

Report

of a

Ministerial Inquiry

into the

Management of Certain Hazardous

Substances in Workplaces

July 2003



Ministerial Inquiry into the Management of Certain Hazardous Substances in Workplaces

4 July 2003

Hon. Margaret Wilson
Minister of Labour
Parliament Buildings
Wellington

Dear Minister


Report of a Ministerial Inquiry into the Management of Certain Hazardous Substances in Workplaces

In November 2002, you appointed me to conduct a Ministerial Inquiry on your behalf into the management of certain hazardous substances, being in particular glutaraldehyde, other aldehydes and solvents, in workplaces in the health, printing and manufacturing sectors.

I was originally requested to report to you by 30 May 2003. That date was subsequently extended to 4 July 2003.

I have now completed that Inquiry and am pleased to enclose my report to you.

Yours sincerely



Denis Clifford

Ministerial Inquiry into the Management of Certain Hazardous Substances in Workplaces

Foreword

I would like to extend my thanks and appreciation to all those people who have contributed to the work of the Inquiry and to the preparation of this Report.

The Report acknowledges the contributions made by the various people who provided submissions, attended hearings and otherwise assisted the Inquiry with its work. I take this opportunity to thank personally all those people for their contributions.

I would like to thank the Inquiry's expert advisers, Doctor Hilda Firth from the University of Otago Medical School, and Doctor Ian Laird of Massey University. I very much appreciated their expert guidance and their personal support. Although the Report expresses my views on the matters raised by the Terms of Reference, and I am responsible for any errors, omissions or oversights, I am pleased to record that both Dr Firth and Dr Laird have advised me that they concur with the Report and its recommendations.

I would also like to record my appreciation of the work undertaken by the Inquiry's secretariat: John Gilbert, Inquiry Manager, Nick Matsas, Analyst, Jill Thomson, who helped analyse the submissions and who provided records of the Inquiry's hearings, and the Inquiry's administrative support, Joanne Brown and, following the birth of Joanne's daughter, Jo-Anne Lundon.

Each of them performed their role with skill and dedication.

Finally, my thanks go to Bob Hill and his team at OSH, and in particular Rex Moir, who went to great lengths to provide the Inquiry with information in response to a wide range of queries.

Denis Clifford

Wellington

July, 2003.

Glossary

ACC:	The Accident Compensation Corporation
Approved Code of Practice:	A statement of preferred work practices or arrangements approved by the Minister of Labour under section 20 of HSE
Control Regulations:	The Hazardous Substances (Classes 6, 8, and 9 Controls) Regulations 2001
COSHH:	Control of Substances Hazardous to Health Regulations and Code of Practice (UK)
COSHH Essentials:	A package of information advising control options for hazardous substances to be used in support of COSHH (UK)
ERMA:	The Environmental Risk Management Authority, the decision making body under HSNO
ERMA New Zealand:	The support organisation for ERMA
ESR:	Institute of Environmental Science and Research Ltd
HASARD:	OSH's Health and Safety Accident Recording Database
HSE:	The Health and Safety in Employment Act 1992
HSNO:	The Hazardous Substances and New Organisms Act 1996
Identification Regulations:	The Hazardous Substances (Identification) Regulations 2001
IPRC:	The Injury Prevention Rehabilitation and Compensation Act 2001
MCS:	Multiple Chemical Sensitivity (or Sensitivities)
MSDS:	Material Safety Data Sheet
MEL:	Maximum Exposure Limit
MOSHH ACOP:	The Management of Substances Hazardous to Health Approved Code of Practice
NODS:	OSH's Notifiable Occupational Disease System
NOHSC:	The National Occupational Health and Safety Commission (Australia)
NZIMRT:	The New Zealand Institute of Medical Radiation Technologists
NZNO:	The New Zealand Nurses Organisation
OSH:	The Occupational Safety and Health Service of the Department of Labour
SNFTAAS:	Support Network for the Aldehyde and Solvent Affected
WSMP:	Workplace Safety Management Practices

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Section 1 Introduction to Report

