed for use where people and animals can come into contact with them' (Wilkinson 1979).

Summary of toxicity: See also copper compounds, chrome compounds, arsenic compounds.

Fire/disaster: Burning CCAs cause fume and ash hazards. Rentokil's data sheet on CCA-containing Celcure AP advises: 'In the event of fire, wear self-con-

tained breathing apparatus'.

Chemical name(s): **Celcure**

Description: Group of Rentokil products containing copper, chromates and sometimes arsenic: see entries for these chemicals.

Chemical group: **Chlorinated hydrocarbon insecticides**

Chemical name(s): Usually **Dieldrin, Lindane** or **Chlorinated naphthalene:** see separate entries for these chemicals.

Chemical group: **Chlorinated naphthalenes**

Chemical name(s): **Trichloro-, tetrachloro-, pentachloro- and hexachloro-naphthalene.**

Description: Chlorinated naphthalenes are produced by chlorination of the aromatic hydrocarbon naphthalene (moth balls) to give compounds ranging from liquid to increasingly waxy as chlorination increases. Commercial products may be a mixture of all four substances. Chlorinated naphthalenes are found in insecticides and wood preservatives.

Summary of toxicity: Extremely toxic by all routes, including skin absorption. They are irritant and skin exposure to fumes or solids causes the disfiguring and persistent skin condition, chloracne. They are also photosensitisers – causing reddening and rashes when the skin is exposed to sunlight.

Chronic toxicity: The liver is the main target organ. Exposed workers get toxic hepatitis and, from the more highly chlorinated compounds, acute yellow atrophy of the liver. Chronic poisoning can cause permanent damage or death.

Cancer hazard: Chlorinated naphthalenes are confirmed cancer agents.

Control: UK Recommended limits (all with warning of skin absorption):
trichloro-: 5mg/m^3
tetrachloro-: 2mg/m^3
pentachloro-: 0.5mg/m^3
hexachloro-: 0.2mg/m^3
These limits take no account of the cancer risk.

Chemical name(s): **5-Chloro-2-methyl-4-isothiazolin-3-one, Kathon**

Description: Found in industrial products from four manufacturers, including pre-treatment products.

Summary of toxicity: Recognised cause of allergic dermatitis – which is 'unfortunate' since another application is a preservative in cosmetics! Some evidence of ability to cause genetic damage.

Chemical group: **Chrome compounds** (see also CCA)

Description: A vast range of substances, found in many forms, and as common contaminants and pollutants throughout industry.

Summary of toxicity: The worst hazards are from Chrome 6 (Chrome VI or hexavalent chrome) and its salts – chromates and dichromates. These cause allergic skin rashes in many occupations and increase the risk of lung cancer in several trades.

Acute toxicity: Toxic by all routes but the main risk of acute poisoning is by swallowing or inhalation.

Chronic toxicity: Dusts, liquids and vapours are irritants and corrosive to the skin and mucous membranes. Chromic acid and its salts cause chrome ulcers – deep, slow-healing holes in the skin. Ulceration in the nose can penetrate the nasal septum (the wall between the nostrils). Chrome ulceration is a prescribed disease. Allergy to chromates is one of the most common causes of occupational

dermatitis. It affects painters, especially when rubbing down paints containing chromates; people using corrosion inhibitors; and many construction trades exposed to cement dust. It must be one of the first materials to be investigated by patch testing when an occupational skin rash is suspected.

Cancer hazard: Increased lung cancer has been found in chrome platers (chromic acid) and pigment makers (lead chromates). Chrome is the main suspect among several in welding fume which may account for the 50 percent higher risk of lung cancer among welders than for the general population. Chrome is also the most likely cause of stomach cancer in cement makers.

Control: UK recommended limits:
Chrome (II) compounds: 0.5mg/m^3
Chrome (III) compounds: 0.5mg/m^3
Chrome (VI) compounds: 0.05mg/m^3
Analysis for Chrome (VI) must be done quickly as it ages rapidly, or it must be fixed (by chelation or precipitation as some other salt). The US government agency NIOSH has recommended a standard 50 times stricter than the UK standard: 0.001mg/m^3, measured as Chrome (VI).

Chemical group: **Copper compounds** (see also CCA)

Summary of toxicity: Inhalation of dust, fumes and mists of copper salts can result in nasal congestion, ulceration of the nasal passages, leading in some cases to perforation of the nasal septum. The salts may irritate the skin, causing a red, itchy dermatitis, and sometimes cause conjunctivitis, ulceration and cloudiness of the cornea of the eye. Dermatitis caused by any external agent capable of irritating the skin is a prescribed disease. The metal itself, though poisonous, seems to cause few health problems unless heated to produce fumes. Inhaling these can give you metal fume fever (easily mistaken for an attack of flu), gastric pains and cramps. Animals exposed to copper dust have suffered injury to blood, lungs and liver but the only serious risk in humans appears to be from the severe neurological damage to people with the very rare Wilson's disease.

Control: UK Recommended limits:
Copper fume: 0.2mg/m^3
Copper dusts and mists: 1.0mg/m^3

Chemical name(s): **Copper 8 (copper 8 quinolate)**

Description: Condensation product of copper 8 quinolate and nickel 2-ethylhexoate. Yellow-brown solid made soluble in organic solvents by nickel 2-ethylhexoate to give a green liquid. Approved for use on wood which comes into contact with food (Wilkinson 1979).

Chemical name(s): **Copper naphthenate**

Description: Fungicide. Occurs in DIY-approved products. Flammable solid used in solution. First used in Scandinavia in the 1920s in a Cuprinol product made from soluble copper salts and naphthenic acid to give a dark green waxy surface which prevents painting.

Summary of toxicity: Severe skin and eye irritant. Moderate amounts applied to the skin killed laboratory rabbits. UK Army Environmental Hygiene Agency found it toxic enough to recommend protective eyewear, gloves, overalls and good ventilation

during use. Very toxic to some kinds of fish, and therefore may be hard to dispose of safely.

Chemical name(s): **Copper sulphate**

Description: Fungicide. Blue crystals, powder or solution.

Summary of toxicity: Toxic if swallowed - 27 grams has caused fatal poisoning but this appears to have been an exceptionally small dose. Severe gastric disturbance, damage to nervous system, liver and kidneys have been reported in acute poisoning. Causes irritation of skin, eyes and mucous membranes and there is a possibility of allergic skin reactions. Portuguese vineyard workers spraying copper sulphate have developed a respiratory disease known as Vineyard sprayer's lung, which can lead to lung cancer. See also copper compounds.

Chemical name(s): **Creosote**

Description: Brown oily liquid of variable composition produced by the distillation of coal tar and less commonly, wood tar. Its main use is as a wood preservative for outdoor timber. It may also be blended with coal tar for use in tank treatments. It is also used as a herbicide, still sometimes used for marking out sports grounds and as an insecticide (tar oil sprays for fruit trees). The interests of the industry are protected by the Creosote Council which fiercely defends it against criticisms of its safety.

Summary of toxicity: Creosote is highly toxic, corrosive, irritant and carcinogenic. Because of its traditional use as a DIY fence preservative the hazards of this material are greatly underestimated.

Acute toxicity: Highly toxic if liquid is swallowed or vapour or mist is inhaled. A swallowed dose of 100mg/kg of body weight has killed a human. Acute poisoning resembles the effects of phenols - the main constituents in creosote - with attack on the nervous system and cardiovascular collapse.