Background to Inquiry

1. In October 1983, Marjorie Gordon, an experienced radiographer, presented a paper to a conference of New Zealand radiographers. Entitled *Are Radiographers at Risk?*, the paper told of Gordon's ill health, and of her gradual association of that ill health with exposure to x-ray processing chemicals.
2. Gordon related how she had for some time suffered from heart problems, tinnitus and a range of 'toxic symptoms' – nausea, tremor, weakness, excessive tiredness and blurred vision. By 1982, the symptoms Gordon was experiencing were severe. Sick leave alleviated the symptoms; a return to work exacerbated them.
3. Gordon told how, with support from her employer, she had decided to investigate the possible links between her work and her ill health. To that end, earlier in 1983 she had visited Agfa–Gevaert in Antwerp. There she became aware, apparently for the first time, of the recognised risks associated with inhalation of x-ray chemicals.
4. During that same trip, she had participated in a conference of the British Society and College of Radiographers. She described her own symptoms to that conference and asked for details of any other radiographers who might be suffering similar reactions to x-ray chemicals.
5. As a result of those investigations, in her October 1983 paper she identified the need for special ventilation of dark rooms, and for the exhausting of fumes from processing areas. Anticipating the enactment of the Health and Safety in Employment Act 1992 (HSE) almost ten years later, she called for:
 - recognition of the risks from exposure to x-ray chemicals
 - the elimination of use of those chemicals
 - the development of safe x-ray processing machines and workplaces.
6. These recommendations parallel the hierarchy of obligations ('identify, eliminate, isolate, minimise and protect') subsequently to be found in sections 7 through 10 of HSE.
7. This Inquiry can be traced directly back to that paper presented by Marjorie Gordon in 1983. Many submissions made to this Inquiry in 2003 refer to the issues that she had raised some 20 years before.
8. Gordon continued her work. By 1984 she had identified glutaraldehyde as a possible principal cause of the adverse effects of exposure to x-ray chemicals. In subsequent years she published a series of articles. In 1986, with the assistance of the Accident Compensation Corporation (ACC) who in 1983 had accepted her claim for cover, she produced *Guidelines for a Safe Working Environment for New Zealand Radiographers and Dark Room Technicians*. The articles she published, and those Guidelines, emphasised her views that:
 - glutaraldehyde and other x-ray processing chemicals were hazardous, and this fact was not sufficiently widely known

- there were safe ways of using those chemicals, involving particular attention to ventilation, good work practices and protective equipment
 - the adverse effects were significant, and could be caused by low-level exposure over time or significant one-off events
 - whilst for most workers the then prevailing exposure standards were safe, for a small percentage adverse effects would occur at much lower levels of exposure.
9. Whilst Marjorie Gordon was concerned about x-ray processing chemicals, and glutaraldehyde in particular, concerns have also been expressed over time about other aldehydes and solvents, and their adverse effects.
 10. A number of articles have appeared in general publications, focussing on particular industries (eg. *Something Nasty in the Boatyard*, North & South, September 1997). Specialist publications have addressed the issue more generally (eg. *Solvent-Induced Neurotoxicity*, Safeguard, January 1996 and *Chronic Solvent Neurotoxicity in New Zealand*, E W Dryson, New Zealand Medical Journal, November 1998). The Occupational Safety and Health Service of the Department of Labour (OSH) has also commented on the issue. The report of the Occupational Disease Taskforce *Together to Zero* in November 1996 provides one example of this.
 11. In 1997, following the New Zealand Institute of Medical Radiology Technologists (NZIMRT) Marjorie Gordon Memorial Seminar, *Glutaraldehyde at Work*, the Support Network for the Aldehyde and Solvent Affected (SNFTAAS) network was set up to raise awareness of that issue. Phillipa Martin, Marjorie Gordon's daughter, has worked for many years as co-ordinator of that network. The members of that network have taken particular interest in this Inquiry.
 12. A recent European Union announcement, launching the first pan-European campaign to reduce the risks of chemical use, shows that concerns with the adverse effects of exposure to hazardous substances are widespread and ongoing.

Terms of Reference

13. The Terms of Reference for this Inquiry are set out in full in Appendix A. The principal objective of this Inquiry is to identify any gaps in the availability and adoption of best practice systems for the management of glutaraldehyde, aldehydes and organic solvents (the Hazardous Substances) in the health sector, the printing industry and the manufacturing sector, and why those gaps exist.
14. To achieve that principal objective, the Inquiry is directed to:
 - review the nature and extent of the adverse health consequences associated with the Hazardous Substances
 - identify and consider the overall legislative framework that governs safety and health issues in relationship to the Hazardous Substances
 - review the way employers and others manage the Hazardous Substances
 - review the extent and effectiveness of the relationships between those manufacturing, those storing and transporting, those using and those disposing of, the Hazardous Substances.

15. Whilst the Terms of Reference direct the Inquiry to “be informed by individual examples and situations”, at the same time they provide that “it is not the purpose of this Inquiry to allocate blame or accountability in relation to any particular situation, incident or exposure”.
16. This aspect of the Terms of Reference was of particular significance. Many individual submitters expressed views highly critical of employers and of relevant government agencies, in particular OSH and ACC. It was not the role of the Inquiry to investigate or make findings as to the merit of those criticisms in individual cases. The Inquiry’s task was, rather, to learn from both the good and bad experiences of the past and draw lessons for the future.

What the Inquiry did

17. Shortly after the announcement of the Inquiry by the Minister of Labour, the Hon. Margaret Wilson, on 26 November 2002, the Inquiry produced a booklet *Guidelines for Participation*. The booklet contained the Inquiry’s Terms of Reference and information on how contributions to the Inquiry could be made.
18. A website was established to assist in publicising the Inquiry. This carried the Minister’s announcement and a copy of the *Guidelines for Participation*. In December the Inquiry secretariat sent out in excess of 100 copies of the Guidelines to individuals, relevant organisations and departments, informing them of the opportunity to provide information to the Inquiry and participate by making submissions and attending hearings. A list of the individuals and organisations to whom the Guidelines were sent is set out in Appendix B.
19. The Inquiry spent December 2002 and January 2003 obtaining information from organisations in the public sector, from employer and employee representatives, and from printing, manufacturing and other organisations that had a direct involvement with the Hazardous Substances. Organisations visited in this period included OSH, Ministry of Health, Business New Zealand, the New Zealand Chemical Industry Council Inc., ACC, the New Zealand Council of Trade Unions, Printing Industries New Zealand, Printing & Allied Industries Training Council Inc., Ministry for the Environment, and ERMA New Zealand. A number of meetings were also held with representatives of the SNFTAAS network.
20. Submissions to the Inquiry closed on 17 February 2003. The Inquiry received 120 submissions from individuals, organisations, chemical manufacturers, unions and business interests. A list of those making submissions to the Inquiry and a brief indication of their subject matter is set out in Appendix C.
21. As will be discussed in a number of sections of this Report, the largest number of submissions received (60 out of 120) were from radiographers and nurses.
22. Public hearings commenced in Wellington on 18 March 2003, and were also held in Auckland, Christchurch, and Nelson. The Inquiry met with a number of submitters in Whangarei. In addition, telephone interviews were conducted with three submitters who wished to be heard but who were unable or unwilling to attend public hearings.

23. The Inquiry arranged a number of site visits to see workplaces first hand and to gain a better understanding of workplace practices. The Inquiry:
- made visits to a number of health sector workplaces in particular. The Inquiry appreciated the co-operation of hospitals and health practices that were visited by the Inquiry. These visits focused mainly on glutaraldehyde use in radiography and endoscopy units, together with the use of formaldehyde and solvents in laboratories
 - met with the suppliers of the relevant equipment and chemicals to the health sector
 - visited a number of workplaces in the printing and boat building sectors. These included a large newspaper publisher, a flexigraphic printing company, a small screen printing plant, a fibreglass powerboat factory and a large yacht factory.
24. The Inquiry made official requests to organisations in Canada, Australia, USA and the United Kingdom. A particularly helpful reply was received from the Health and Safety Executive in the United Kingdom.
25. The Inquiry held discussions with a number of staff members in OSH and ERMA New Zealand, and undertook a series of meetings with occupational physicians who work directly with ACC and OSH to discuss issues relating to the nature and incidence of the adverse health effects of exposure to the Hazardous Substances.
26. The Inquiry reviewed and collected a very large volume of technical and professional information. Massey University undertook a formal literature review on behalf of the Inquiry, and literature was also sourced from government agencies, particularly through OSH, as well as from a wide range of websites.
27. In addition to formal submissions, the Inquiry received written information from government and non-government sources. Government agencies who assisted the Inquiry with information included ACC, ERMA New Zealand, the Ministry for the Environment, and the Ministry of Health. Non-government sources of information included Agresearch Ltd., the Boating Industries Association of New Zealand Inc., Dow Chemicals (Australia) Ltd., Institute of Environmental Science and Research Ltd. (ESR), the New Zealand Chemical Industry Council Inc., the New Zealand Society of Gastroenterologists, the New Zealand Veterinary Association Inc., and Printing Industries New Zealand.

Comment on Submissions

28. The Inquiry is appreciative of the many individuals and organisations who made submissions, and also of those people who made the effort to appear at public hearings or otherwise speak to the Inquiry on their submissions.
29. For many of the individuals involved, the preparation of those submissions, and particularly appearing at hearings, involved revisiting very painful memories and carried an emotional toll. No one who read the submissions, or listened to individual submitters speak in person, would have remained unmoved by the events described or have been left in any doubt as to the very real pain and suffering those events had involved. Whilst

there is debate about proper diagnosis, and cause and effect, that reality should not be forgotten.

30. The Inquiry also wishes to acknowledge the positive way in which those individuals responded to the Terms of Reference. There was some disappointment that the Terms of Reference did not include questions of blame or accountability. Notwithstanding that disappointment, the great majority of individual submitters did seek to draw from their own personal experiences more general lessons on workplace health and safety issues and to recommend improved practices for the future.
31. It had been the Inquiry's original intention to publish submissions on its website, following the practice now commonly adopted where submissions are made by interested persons and organisations on matters of public policy. As the Inquiry reviewed the submissions, it became apparent that publication would not always be appropriate. The submissions dealt, in many cases, with personal and private matters. Numbers of submitters expressly reserved confidentiality for their submissions in whole or in part. Others did not make it clear whether they were willing for their personal information to be published, notwithstanding requests from the Inquiry to that effect on more than one occasion. Whilst others were happy for their submissions to be published, the Inquiry would have had to reach its own view on the appropriateness of publication, often because of references to other named persons or organisations. Anonymising the submissions, and otherwise preparing them for publication, would have been a very large task indeed. The Inquiry therefore decided not to publish any submissions on its website.
32. The Inquiry recognises that this decision may disappoint some submitters. The Inquiry hopes that this report will provide appropriate recognition of the submissions that were made to it.