Chronic toxicity: Chronic poisoning is not documented but nervous disorders, and damage to liver and kidneys would be expected. Skin effects can be both acute and chronic. Splashes and contact with treated timber can burn the skin almost immediately. Regular contact can lead to dermatitis which may be caused by an allergy. Creosote is a photosensitiser: skin can be reddened or burned even when there isn't much sun. Inhalation of mist from spraying has caused acute bronchitis. Long term exposure to mist and vapour, especially in plants where creosote is heated, is likely to produce chronic bronchitis.

Cancer hazard: Creosote is a recognised cause of skin cancer. Common tumour sites are face and neck, forearm, scrotum and penis. Workers and their doctors should investigate any warts or other unusual lumps in the skin without delay. Creosote causes lung cancer in experimental animals. As well as the polycyclic aromatic hydrocarbons associated with lung cancer, it also contains aromatic amines which are potent cancer agents in the bladder.

Control: No specific limits have been set for creosote in the air. NIOSH used the limit for 'coal tar pitch volatiles' under which the fraction of the sample which can be dissolved

out by cyclohexane should not exceed 0.2mg/m³. Swedish construction workers banned creosote before 1980 because of evidence of skin cancer among roofers (*Hazards Bulletin* 1980). As with any other cancer agent, there is no safe limit.

Chemical name(s): **Cuprinol**
Description: Cuprinol is the trade name for a range of wood preservatives for the amateur and professional markets, the latter including formulations for use in pretreatment plants. The company has now removed pentachlorophenol and gamma HCH (lindane) from DIY products, except for 'Low Odour Combination Grade' which contains lindane. But these chemicals are still used in their professional and industrial products. Basic DIY formulations on the retail market are likely to be acypetacs-zinc, dichlofluanid or pyrethroids in an organic solvent. Industrial timber preservative for immersion or double vacuum process is pentachlorophenol, lindane and zinc naphthenate in an organic solvent. Joinery preservative for use in factory production of joinery and cladding contains tributyl tin oxide in organic solvent. Joinery QD special grade contains lindane as well.
Summary of toxicity: See Pentachlorophenol, Lindane, Tributyl tin oxide, and pyrethroid compounds.

Chemical name(s): **Cypermethrin** (see also Permethrin, Pyrethroid compounds)
Description: Insecticide. Found in products from several companies including Cuprinol.
Summary of toxicity: As with all pyrethroid compounds, cypermethrin is regarded as a safer substitute for older chemicals, but not enough is known yet about its effects. Animal experiments so far show that it affects the nervous system, lowering performance; depresses the immune system; affects the control of breathing and circulation; and causes growth and other deformations in internal organs at doses one-tenth to one-fortieth of the LD50. It causes paraesthesia (see Pyrethroid compounds) four times more often than permethrin.
Genetic effects: Experiments show potential for genetic effects.

Chemical name: **DDVP** see Vapona

Chemical name(s): **Dibutyl phthalate**
Description: Used as an additive in 'co-solvent' wood preservative formulations.
Summary of toxicity: Experimental mutagen and teratogen. Affects the eyes.
Control: UK Occupational Exposure Limit: 5mg/m³

Chemical name(s): **Dichlofluanid**
Description: Found in several fungicidal wood preservatives approved for household use.
Acute toxicity: Oral rat LD50: 500mg/kg (High to moderate)
Skin rat LD50: 1000mg/kg (High to moderate)
Reproductive hazard: Some experimental evidence of genetic damage

Chemical name: **Dichlorovos, Dichlorvos** see Vapona

Chemical name(s): **Dieldrin**
Description: Colourless to light tan coloured solid with mild smell. Dieldrin is a highly toxic and persistent organochlorine insecticide and wood preservative.
Summary of toxicity: Dieldrin enters the body by all routes including

skin absorption. Target organs in acute and chronic poisoning are the central nervous system, liver, kidneys and skin. Symptoms include headache, weakness, dizziness, nausea, vomiting, malaise, anxiety, anorexia, sweating, muscular spasm, convulsions, and coma. This substance is on the Dirty Dozen list of most unwanted pesticides produced by an international coalition of environmental groups including Friends of the Earth.

Cancer hazard: Dieldrin causes malignant liver tumours in mice at low levels in food. Shell has always resisted the US Environmental Protection Agency's case that animal experiments justified banning it. The International Agency for Research into Cancer (IARC) rated it 'Animal positive' as a carcinogen in 1974.

Control: UK Recommended limit (1988): 0.25mg/m^3 with warning that skin contact can contribute to poisoning. There is no safe limit for a cancer agent. Dieldrin was banned for all uses in the USA in June 1975 but still permitted for limited applications, mostly to do with seed dressing, in the UK. In 1988, two Cementone Beaver wood preservatives and two of Rentokil's Celpruf export products containing dieldrin were still approved for industrial use. Dieldrin was phased out of 'remedial' wood preservatives by voluntary agreement at the end of 1984 although its use in pretreatment plants is allowed to continue and it is still manufactured by Shell Chemicals for markets which will accept it and still used by UK wood preservative formulators for export brands. Cornwall County Council has banned its use for timber treatment in schools. The UK has finally accepted the EEC directive to ban the 'drins' (aldrin, dieldrin and endrin) and chlordane and heptachlor, by 1992.

Chemical name(s): **Dinitrophenol**

Description: No longer approved but used until quite recently and should be watched out for.

Acute toxicity: This is a highly toxic and irritant compound, absorbed into the body by all routes including the skin. Skin contact can cause dermatitis and you may become allergic to it. A special characteristic of poisoning by dinitro compounds is that body temperature rises, with profuse sweating, racing heart and fast breathing. Nobody should have anything to do with this chemical in wood preservatives or anything else.

Chronic toxicity: Dinitrophenol can damage the nervous system, liver and kidneys. Cataracts can develop in the eyes long after systemic absorption.

Reproductive hazard: The UK government has recently banned Dinoseb, a dinitrophenol agricultural pesticide compound, following the example of the US Environmental Protection Agency which banned Dinoseb after animal tests showed that it causes birth defects and infertility. The EPA stated that a pregnant woman exposed to dinoseb on a single occasion could give birth to a deformed child.

Chemical name(s): **Disodium hexaborate:** see Boron compounds

Chemical name(s): **Disodium octaborate:** see Boron compounds

Chemical name: **Ensele**

Ensele is the trade name for two wood preserva-

tives produced by Hicksons; Ensele Mark 2 is approved for professional use and Ensele X is approved for industrial use.

Acute toxicity: The Hazards Centre has received reports of skin rashes and irritation from workers exposed to Ensele Mark 2.

Chemical group: **Fluorides, inorganic**

Description: This group of chemicals includes the salts of hydrofluoric acid found as solids, powders and dusts throughout industry. Three compounds, ammonium bifluoride, potassium bifluoride and sodium fluoride appear in several wood preservatives approved for industrial use. The use of fluorides in public drinking water supplies and toothpastes to prevent tooth decay makes it easy to assume that these chemicals are safe. In fact the hardening of the teeth produced deliberately by this therapeutic dosing is one step removed from 'fluorosis' – the damage to bones and embrittlement of teeth caused by excessive exposure to fluorides. It is worth remembering that naturally occurring fluorides in the drinking water were responsible for staining and embrittlement of teeth in the general population in several parts of England, notably around Maldon in Essex, in the 1930s. With the current increase in community exposures to fluorides, the margin for collecting additional dosages at work may be small.

Summary of toxicity: Fluorides are irritant to skin, eyes and the respiratory system and there is a possibility of allergic reactions.

Acute toxicity: Acute effects of overexposure include nausea, abdominal pain, diarrhoea, excessive salivation, thirst and sweating.

Chronic toxicity: Long-term exposure may affect the lungs, blood and nervous system but the main risk is to the kidneys and bones. Bones can become embrittled and lumps may grow out from the bones. Symptoms are pain and stiffness, especially in the spine, pelvis and ribs. Disability could be misdiagnosed as rheumatism, arthritis or old age.

Cancer hazard: American studies of populations exposed to fluoridated water have suggested that there may be an increase in cancer. The statistics are disputed, but a possible mechanism for induction of cancer by fluorides has been uncovered and the risk cannot be discounted.

Control: US and UK limit is 2.5mg/m^3, measured as fluoride.

Chemical name(s): **Furmecyclox**

Description: Found in several wood preservatives approved for household use.

Summary of toxicity: No data found.

Chemical name(s): **Gamma HCH:** see Lindane

Chemical name(s): **Heptachlor**

Description: Insecticide used mainly against ground-living insects. Used to be found in Hickson's HD Cream (with pentachlorophenol) for treating telegraph poles. Heptachlor does not appear in *Pesticides 1988.* Still used, for example, in the USA against termites in houses.

Summary of toxicity: Highly hazardous by mouth or skin: oral rat LD50 is 40 mg/kg, skin rat LD50 is 119 mg/kg.

Cancer hazard: Caused cancer in laboratory mice.

Chemical name(s): **Lindane, Gamma HCH**

Description: Lindane is the common name for the insecticide

1,2,3,4,5,6-hexachlorocyclohexane (Gamma HCH) or gamma benzene hexachloride (Gamma BHC). The gamma isomer (molecular layout) of HCH is supposed to be the safest version and it is common to blame past poisonings by HCH on other isomers or on contamination of the gamma. It is best not to take much notice of this since even pure lindane is an extremely dangerous material. Lindane may be encountered as a colourless solid, white powder, liquid or 'smoke bomb' for fumigation. Restrictions of agricultural uses leave only a few permitted uses on farms and many in the general environment. Dust and fume preparations are used against insect infestations in buildings (typically for cockroaches in the service ducts of flats and hospitals). Another heavy consumer is the wood preservative industry (see entries for Chlorinated hydrocarbons and Cuprinol).

Summary of toxicity: All forms can poison you through the skin as well as by swallowing and inhalation. Dust, mist and smoke irritate the eyes, nose and throat. Allergic reactions cause dermatitis and lindane should be suspected in other allergic conditions, such as asthma.

Acute toxicity: The immediate effects of poisoning include headaches, nausea, and, in serious cases, convulsions, respiratory problems, cyanosis (turning blue) and damage to the liver and kidneys. Convulsions closely resembling 'grand mal' epileptic fits may come on before other symptoms are noticed.

Chronic toxicity: Like other chlorinated hydrocarbon insecticides, lindane accumulates in body fat and can stay there for a long time after exposure. The nervous system is the first target organ; regular exposure can cause symptoms which may not be recognised as poisoning, such as irritability, depression, lethargy, poor memory and concentration or disturbed sleep. Aplastic anaemia, (reduction in red blood cells caused by damage to the bone marrow) is a recognised risk of lindane exposure. Cases have included a woman who regularly washed her dog in lindane solution over a period of two years and people exposed to fumes from insecticidal vapourisers. Animals treated with lindane have developed hypoplastic anaemia.

Cancer hazard: Lindane causes liver cancer (as well as other kinds of liver damage) in test animals and should be regarded as a human cancer agent.

Control: US/UK Control limits: 0.5mg/m^3 with warning of skin absorption. Lindane was banned from household and garden formulations in Sweden in 1969. The US Environmental Protection Agency has severely restricted its use citing evidence of carcinogenicity, teratogenicity, reproductive effects, acute toxicity and other chronic effects. London ambulance workers forced the GLC to stop lindane fumigation of ambulances in May 1980 (*Hazards Bulletin* 1978).

Commentary: Despite the wealth of evidence showing its toxicity a wood preservative manufacturer talking to the London Hazards Centre in October 1984 had this to say:
'We have assurances from the Health and

Safety Executive and Pesticides Precautions Scheme that lindane will still be allowed to be used partly because there's no cheap alternative.'

Chemical group: **Mercury compounds**

Description: These extremely dangerous chemicals have been used in timber preservation in the past – for example mercuric chloride in fence post preservatives – but are unlikely to be found in many current UK products. However, they still have limited use in agriculture and as fungicides for mould prevention in the home, so it is as well to be vigilant in case the manufacturers' search for alternative fungicides drives them back to these chemicals.

Summary of toxicity: There are important differences between the toxicities of the inorganic compounds (eg mercurous chloride – Calomel, used in lawn sand) and the organomercury fungicides, such as methyl mercury, which are covered by the Poisons Rules and have caused mass poisonings when people ate treated grain and in pollution disasters (eg Minamata disease in Japanese fishing communities). But the common features are more important than the differences. All mercury compounds poison through the skin as well as by swallowing and inhalation. Skin contact commonly causes dermatitis. Organomercury compounds can blister the skin. Allergic skin reactions are extremely likely. The most important targets for poisoning are the brain and nervous system. The term 'mad as a hatter' comes from hat makers who felted rabbit fur in mercuric nitrates and suffered the characteristic mental disturbances which include loss of confidence, withdrawn behaviour, anxiety and loss of memory. Common signs of poisoning are tremors, particularly of the hands, and damage to mouth and gums – often with loosening of the teeth. The kidneys may also be damaged. Mercury compounds accumulate in the body and low-level exposure may cause gradual decline which is not recognised as poisoning even by the victim.

Reproductive hazard: Minamata disease has provided the sad evidence that mercury compounds alter our genetic material and damage the foetus.

Control: UK Recommended limits: for mercury alkyls (eg ethyl and methyl mercury): 0.01mg/m^3 with warning of skin absorption. Mercury vapour and all other compounds including remaining organic chemicals: 0.05mg/m^3. All measured as mercury.

Chemical name(s): **Methylene bis thiocyanate (MBT)**

Description: Occurs in industrial products from Ashby, Hicksons, Rentokil and Tenneco. May be substituted for PCP in pre-treating wooden pallets.

Summary of toxicity: Few data. Causes dermatitis in guinea pigs but apparently not in humans.

Chemical name(s): **Orthophenyl phenol:** see Phenyl phenol

Chemical name(s): **PCP:** see Pentachlorophenol

Chemical name(s): **Pentachlorophenol.** Also known as **Penta, PCP** and (trade names) **Dowicide, Santophen.**

Description: Colourless to grey, yellow or light brown flaky crystals with a carbolic

smell, especially when hot. PCP is a fungicide which is used as an additive to preserve a wide range of products such as commercial starches, pastes, paper; but mainly as a wood preservative. It is found in products for brush and spray application and in formulations for pressure treatment. Made by reacting chlorine and phenol, PCP always contains at least 10 per cent of other chlorinated phenols, phenoxyphenols, dioxins and dibenzofurans. The dioxins are the hepta-, hexa- and tetrachloro-dibenzodioxin which poisoned Seveso in 1976. One of the most dangerous pesticides in common use, PCP is on the Dirty Dozen list produced by a coalition of environmental and third world groups including Oxfam and Friends of the Earth.