Expert Support for the Inquiry

33. Expert support for the Inquiry was provided by Dr Hilda Firth and Dr Ian Laird.
34. Dr Firth is employed as a Senior Lecturer in Occupational Health in the Department of Preventive and Social Medicine at the University of Otago Medical School in Dunedin. She holds specialist medical qualifications in occupational medicine and public health medicine, and has a Ph.D in occupational epidemiology. Dr Firth has worked in the field of occupational health for over 15 years, including within the health sector.
35. Dr Laird is currently a Senior Lecturer in Occupational Health and Safety in the Centre for Ergonomics and Occupational Safety and Health, Massey University, Palmerston North. Dr Laird has a B.Sc. (Honours) from Victoria University of Wellington, a M.Sc. in Occupational Hygiene from the London School of Hygiene and Tropical Medicine, University of London, and a Ph.D. in Physiology from Massey University. Dr Laird worked for the Ministry of Health and Accident Compensation Corporation before taking his position at Massey University. In that capacity, he contributed on behalf of ACC to the glutaraldehyde guidelines prepared by Marjorie Gordon in 1986.
36. Mr Nick Matsas, an occupational hygienist on secondment from OSH as the Inquiry's analyst, also provided a great deal of support to the Inquiry on technical issues.

Outline of the Report

37. Section 2 is a high-level executive summary of this Report. Section 3 introduces the Hazardous Substances and summarises their use in industry in New Zealand. Section 4 provides an overview of the submissions the Inquiry received. Section 5 reviews the legislative framework. Section 6 reviews the nature of the adverse consequences associated with exposure to the Hazardous Substances. It also reviews evidence, including submissions made to the Inquiry, as to the extent to which such adverse consequences occur. Section 7 discusses issues relating to best practice. Section 8 reviews the way employers in New Zealand have managed the Hazardous Substances. In Section 9 relationships between various parties in connection with the manufacture, storage and transportation, use and disposal of the Hazardous Substances are briefly considered. Finally, Section 10 sets out the Inquiry's conclusions and recommendations.

Section 2 Executive Summary

38. The Inquiry identified a wide range of substances within the Terms of Reference. The characteristics of those substances, and many examples of their use in New Zealand, are recorded in this Report.
39. Glutaraldehyde, and its use in the health sector, received most attention in the submissions the Inquiry received. The issues raised by those submissions are a focus of this Report. Similar issues were raised relating to the Hazardous Substances more generally.
40. The occupational health risks of exposure to glutaraldehyde were not always managed well in the health sector in the past. That situation has improved more recently, but it is not clear that past problems have been fully addressed. Less information was provided to the Inquiry by submitters on the other Hazardous Substances. The information that was available reflected similar concerns in respect of occupational health risks as were raised in the context of the use of glutaraldehyde in the health sector.
41. The Inquiry concludes that the lessons to be learnt from past experience with managing the occupational health risks associated with exposure to the Hazardous Substances relate to two issues in particular. These are:
 - the latency of the adverse health effects associated with those risks
 - differing individual susceptibility to those risks.
42. Given those issues, particular attention needs to be paid in the occupational health area to ensure that the HSE obligations to identify hazards and inform employees of their existence, and to take all practicable steps to control those hazards, are *proactively* complied with. Better information needs to be available to assist employers to discharge those obligations. Better information on the range and incidence of occupational illness associated with the toxic effects of the Hazardous Substances would also greatly assist improved outcomes in this area.
43. The Inquiry's recommendations address a range of, the Inquiry hopes, practical steps to reflect the lessons learnt and to address the issues identified.

Section 3 An Introduction to the Hazardous Substances, Including their Characteristics and their Use in Industry

Introduction

44. The Hazardous Substances that are the subject of this Inquiry are glutaraldehyde, other aldehydes and organic solvents as used particularly, but not only, in the health, printing and manufacturing sectors. They also include other organic compounds used in those sectors that the Inquiry considers may be similar in their adverse health effects. This is a very wide range of substances. The emphasis given in this overview to particular substances reflects the overall weight given to them in submissions to the Inquiry and in the Inquiry's investigations.

Glutaraldehyde

45. Glutaraldehyde is an aldehyde used in the health, manufacturing and agricultural sectors. It is also used in scientific research. It is liquid at room temperature, and is usually supplied as a concentrated solution in water. It is more volatile in concentrated form than in working solutions.
46. In the health sector, glutaraldehyde has two principal uses: as a hardening agent in x-ray film developing processes and as a cold high-level disinfectant.
47. Prior to the introduction of automatic x-ray processing in the 1960s, developing was carried out in a darkroom using tanks or trays of chemicals into which film was manually dipped. The radiologist would often read the x-ray in the darkroom after developing (revealing the image), but before fixing (making the image resistant to change when exposed to light). In automatic film processors, the x-ray film is developed by being carried by rollers through a series of containers of chemicals enclosed within the processing machine. Glutaraldehyde was introduced into the developing chemicals to prevent damage to the film within the processor and during the rapid drying process.
48. Early automatic processors were installed in 'a hole in the wall' of the darkroom. The radiographer fed the undeveloped film into the processor from within the darkroom, and the dry developed and fixed film was collected and examined on the light side. Mixing of processor chemicals often occurred within the darkroom. The heat associated with the developing process, together with the inherent volatility of the chemicals involved, resulted in evaporation both within the dark room and on the 'light side'. If the workplace had inadequate ventilation, radiographers could be exposed to processing chemicals for long periods of time. Manual mixing and handling of the chemicals also involved the possibility of contact through splashes and spills. From its introduction in the 1960s, glutaraldehyde was, until relatively recently, present in virtually all x-ray processing chemicals used in New Zealand.