Summary of toxicity: PCP is highly toxic, irritant, it causes dermatitis, chloracne, photosensitivity, it is probably allergenic and it is a known nerve poison, carcinogen, mutagen and teratogen. PCP is toxic by all routes, including skin absorption. The fatal oral dose for humans is 29mg/kg of body weight; though the oral rat LD50 is 50mg/kg. Poisoning through skin, rat LD50: 105mg/kg. PCP is believed to have caused 1000 deaths around the world, mostly through skin absorption. They included sawmill workers, herbicide sprayers, wood preservers and chemical plant workers (*Safety*, September 1982). In March 1982, four out of six workers loading sacks of PCP onto a lorry died after heavy exposure caused by a burst sack (*Jornal do Brazil*, 14, 3 1982).

Acute toxicity: PCP irritates the nose, respiratory system (causing sneezing, coughing, sinusitis), and eyes; it can cause conjunctivitis. It causes dermatitis and chloracne - a painful and disfiguring skin condition. Of 158 workers studied at the Monsanto factory in Newport Gwent (closed in 1978 because of fears about the hazards to workers), one in six had chloracne. The Employment Medical Advisory Service has been investigating chloracne at Rentokil and five other firms making wood preservatives. In the USA people handling firewood made from ex-Army ammunition boxes got chloracne. The wood had been preserved with PCP. In cases of acute poisoning, PCP attacks the nervous system, the body temperature rises, with fever and sweating, rapid breathing and heartbeat, and abnormal blood pressure. Poisoning may cause convulsions, collapse and coma. Several deaths from hyperthermia (fever) have been reported.

Chronic toxicity: Long term effects include anorexia and low weight, sweating, headaches, dizziness; damage to nerves controlling movement in the extremities (peripheral motor neuropathies); neuralgic pain in the legs; numbness in wrists and fingers, aching limbs. Chest pain and bronchitis, heart disease, liver and kidney injury have been reported in workers exposed to PCP.

Cancer hazard: The US government agencies NIOSH and Environmental Protection Agency regard PCP as a cause of cancer in animals. Two of the chloracne victims at

Monsanto in South Wales died of the comparatively rare cancer known as non-Hodgkins lymphoma. It is not known whether pentachlorophenol is a cancer agent in its own right or because of the 11 or 12 per cent of other ingredients, notably the dioxins and dibenzofurans. In practice this is immaterial since even Dow Chemical's 'purified' product (Dowicide EC-7) contained more than 10 per cent other compounds, and the chlorinated dibenzodioxins and dibenzofurans were still present though greatly reduced. (Dow stopped making this product several years ago because customers were reluctant to pay the extra cost and the company had problems disposing of the extracted toxins).

Reproductive hazard: PCP causes deformed offspring when fed to pregnant rats.

Control: UK Recommended limit: 0.5mg/m^3 with a warning of skin absorption risk. As if this wasn't permissive enough for such a dangerous material, a short term exposure limit (STEL) of 1.5mg/m^3 for 10 minutes is also permitted. Like all STELs, this should be ignored. No exposure is acceptable. In July 1984 the US Environmental Protection Agency announced a ban of all consumer use of PCP, with strict control of industrial use. PCP is still permitted in products for sale to the British public. Manufacturers are beginning to restrict it to industrial customers, for example see Cuprinol, but contamination of our homes, schools and public buildings will not stop unless trade unions and employers exclude PCP from specifications. When Cornwall County Council banned Dieldrin and Lindane, they decided to phase out all chlorinated hydrocarbons, including PCP.

Chemical name(s): **Pentachlorophenol laurate:** see Pentachlorophenol

Chemical name(s): **Pentachlorophenol sodium:** see Sodium pentachlorophenate

Chemical name(s): **Permethrin.** (See also Pyrethroid compounds and Cypermethrin.)

Description: A white powder which can be mixed with water to produce a milky liquid. Manufactured by Wellcome and supplied to many formulators of pesticides and wood preservatives.

Summary of toxicity: This is generally thought to be one of the safest insecticides, but it is more recent than most and therefore less is known about its toxicity – particularly the long-term effects of exposure. As with other pyrethroids, there are definite nervous system effects including paraesthesia. In animal experiments, permethrin affects the nerves' control of the muscles and of breathing.

Acute toxicity: The data on the acute toxicity of permethrin are confusing since the fatal dose in rodents (LD50) ranges from 400 to 4,000mg/kg of body weight – ie from very toxic to slightly toxic.

Cancer hazard: There has been a long debate in the US about permethrin's carcinogenicity – it is a suspected cancer agent.

Control: None set in the US or UK.

Chemical name(s): **2-Phenylphenol, 2-biphenylol** (see also Sodium orthophenyl phenate).

Description: Fungicide used in products approved for DIY, professional and industrial applications.

Summary of toxicity: Moderately poisonous by mouth (oral rat LD50: 2,700 mg/kg). Severe irritant to skin and eye.
Reproductive hazard: Experimental data show possible genetic effects.

Chemical name(s): **Potassium bifluoride:** see Fluorides

Chemical name(s): **Potassium dichromate:** see Chrome compounds

Chemical name(s): **Protim**
Description: Trade name for a pressure impregnation formulation containing Pentachlorophenol (PCP) and Tributyl tin oxide (TBTO). See also separate entries. 'Protimised' has become almost a generic term for pressure-treated timber. On site, it may be used almost interchangeably with 'Tanalised' (see separate entry for Tanalith). Treated timber of both types can be immediately hazardous to those handling it, but the short and long-term dangers are different.

Chemical group: (Synthetic) **Pyrethroid compounds**
Chemical name(s): Synthetic pyrethroid compounds can be identified by names ending in -thrin. The most common pyrethroid wood preservatives are **Permethrin** and **Cypermethrin.**
Description: These pesticides are synthetic imitations of derivatives of pyrethrum flower extract used mainly as insecticides.
Summary of toxicity: Synthetic pyrethroids are highly irritant to the skin and respiratory system and can cause itchiness, dermatitis and blistering if the exposed skin is damp. They cause a feeling of burning, tingling or pins and needles in the skin known medically as paraesthesia: this is due to their interference with the chemical mechanisms of the nerves. Allergic reactions may show as 'hay fever' with sneezing. Hypersensitivity to pyrethroids can be serious, causing you to collapse after a small exposure. Large doses can cause hyperexcitability, unco-ordination, tremors and muscular paralysis. Pyrethroids are suspected of causing damage to the peripheral nervous system (the part affected in paraesthesia) in experimental animals.

Chemical name(s): **Rentokil**
Description: As with other household names 'Rentokil' is often wrongly used to describe a chemical or a treatment when some other product or company is involved. Rentokil products contain a large number of officially approved chemicals including arsenic, PCP, lindane and TBTO. See company profile in Section 2.

Chemical name(s): **Sodium arsenate:** see Arsenic compounds

Chemical name(s): **Sodium dichromate:** see Chrome compounds

Chemical name(s): **Sodium fluoride:** see Fluoride compounds

Chemical name(s): **Sodium orthophenyl phenate, Sodium 2-phenylphenoxide,** (see also 2-Phenylphenol)
Summary of toxicity: Moderately poisonous by mouth (LD50 oral-rat: 656 kg/mg), mild skin irritant.
Cancer hazard: The International Agency for Research on Cancer has found sufficient evidence to list this chemical as an animal carcinogen. Oral administration produced bladder cancer in rats, and rare blood and liver tumours (haemangiosarcomas and hepatocellular cancer) in male mice.

Chemical name(s): **Sodium pentachlorophenate**
Summary of toxicity: Less toxic by swallowing and skin absorption than straight pentachlorophenol but the risks are essentially the same. See Pentachlorophenol.

Chemical name(s): **Sodium 2-phenylphenoxide,** see Sodium orthophenyl phenate.

Chemical name(s): **SOPP:** see Sodium orthophenyl phenate

Chemical name(s): **Tanalith**
Description: Tanalith is the trade name for pressure pre-treatment chemicals and the treatment process of Tanalising. This includes various products and services but is best known for Copper/Chrome/Arsenic formulations. See separate entry under CCA compounds. See also Protim with which this firm's products and process may sometimes be confused. The trade name Tanalith is owned by Hickson's Timber Products Ltd, Castleford, West Yorkshire. Tel: 0977 55378.

Chemical name(s): **TBTO:** see Tributyl tin oxide

Chemical name(s): **2-Thiocyanomethylthio-benzothiazole (TCBTB)**
Description: A likely replacement for PCP in pallet pretreatment.
Summary of toxicity: No data readily available.

Chemical name(s): **Tributyl tin oxide Tri-n-butyl tin oxide, TBTO, hexabutyl-distannoxane**
Description: TBTO is a clear to yellowish liquid with a smell which is described as unpleasant. It has become one of the most important fungicides in UK wood preservatives but is associated with many of the cases of ill-health reported after treatment of homes and schools.
Summary of toxicity: TBTO is highly toxic. The oral LD50 in rats is 194mg/kg of body weight. It can also poison through the skin in animals and this should be assumed to be a risk for humans. TBTO is irritant and corrosive to skin, producing burns and slow-healing rashes. It is a nerve poison and it can damage the immune system.
Reproductive hazard: In 1986 the US Environmental Protection Agency found that TBTO can cause birth defects in animals.

Chemical name: **Vapona, Dichlorvos, Dichlorovos, DDVP, Dimethyl dichlorovinyl phosphate.**
Description: Insectide commonly used in cat collars. Used against woodworm either as a spray or as a vaporising block for loft spaces. Belongs to organophosphorous group of insecticides. Works by affecting the nervous system.
Summary of toxicity: Highly toxic to eat, breathe or touch. Rat LD50s: oral 32 mg/kg, skin 75mg/kg. Effects on blood system. Has been shown to cause asthma (Bryant 1985). Has caused neurological damage resembling multiple sclerosis (see Case file).
Cancer hazard: Not enough data to show whether it causes cancer.
Genetic effects: Some experimental evidence for genetic effects in microbes but not in mammals.

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Appendix I

The Cornwall methods

Cornwall County Council's standard specification for the treatment of timber in roof spaces of existing buildings (1987)

This specification was developed by Deputy County Architect, Peter Richardson at the Cornwall County Architect's Department.

Work prior to preservative treatment

△ All roof areas to be treated must have all remaining debris removed and all dust must be vacuum cleaned from timbers to be sprayed.

△ Any roof spaces *not* to be treated but which adjoin those where treatment is to be carried out must be effectively screened off using polythene with lapped taped joints on timber framing. These screens may be left in situ after spraying has been carried out at the discretion of the Inspecting Officer. Any moveable furniture still in the rooms below must be removed. Any built-in cupboards etc must be emptied of their entire contents and their doors sealed shut with tape.

△ All fixed chalkboards and pin-up boards etc must be completely covered with new polythene sheets with lapped and taped joints.

△ Avoid contact between preservative chemicals and any absorbent surfaces due to spray drift, spillage of runs of liquid and dropping of mayonnaise. Any preservative in contact with electricity cables in the roof void should be wiped off immediately.

△ All paint, varnish or lacquer on all members of trusses and purlins to be treated is to be removed using an electric hot-air paint stripper such as a Sikkens, a Leister Electron or similar. On no account are conventional blowlamps or chemical paint removers to be used. NB: all varnish must be removed, by mechanical means if necessary. The supervising officer's approval is required for the above work before preservative treatment commences.

General conditions of treatment sub-contract

△ The preservative treatments scheduled below shall be carried out by an approved specialist sub-contractor giving a written 10 year guarantee and who is preferably a member of the British Wood Preserving Association.

△ The specialist sub-contractor shall state in writing precisely which active agents have been used in the course of the contract.

△ All materials used shall be those approved by the Health and Safety Executive under the Control of Pesticides Regulations. The handling and application of these materials shall be entirely in accordance with manufacturers' instructions and recommendations particularly in respect of safety such as the wearing of gauntlets, goggles and masks etc.

Insecticide treatment

△ The surfaces of all existing roof timbers are to be sprayed with insecticide using a water/oil emulsion as the solvent.

NOTES

A Dual purpose sprays containing both insecticide and fungicide *not* to be used.

B No preparation containing the chlorinated hydrocarbon dieldrin shall be used.

C The insecticidal spray to be used shall be permethrin-based only. (The use of lindane is now discontinued).

Fungicide treatment

△ The exposed ends of trusses and purlins plus any localised attacks of wet or dry rot are to be treated with the full-bodied mayonnaise 'Woodtreat BP' and applied by hand.

△ This mayonnaise contains the active ingredients zinc octoate (fungicide) and permethrin (insecticide) and is manufactured by:
Stanhope Chemical Products Ltd
96 Bridge Road East
Welwyn Garden City
Herts AL7 1JW
Tel: 0707 324373

△ If it is not possible to apply the mayonnaise in certain situations, specific approval must be sought from the supervising officer for the use of a liquid spray applied by lance, in which case the spray *shall not* contain tributyl tin oxide (TBTO) and the substitute fungicide must have an LD50 value greater than 200.

Work after preservative treatment

△ After completion of treatment the ceiling void, the trusses and purlin end cavities and the rooms below are to be thoroughly ventilated for a minimum of three days.

△ All occupied spaces are to be thoroughly cleaned using an industrial vacuum cleaner to remove *all* dust which will contain preservative chemicals. All floors plus any other horizontal surfaces where dust can settle such as picture rails, window boards, chalkboard rails and tops of dados etc shall be covered with resinous sawdust which is to be left for at least 48 hours. After this time all such surfaces shall be very gently brushed and vacuum cleaned. After an *additional* 48 hours these same surfaces shall be washed down with Gloquat, type 'SD extra' or similar equal and approved, similarly any runs of preservative liquid down the wall shall be washed off with the same solution.

△ During the four day period referred to above, no absorbent materials such as fiberglass insulation or ceiling tiles are to be stored or installed where they can come into contact with the preservative sprays.

Appendix 2

Surveys

This is the statement devised by Malcolm Rickards of Rickards Preservation and published in *Building Trades Journal*, 24 October, 1985.

△ Mycologist Dr Singh points to an inspection hole, into which an optical fibrescope can be inserted, at Netley House.

Statement by remedial specialist

An approved specialist firm should be instructed to examine all the timbers of the property for woodbeetle and fungal decay, and the walls for rising dampness.