49. Although glutaraldehyde-free developing solutions have been available since the early 1990s, the use of substitute products was slow to occur, generally because of concerns about image quality and durability. More recently, those concerns would appear to have been addressed. Some practitioners remain reluctant to replace glutaraldehyde systems for mammography x-ray processing, due to ongoing concerns as to image quality. That view is not shared by all. An increasing number of hospitals in New Zealand have now completely replaced glutaraldehyde wet-film processing with glutaraldehyde-free alternatives, including for mammography purposes. Digital, chemical free, x-ray systems are now available. These are being introduced slowly, typically in connection with the rebuilding of major hospitals.
50. Glutaraldehyde is today present in processing chemicals used for approximately 20% of x-ray images developed in New Zealand.
51. The other principal use of glutaraldehyde in the health sector is as a cold, high-level disinfectant for medical equipment that cannot be sterilised by methods involving high temperatures. It has been used mainly for instruments such as endoscopes and their accessories. It is usually used in a two-percent activated solution. In the past, endoscopes were cleaned manually by soaking in a container of glutaraldehyde solution, and injecting the solution through the inside of the scope. With this method, the operator could be exposed to glutaraldehyde from skin contact or from inhaling vapour from the uncovered container. Automatic washers are now available that, where properly used, mean the operator has virtually no contact with the chemical.
52. Submissions received also evidenced the use of glutaraldehyde to disinfect general surgical instruments and in other situations, eg. podiatry.
53. Substitutes for glutaraldehyde as a high-level disinfectant are now widely used. These include peracetic acid (eg. Steris) and ortho-phthalaldehyde, a less volatile dialdehyde (eg. Cidex-OPA). It is not possible to say exactly how much glutaraldehyde is still used for this application, but there has been wide adoption of the substitutes.
54. Glutaraldehyde is used in many other work situations. A glutaraldehyde solution is used in scientific research laboratories as a fixative for animal and plant tissue before viewing under electron microscopes. Many funeral directors use glutaraldehyde as a substitute for formaldehyde in the embalming of human bodies. It is estimated that 20–30% of embalming in New Zealand now uses glutaraldehyde.
55. In the agricultural sector, glutaraldehyde is used as a disinfectant for animal and plant bedding. It is applied as a spray to straw bedding used in chicken sheds and mushroom growing. Glutaraldehyde has been used in veterinary practices, as in hospitals, for cold high-level disinfection and as a component of automatic x-ray film processing chemicals. Changes in usage in veterinary practice have reflected those in hospitals, with alternative chemicals being used in both x-ray processing and high-level disinfection.

Other Aldehydes

56. The principal other aldehyde within the Terms of Reference is formaldehyde. Formaldehyde is a gas at room temperature. It is used most commonly as a formalin

solution (formaldehyde dissolved in water with a small amount of methanol as a stabiliser), and as the solid polymer paraformaldehyde.

57. Formaldehyde is used in the health sector in laboratories to prepare biopsy samples for examination, and as a disinfectant. Some hospital laboratories make up their own formaldehyde solutions, and decant these into sample containers that are sent to operating theatres and wards for sample collection. Other hospitals purchase the solution in a ready-to-use form. Formaldehyde can also be used as a fumigant to sterilise fume cupboards and laminar flow cabinets used for sterile pharmaceutical dispensing.
58. Formaldehyde is widely used in manufacturing, particularly as a component of plastic resin systems. For example, urea-formaldehyde resins are used in the manufacture of chipboard, medium-density fibreboard (MDF), and other wood products. Formaldehyde resins can also be a component of industrial wood glues.
59. In agriculture, formaldehyde is used as a fumigant. Newly laid eggs to be sold as eggs are fumigated with formaldehyde gas, as are incubated eggs just prior to hatching. Veterinary practices use formaldehyde in much the same manner as hospitals, mainly as a fixative for tissue samples to be examined by light microscopy.
60. Formaldehyde remains the main ingredient in embalming fluids used by funeral directors in New Zealand. It has also been used as a component in the developers in one-hour film processors present in shopping malls and photographic shops.
61. Formaldehyde can be a cause of indoor air-quality problems in both workplaces and homes, particularly through “outgassing” from new products manufactured using formaldehyde.

Organic Solvents

62. There is a wide range of chemicals that can be described as organic solvents. An organic solvent includes carbon-based molecules that are liquid at room temperature, and able to dissolve other molecules. Of greatest occupational health concern are those that are volatile, that is they evaporate at low temperatures, meaning people working with them can easily inhale the vapour. Many organic solvents are also lipid or fat soluble, meaning they can cross through the skin, lung surfaces and other body membranes into the blood stream.
63. Organic solvents are widely used in New Zealand workplaces. Spray painters, printers and boat-builders have been identified as the groups with the greatest risk of solvent exposure.

Use of Organic Solvents in the Health Sector

64. In the health sector the main use of organic solvents is in laboratories, where solvents such as xylene, acetone and alcohols are used to de-water and stain tissue samples

prior to examination under the microscope. Processes such as the manufacture of artificial limbs and walking aids also use solvent-based glues and resins.