The specialist firm should be given this document before inspection and advised that it will be required to complete the statement below to enable its account to be approved for payment. This statement should subsequently be retained with the firm's guarantee.

To The ABC Building Society *Address of property:*

Re: Applicant

Dear Sirs,

We confirm that we have completed work at the above premises, including reinspecting all areas restricted at the time of our first inspection, and that the following have been included:

1. *Inspection of sub-floor timbers including recommending removing and re-supporting built-in wall plates and joist ends of the ground floors where necessary.*
2. *Recommending removal of all timber debris from the oversite.*
3. *Recommending, where necessary, increasing sub-floor ventilation including cross-partition walls where these were below floor level.*
4. *Recommending that the client, where possible, lowers external levels which are above existing dpc.*
5. *Advising the client specifically of all necessary repairs to prevent rainwater ingress which might prejudice our guarantee.*
6. *We confirm that we have completed all necessary treatment to eradicate timber fungal decay, infestation and rising damp, excluding the following:*
   - *(i) areas not apparently requiring treatment;*
   - *(ii) infested timbers within the fabric of the building which could only have been discovered by opening up, for which there was no apparent justification;*
   - *(iii) specific, unavoidable restrictions as detailed below, including the client's failure to complete specified repairs.*

We expect payment to be authorised on the understanding that the above is true and correct and we hereby warrant that we will, at no expense to the building owner at the time, rectify any defects found in items 1,2,3 and 6 during the period of our guarantee, to which this warranty is an addition.

Yours faithfully,

XYZ Treatment Company.

Appendix 3

Chemicals Policies

The Control of Substances Hazardous to Health (COSHH) Regulations will come into effect in 1989. But trade union safety reps will need more than the new regulations on hazardous substances to just hold the line on chemical hazards against the forces of deregulation and privatisation.

Local authority unions working at branch level are negotiating policies for controlling chemical hazards which take their members and the communities they serve far ahead of the new regulations which are due to come into force on 1 October 1988.

This factsheet sets out the essential elements of a *chemicals policy*. This is the document in which the employer commits the organisation, whether it's a company or a local authority, to comply with set methods and standards in all aspects of chemical use. It needs to be endorsed, in writing, at the highest level of the organisation and to be 'wired-in' to every level of the management and trade union structure. It must therefore be an integral part of the *safety policy*.

Just writing a policy and agreeing it will not in itself alter very much unless the employer makes organisational changes, and commits staff and resources to implementing all stages of the policy. The union side must also be able to monitor the policy. This means using the *Safety Representatives and Safety Committees Regulations* to insist on adequate numbers of safety reps, trained in the necessary skills and able to exercise their right to time off for inspection, reporting back, and meeting to co-ordinate their work.

To be effective in monitoring a chemicals policy the union side will also need textbooks and extra facility time, for visiting libraries, union offices and outside resource centres. All this should be written into a *health and safety agreement* between management and unions which defines the union role in decision-making and lays down levels for resolving differences over chemicals at all levels from vetting committee to individual workplace. Without this agreement the policy will not work.

Islington chemicals policy

The Hazards Centre has worked in most London boroughs on some aspects of chemical use and safety. Contacts with management and trades union reps in Hackney and Islington have proved particularly fruitful. Both boroughs are now moving towards comprehensive hazardous substances policies going far beyond the requirements of the COSHH Regs (see box). Below is a highly condensed summary of the Islington agreement.

Policy statement: The council accepts its responsibility for protecting workers, the public and the environment from chemical risks and will:

△ Carry out a full audit of all chemicals used/stored on council property, draw up an inventory of chemicals and prepare a standard hazards data sheet on each material listed.

△ Together with the trade unions draw up a list of permitted substances and what these substances may be used for. The council and unions will review work methods and will authorise the use of chemicals only where these provide both a safe and effective means of doing the work.

△ Safe working practices will be drawn up for each substance, and will include requirements for adequate levels of training and supervision.

△ Where concern is expressed about the hazards presented by the ingredients of any chemical formulation, it is accepted that the substance will not be used until after consultation with the trades unions.

Daily Hazard No 19 Oct 1988

The agreement also includes specific clauses restricting the use of chemicals suspected of being reproductive hazards or of causing cancer (the no-carcinogens/teratogens/mutagens clauses). Some of the more important points from the 'no-carcinogens' clause are summarised below.

△ The council undertakes not to purchase, store or use any cancer-causing substance.

△ Suspect carcinogens: the council will take all practicable steps to ensure that it does not purchase any substance designated 'cancer suspect' or 'carcinogenic determination indefinite'. Substances in this category (as designated by eight named organisations) will be phased out of use as soon as is practicable.

△ The council accepts that it is responsible for obtaining information on the cancer-causing potential of all materials it uses or intends to use and for disclosing this information to the trades unions.

Copies of the full Islington Policy Statement and related clauses are available from the London Hazards Centre.

The essentials of a policy

A policy on hazardous substances must cover:

△ **Management structures**: the procedure and competent personnel needed to ensure safety at every stage from selection to disposal. Includes skills and training needs at all levels in management, especially supervision, and workforce. Named managers made responsible.

△ **Selection/assessment of risk**: needs to be task-centred – 'Which method?' comes before 'Which chemical?' (see Islington Policy Statement). Considerations include public and environmental protection.

△ **Auditing**: What materials are currently held, quantities, condition – a horrifying exercise in most organisations.

△ **Purchasing**: Who is authorised to buy. Control and record keeping.

△ **Information**: use of standard data sheets; requirement on suppliers to complete fully (see Resources); filing, distribution of data sheets; warning notices; language needs of all groups affected.

△ **Storage**: locations, safety of buildings, stores, etc, record-keeping. Notifications to emergency services; Hazchem markings.

△ **Issuing and return**: permit-to-work systems; procedures for return of unused materials.

△ **Transport**: selection, design and labelling of vehicles. Emergency procedures.

△ **Use/handling**: worker protection: safe work method, information, training supervision, protective equipment; public protection: information, exclusion, warning leaflets and signs.

△ **Disposal**: containers and residues – worker, community and environmental protection.

The essentials of policy continued.

△ **Monitoring**: the key to it all. Measuring levels of harmful substances in the workplace air, also on skin and clothing. Measuring air, water and soil pollution around operations and in the community; biological monitoring: testing for workplace materials in blood, urine etc Medical monitoring – creating and checking medical records, examining workers for symptoms related to work. Using the accident book and analysing entries for trends/problem areas, etc. Managerial monitoring – checking to see that all control procedures actually work. Union/management reviews of policy effectiveness.

Key COSHH proposals

△ **1.** All substances/employers/self-employed and other persons are covered.

△ **2.** An assessment of the risk from the exposure to any substance must be carried out and recorded. The assessment will include toxicity information, based largely on suppliers data sheets and an estimate of the nature/degree of exposure. Air monitoring will be required in many cases.

△ **3.** Exposure to substances must be adequately controlled by means other than personal protection, if reasonably practicable. Occupational exposure limits will be used to judge whether control is adequate. Carcinogens are covered by a separate Code of Practice.

△ **4.** Control measures must be used and properly maintained.

△ **5.** Health surveillance must be provided but will range from just recording personal details to regular medicals.

△ **6.** Information, instruction and training must be provided for employees, especially those with COSHH duties.