Use of Organic Solvents in the Printing Sector

65. Solvents are widely used in the printing sector. Their use depends on the particular printing process involved, the type of ink being used and the material being printed on. Newspaper printing uses light grade mineral oils as solvents to carry the pigment into the paper. As the newsprint absorbs the ink, it is touch dry immediately. Other materials such as glossy paper or plastic do not absorb ink, so the ink itself has to dry in a very short time-frame, sometimes in only a matter of seconds. Solvent-based inks facilitate this process. Some printing techniques have a drying stage as part of the process. Once the ink is applied, the printed plastic or paper is rapidly dried in heating tunnels before stacking. Some solvent-based inks can now be replaced by solvent-free inks, set by exposure to UV light.
66. Other, often more volatile, solvents are used as cleaners in a range of situations. Cleaning printing machinery to a very high standard between uses is of critical importance to the quality of the subsequent run. Efforts have been made in recent years to replace some of the more volatile solvents with viable alternatives. One example is the fruit extract limonene, which is sold under various brand names as a general cleaner. Whilst suitable for a wide range of cleaning tasks, more effort is often required to achieve an acceptable outcome.

Use of Organic Solvents in the Manufacturing Sector

67. Organic solvents have a multiplicity of uses in the New Zealand manufacturing sector. Based on the information available to this Inquiry, more significant uses occur in spray-painting, fibreglass boat building, furniture manufacture and clothing manufacture.

Use in Other Sectors

68. Examples of other sectors where organic solvents are used include resin flooring systems in the construction sector and glues for joining PVC pipes by plumbers.

Other Organic Compounds

69. The Inquiry identified a number of other organic compounds used in the health, printing and manufacturing sectors that could be considered to cause similar problems.

X-Ray Processing

70. Apart from glutaraldehyde, other organic (and inorganic) compounds are used in x-ray processing chemicals.

Isocyanates

71. Isocyanates are another volatile organic compound. They are used primarily in the manufacture of rigid or flexible foams, and in paint systems. Isocyanates are used to manufacture moulded foams such as for the seats of office chairs. Soft foams are also used to fill cavities in building and manufacturing operations. Rigid foams are used for moulded plastic parts in furniture manufacture. Isocyanates are used in one- and two-pot polyurethane paint systems.

Epoxy Compounds

72. Epoxy compounds are used in resin systems for applications such as glues and boat building. In boat building, epoxy is used in association with wood and rigid foam construction. It can be used as a liquid, or in pre-impregnated carbon fibre sheets. Epoxy compounds used in resins are not highly volatile, but some of the additives used are. Chemicals such as amines and anhydrides that are used to help cure the resins are important in terms of health effects.

Methyl Bromide

73. Methyl bromide is a gas at 'room' temperature. It is used as a fumigant in New Zealand for imported goods and for some manufactured goods prior to export.

Section 4 Submissions – An Overview

Introduction

74. The Inquiry received a total of 120 submissions. The information provided by those submissions is of particular relevance to Sections 5 and 7 of this Report, and will be referred to in some detail in those sections. It is also of particular relevance to the principal objective of the Inquiry, the identification of gaps in the availability and adoption of best practice for the management of the Hazardous Substances. This section of the Report provides an overview of the submissions.
75. The submissions can be categorised into three principal groups:
- those that related to the use of the Hazardous Substances in the health sector
 - those that related to the use of the Hazardous Substances in the printing and manufacturing sectors
 - those that addressed issues relating to the use of the Hazardous Substances and the Inquiry's Terms of Reference more generally.
76. The great majority of the submissions the Inquiry received, 72 in total, fell into the first group. A number of submissions were also received that were on the margins of, or outside, the Terms of Reference.

Health Sector Submissions

77. The submissions the Inquiry received relating to the management of the Hazardous Substances in the health sector fell into four groups. These were:
- submissions from individuals based on personal experiences of exposure (60)
 - submissions from health sector employee representative organisations (2)
 - submissions from hospitals (3)
 - submissions relating to laboratory users of the Hazardous Substances (7).
78. Two submissions were also received from suppliers of equipment and chemicals.
79. Submissions about individual experiences raised many issues relating to the use of the Hazardous Substances, and glutaraldehyde in particular. Those issues, in general terms, focussed on:
- poor workplace practices
 - the adverse effects experienced, and difficulties relating to the recognition of, and response to, those adverse effects by the medical profession, OSH and ACC
 - lessons for the future.

The SNFTAAS network, represented by Phillipa Martin, also provided a comprehensive submission on issues relating to exposure to glutaraldehyde and others of the Hazardous Substances.

80. Submissions from health sector employee organisations and hospitals dealt with similar issues, the latter focussing more on the current application of best practice.
81. Submissions relating to the laboratory use of the Hazardous Substances, and glutaraldehyde and formaldehyde in particular, focussed on the absence of any suitable substitutes for those substances.
82. A number of submissions from the United Kingdom, Australia and the United States were also received relating to the risks of exposure to glutaraldehyde. Whilst these submissions, to the extent they referred to events overseas, were outside the Terms of Reference, they reflected the experiences of the New Zealand health workers who made submissions.

Printing and Manufacturing Sector Submissions

83. Submissions concerned with occupational exposure to the Hazardous Substances were received from or about 22 individuals in a range of workplaces in the printing and manufacturing sectors. These comprised six printers, three boat-builders, and a number of individuals from a range of other workplaces, for example, a supermarket, a jewellery manufacturer, a plumbing business, a tannery, a machine shop, a plastics factory, a general office and a joinery factory.
84. Those individual submissions raised a wide range of issues but, in general terms, focussed on working conditions and the effects workplace exposures have had on the submitters' health.
85. Submissions were also received from two employer organisations in these sectors (printing and plumbing).

General Submissions

86. Both Business New Zealand and the New Zealand Council of Trade Unions made submissions to the Inquiry. Business New Zealand questioned the need for the Inquiry. They stated that, in their opinion, there was both adequate regulation and adequate official guidance material available for the effective management of hazardous substances in workplaces.
87. The New Zealand Council of Trade Unions submission examined some ideas used in other countries for managing exposure to hazardous substances in workplaces. The submission also promoted the right of workers to know about the substances they use, and the right to be involved in managing those substances in the workplace. It also advocated the involvement of workers in the process of writing guidelines and codes of practice.

Submissions outside the Terms of Reference

88. The Inquiry received a number of submissions that were outside the Terms of Reference. These included submissions on environmental issues, and smoking in the workplace. Submissions were also received on methyl bromide.
89. Methyl bromide is an organic compound used to fumigate goods. In the submissions received, methyl bromide was being used to fumigate imported goods. As such, that was a use that did not appear to fall within the Terms of Reference. Methyl bromide fumigation can, however, also be used as a process to 'finish' manufactured goods prior to export, where it would come within the Terms of Reference. Accordingly, those submissions were considered.

Section 5 The Legislative Framework Governing Safety and Health Issues in Relationship to the Hazardous Substances

Introduction

90. The Terms of Reference direct the Inquiry to:

“Identify and consider the nature, scope, and content of, and the relationship between, the various elements of the legislative framework that govern safety and health issues in relationship to the hazardous substances”.

91. This is not a straightforward task. The relevant legislative framework is complex and overlapping. The principal elements of that legislative framework, as it currently¹ exists, comprise:

- the Health and Safety in Employment Act 1992 (HSE)
- the Hazardous Substances and New Organisms Act 1996 (HSNO), including provisions of the repealed Toxic Substances Act 1979 and Dangerous Goods Act 1974, which are continued on a transitional basis by Parts XIII and XIV respectively of HSNO
- the Injury Prevention, Rehabilitation and Compensation Act 2002 (IPRC).

92. Each of these Acts is supported by regulations, including (in the case of HSNO) regulations under predecessor Acts, which continue on an interim basis to support the transitional provisions of HSNO. There are other elements that complete the legislative framework². Given the focus of the Terms of Reference on the workplace management of the Hazardous Substances, the Inquiry considers this review should address the principal elements named above, as they are the ones that most directly impact on workplace issues.

93. This section of the Report summarises those principal elements as they relate to health and safety issues in relationship particularly to the toxic effects of the Hazardous Substances. It then addresses the more difficult question of how these elements interact. How the various pieces of legislation have worked in practice, for example as regards the management of glutaraldehyde in the health sector, is not commented on in this section, but is reviewed in subsequent sections of the Report.

¹ Many of the submissions the Inquiry received referred to events which had occurred over a significant period of time, in some cases up to 20 or more years ago. This section summarises the legislative framework as it exists today. Fairly obviously, the current legislative framework was not in place at all relevant times. HSE was enacted in 1992, HSNO in 1996. Whilst accident compensation was first introduced in 1972, there have been a number of significant changes to the basis of the scheme since then, as well as countless minor changes. In general terms, this report does not consider the provisions of prior legislative arrangements.

² For example, the Building Act 1991 (safe storage of hazardous substances), the Health Act 1956 (territorial local authority control of nuisances, offensive trades and handling and storage of noxious substances) and the Land Transport Act 1993 (transport of hazardous substances on land).