The COSHH Regs won't make a blind bit of difference unless the HSE, instead of shrinking is expanded to enforce them – or trade unionists force the employer to implement.

Appendix 4

Contact addresses

Sources of information or help

Building Research Establishment
Building Research Station, Garston, Watford WD2 7JR. Tel: 0923-674040.

British Wood Preserving Association
6 The Office Village, 4 Romford Road, Stratford, London E15.

Friends of the Earth
26–28 Underwood Street, London N1 7JQ. Tel: 01-490 1555.

Greenpeace
36 Graham Street, London N1 8LL. Tel: 01-608 1416.

Hutton and Rostron, Architects
Netley House, Gomshall, Surrey GU5 9QA. Tel: 048-641 3221.

Myalgic Encephalomyelitis Association
PO Box no 8, Stanford-le-Hope, Essex. Tel: 0375-642466.

National Poisons Information Service
New Cross Hospital, Poisons Unit, Avonley Road, London SE14 5ER. Tel: 01-407 7600, (emergencies only: 01-635 9191).

Nationwide Association of Preserving Specialists
2 Castle Street, Salisbury, Wiltshire SP1 1BB. Tel: 0722-20326.

Work hazard groups and resource centres

Greater Manchester Hazards Centre
c/o MERG, Room 36, Cavendish Building, Manchester Polytechnic, All Saints, Manchester M15 6BG. Tel: 061-228 7979.

Health and Safety Advice Centre
Unit 304, The Argent Centre, 60 Frederick Street, Birmingham B1 3HS. Tel: 021-236 0801.

Health and Safety Project
Trade Union Studies Information Unit, 'Southend', Fernwood Road, Jesmond, Newcastle NE2 1TJ. Tel: 091-281 6087.

London Hazards Centre
3rd Floor, Headland House, 308 Gray's Inn Road, London WC1X 8DS. Tel: 01-837 5605.

South East Scotland Hazards Group
10 Fountainhall Road, Edinburgh.

Women and Work Hazards Group
c/o A Woman's Place, Victoria Embankment, London WC2N 6PA.

Local trade union health and safety groups

Birmingham Region Union Safety and Health Campaign
Tommy Harte, 68 Joseph's Avenue, Northfield, Birmingham B31 2XQ. Tel: 021-475 4739.

Coventry Workshop
38 Binley Road, Coventry CV3 1JA. Tel: 0203-27772/3.

Hull Action on Safety and Health
31 Ferens Avenue, Cottingham Road, Hull HU6 7SY. Tel: 0482-49768.

Isle of Wight Trade Union Safety Group
Bob Davies, 12 Winston Road, Newport, IOW PO30 1RF.

Merseyside Trades Council Health and Safety Committee
Tel: 051-709 4398.

Merseyside Trades Union Resources
24 Hardman Street, Liverpool L1 9AX. Tel: 051-709 3995.

Portsmouth Area Health and Safety Group
Norman Harvey, 32 Rowner Close, Gosport, Hants PO13 0LY. Tel: 0329-281898.

Potteries Action for Health and Safety
Bill Edmundson, 16 Fieldway, Longton, Stoke-on-Trent ST3 2AN. Tel: 0782-327144.

Sheffield Area Trade Union Safety Committee
Seb Schmoller, 312 Albert Road, Heeley, Sheffield S8 9RD. Tel: 0742-584559.

Sheffield Occupational Health Project
Birley Moor Health Centre, 2 Eastgate Crescent, Sheffield S12 4QN. Tel: 0742-392541 Mon, Tue.

Sunderland Community and Occupational Health and Safety Group
Jimmy Harrison, 48 Wearmouth Drive, Sunderland. Tel: 0783-494482.

Walsall Action for Safety and Health
7 Edinburgh Drive, Rushall, Walsall WS4 1HW. Tel: 0922-25860.

HSE area office information services

1 South West Inner City House, Mitchell Lane, Bristol BS1 6AN. Tel: Tel: 0272-290681.
Avon, Cornwall, Devon, Gloucestershire, Somerset, Isles of Scilly.

2 South Priestly House, Priestly Road, Basingstoke RG24 9NW. Tel: Tel: 0256-473181.
Berkshire, Dorset, Hampshire, Isle of Wight, Wiltshire

3 South East 3 East Grinstead House, London Road, East Grinstead, West Sussex RH19 1RR. Tel: 0342-26922
Kent, Surrey, East Sussex, West Sussex

5 London N Maritime House, 1 Linton Road, Barking, Essex IG11 8HF. Tel: 01-594 5522
Barking and Dagenham, Barnet, Brent, Camden, Ealing, Enfield, Hackney, Haringey, Harrow, Havering, Islington, Newham, Redbridge, Tower Hamlets, Waltham Forest.

6 London S 1 Long Lane, London SE1 4PG. Tel: 01-407 8911
Bexley, Bromley, City of London, Croydon, Greenwich, Hammersmith and Fulham, Hounslow, Kensington and Chelsea, Kingston, Lambeth Lewisham, Merton, Richmond, Southwark, Sutton, Wansworth, Westminster.

7 East Anglia 39 Baddow Road, Chelmsford, Essex CM2 0HL. Tel: Tel: 0245-84661.
Essex except the London Borough in Essex covered by Area 5; Norfolk, Suffolk.

8 Northern Home Counties 14 Cardiff Road, Luton, Beds LU1 1PP. Tel: 0582-34121
Bedfordshire, Buckinghamshire, Cambridgeshire, Hertfordshire.

9 East Midlands Belgrave House, 1 Greyfriars, Northampton NN1 2BS. Tel: 0604-21233
Leicestershire, Northamptonshire, Oxfordshire, Warwickshire.

10 West Midlands McLaren Bldg, 2 Masshouse Circ, Queensway, Birmingham B4 8NP. Tel: 021-236 5080
West Midlands

11 Wales Brunel House, 2 Fitzalan Road, Cardiff CF2 1SH. Tel: 0222-497777
Clwyd, Dyfed, Gwent, Gwynned, Mid Glamorgan, Powys, South Glamorgan, West Glamorgan

12 Marches The Marches House, Midway, Newcastle-under-Lyme, Staffs ST5 1DT. Tel: 0782-610181
Hereford and Worcester, Shropshire, Staffordshire.

13 North Midlands Birbeck House, Trinity Square, Nottingham NG1 1AU. Tel: 0602-470712
Derbyshire, Lincolnshire, Nottinghamshire.

14 South Yorkshire Sovereign House, 40 Silver Street, Sheffield S1 2ES. Tel: 0742-739081
Humberside, South Yorkshire

15 W & N Yorks 8 St Pauls Street, Leeds LS1 2LE. Tel: 0532-446191
North Yorkshire, West Yorkshire

16 Greater Manchester Quay House, Quay Street, Manchester M3 3JB. Tel: 061-831 7111
Greater Manchester

17 Merseyside The Triad, Stanley Road, Bootle L20 3PG. Tel: 051-922 7211
Cheshire, Merseyside

18 North West Victoria House, Ormskirk Road, Preston PR1 1HH. Tel: 0772-59321
Cumbria, Lancashire.

19 North East Arden House, Regent Centre, Regent Farm Road, Gosforth, Newcastle-upon-Tyne NE3 3JN. Tel: 091-284 8448
Cleveland, Durham, Northumberland, Tyne & Wear

20 Scotland East Belford House, 59 Belford Road, Edinburgh EH4 3UE. Tel: 031-225 1313
Borders, Central, Fife, Grampian, Highland, Lothian, Tayside and the island areas of Orkney & Shetland.

21 Scotland West 314 St Vincent Street, Glasgow G3 8XG. Tel: 041-204 2646
Dumfries & Galloway, Strathclyde and the Western Isles

Trades Unions

General, Municipal, Boilermakers and Allied Trades Union (GMB)
Thorne House, Ruxley Ridge, Claygate, Esher, Surrey KT10 0TL. Tel: 0372-62081

Transport and General Workers Union (TGWU)
Transport House, Smith Square, London SW1P 3JB. Tel: 01-828 7788.

Union of Construction and Allied Trades Technicians (UCATT)
177 Abbeville Road, London SW4 9RL. Tel: 01-622 2442.

Trades Union Congress (TUC)
Congress House, Great Russell Street, London WC1B 3LS. Tel: 01-636 4030.

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About the London Hazards Centre

Fighting for health and safety at work and in the community

- **Information on hazards**
- **The law and how to use it**
- **Organising and helping build campaigns**

A vital resource for London's trade unions, community groups and tenants' associations

The London Hazards Centre was set up in 1984 to provide people in London with the resources to fight hazards at work and in the community. We can supply information on thousands of different hazards, from asbestos in the home to noise and chemical pollution in the workplace. We try to present technical information in plain language. We advise on the law and how to use it. We help people to organise effective campaigns, and work mainly with groups such as trade union branches and tenants' associations.

Getting involved

In order to make sure the work of the Centre reflects people's needs, we have set up working groups which draw in users of the Centre. There are working groups for Black people, for tenants and others organising around community issues, for women, for trade unionists, and for people interested in the collection and exchange of information.

Fighting racism

In our racist society, Black people end up in the most dangerous jobs and polluted workplaces, doing more than their share of shiftwork and homework, and running a higher risk of unemployment. Black people are also more likely to be allocated the worst available housing. The London Hazards Centre has made a positive commitment to work with Black organisations and to develop the resources they need to fight hazards.

Women and hazards

Because of discrimination and domestic commitments, women often have jobs where the law offers little protection. Deregulation in employment law means that more and more women find themselves in workplaces where organising together is the only way

to improve working conditions. New technology is enabling employers to create a new generation of sweatshops and new risks to workers' health in offices and countless other workplaces. The Hazards Centre works with women organising at work and in the community against dangers such as asbestos, damp, pest infestations, chemicals at work and hazards to reproduction.

Resources

We have a large and ever-growing library of hazards information to help us respond appropriately to people who contact us, seeking the most effective strategy and putting people in contact with others who have been fighting similar hazards. Sometimes an inspection is appropriate, and we may use our monitoring equipment or help groups to organise a survey by an outside agency.

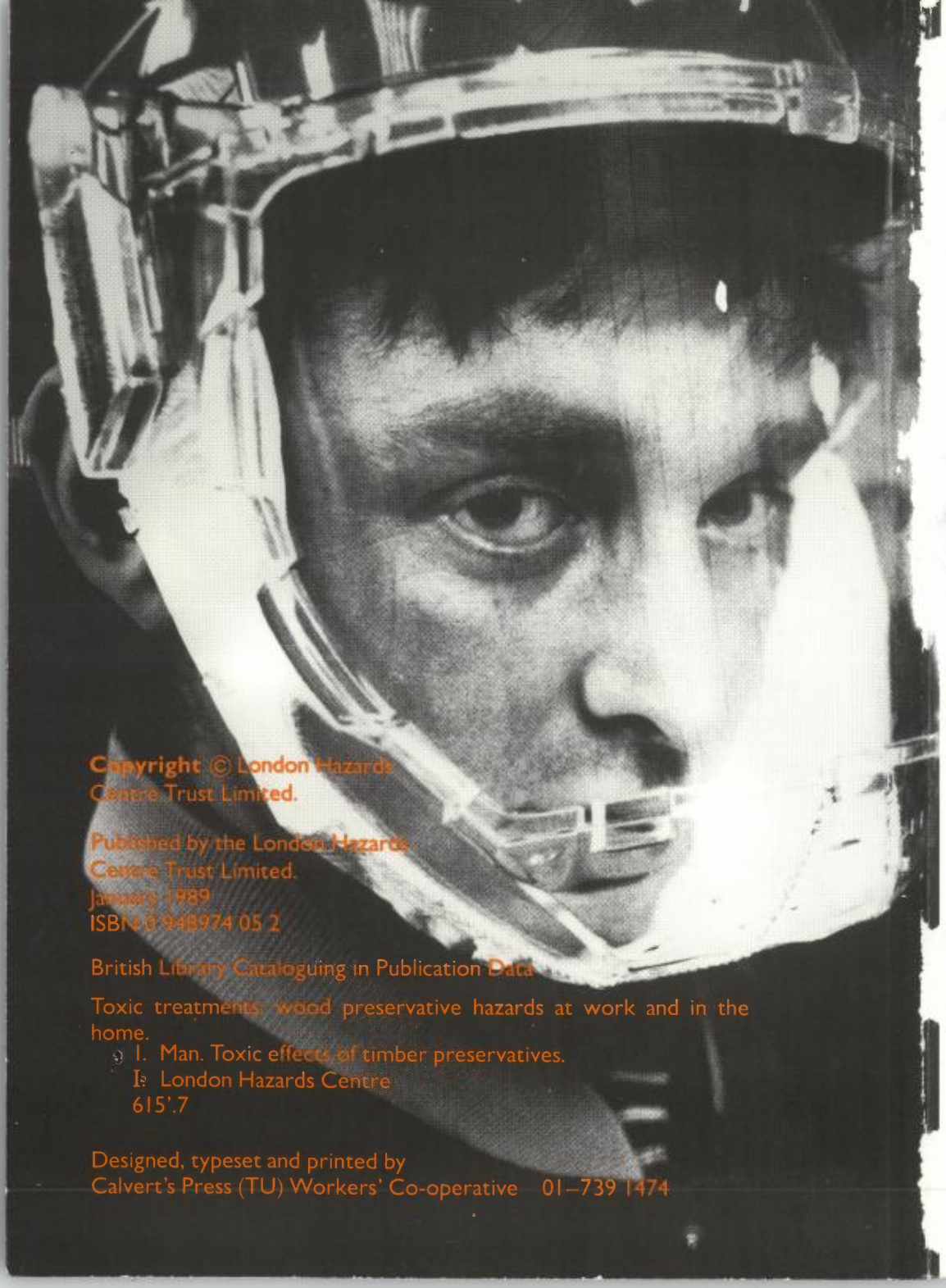
Other Publications from the London Hazards Centre

- **Fluorescent Lighting – A Health Hazard Overhead**
  £5.00 (£2.00 to trade union and community groups)
  March 1987 ISBN 0 948974 01 X
- **Repetition Strain Injuries – Hidden Harm from Overuse**
  £6.00 (£3.00 to trade union and community groups)
  (to be published) 1987 ISBN 0 948974 03 6

Affiliate

We welcome affiliations from individuals and groups committed to the fight against hazards at work and in the community. Affiliation shows support for the Centre, brings you a year's supply (five issues) of our newsletter, the *Daily Hazard*, and news of the Centre's other publications and activities.

- **Contact the London Hazards Centre for further details and affiliation rates**



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