The Health and Safety in Employment Act

Objective of HSE and Core Duties

94. The objective of HSE is to promote the prevention of harm to all persons at work, or to other persons in, or in the vicinity of, places of work. That objective is to be achieved under HSE by a range of methods. Those methods are given effect by the operative provisions of HSE. At the heart of those operative provisions is section 6. Section 6 imposes on employers a duty “to take all practicable steps to ensure the safety of employees at work”.
95. The concept of safety is encapsulated in three important inter-linking definitions:
- ‘safety’ is the state of being not exposed to or being free from hazards
 - a ‘hazard’ is a cause of harm
 - ‘harm’ is illness or injury, and includes physical and mental harm caused by work-related stress.
96. Accordingly, the section 6 duty is to take all practicable steps to ensure that employees are not exposed to causes of illness or injury. The general section 6 duty is supported by an obligation in section 7 to ensure that effective methods exist for systematically identifying existing and new hazards, and for recognising significant hazards. Significant hazards are ones that cause serious harm (defined in the First Schedule of HSE), and harm that occurs over time or whose severity depends on the frequency or extent of exposure to the hazard in question.
97. Once a significant hazard has been identified, an employer is then under a hierarchy of obligations to:
- eliminate, or
 - isolate, or
 - minimise and protect employees from, and monitor their exposure to,
- that hazard.
98. The important qualification is that the duty is generally to take all practicable steps to achieve the stated objective. The phrase ‘all practicable steps’ is extensively defined in HSE. It means, in effect, all steps that are reasonably practicable having regard to a range of factors including:
- the nature and severity of the potential harm in question
 - the state of current understanding of the likelihood of the harm occurring in the absence of successful intervention
 - the current state of knowledge of means of avoiding the harm
 - the availability, effectiveness and cost of those means.
99. The Courts have considered the concept of ‘all practicable steps’ on a number of occasions. Beyond, however, acknowledging that what is reasonably practicable in terms of HSE is a “matter of fact and degree in each particular case”, the cases provide little elaboration on the statutory definition itself. What is clear is that a balance of a

number of factors is required, emphasising the conditional nature of the obligation to act to mitigate a hazard.

Supporting Obligations

100. The core duties of ensuring safety (section 6), hazard recognition (section 7) and hazard mitigation and protection (section 8) are supported by a range of other employer obligations. These include duties to:
- give employees results of monitoring of employees' exposure (section 11)
 - provide employees with useable information about emergencies, identified hazards, and location of safety equipment (section 12)
 - ensure responsible employees have knowledge of, and are trained and supervised to avoid, harm (section 13).
101. HSE also places a duty on employees to take all practicable steps to ensure their own safety at work, including by using protective equipment provided by an employer, and to ensure the safety of others, as that may be affected by their own actions or inactions.
102. With effect from 5 May 2003, Part IIA of HSE imposes a new series of duties on employers, in essence requiring employee participation in the systematic management of health and safety risks in workplaces.

General Provisions

103. The 'duties' and 'standards' provisions of Parts II and III of HSE are supported by a range of 'general provisions' in Part IV. These include the reporting of accidents and serious harm by employers and others, control over accident sites, employees' rights to refuse work that may cause serious harm, the role of inspectors and departmental medical practitioners and a range of provisions relating to the enforcement of the Act.

Regulations

104. As noted above, the generic and non-prescriptive scheme of HSE replaced any number of industry specific, and prescriptive, schemes. Part III of HSE, entitled "Standards", provides for the promulgation of specific regulations and also for formal approval by the Minister of codes of practice. These are of direct relevance to the Terms of Reference as they relate to "the availability and adoption of best practice systems for the management of hazards".
105. Regulations may be passed to impose duties relating to health and safety, by definition more detailed than the duties imposed by HSE itself (section 21), or to provide for a range of other administrative and substantive matters (section 23).

106. The Health and Safety in Employment Regulations 1995 contain a number of general and specific duties applying to employers and others. Except in the case of duties imposed on manufacturers and suppliers of plant, none are of particular relevance to this Inquiry.
107. A small number of industry and hazard specific regulations have been promulgated. They do not relate to the management of the Hazardous Substances.
108. Fewer regulations have been promulgated than would appear to have been the original intention. The Inquiry understands, based on comments made in the course of its enquiries on behalf of OSH, that many of the pre-HSE industry or hazard specific schemes were intended, notwithstanding their repeal by HSE itself, to have subsequently been continued under HSE as regulations. That proved difficult to achieve. The old prescriptive regulations were not easily adapted to the new regime. The then Minister of Labour decided in 1995 that regulations should only be made for situations which could not be otherwise enforced under HSE. OSH continues to follow this policy today in its approach to recommending regulations.

Codes of Practice

109. Codes of practice are, in general terms, 'preferred work practices or arrangements' for protecting people from hazards. A court is entitled to have regard to a relevant code of practice in determining whether or not a person charged with failing to comply with any provision of HSE complied with that provision. The Inquiry's understanding is that, in practice, compliance with an Approved Code of Practice would generally be regarded as discharging the 'all practicable steps' duties.
110. Thirty-one Approved Codes of Practice have been formally recognised. Those relevant to this Inquiry relate to the management of substances hazardous to health, to isocyanates, to photoengraving and lithographic processes and to timber preservatives and antisapstain chemicals.
111. The Approved Code of Practice for the Management of Substances Hazardous to Health (*MOSHH ACOP*) is of particular significance under the Terms of Reference. The *MOSHH ACOP* is intended to provide a practical guide on how to comply with HSE as regards the risk of occupational illness due to exposure to substances hazardous to health.
112. Also of relevance is the wide range of less formal publications prepared or published by OSH, or by others in association with OSH. These will be referred to later in this Report.

The Hazardous Substances and New Organisms Act

Introduction

113. HSE takes a generic, and reasonably linear, approach to workplace health and safety issues. By contrast, HSNO creates a complex and multi-dimensional approach to the management of hazardous substances.³
114. The purpose of HSNO is to protect the health and safety⁴ of people in communities by preventing or managing the adverse effects of hazardous substances. To achieve this object, HSNO provides a systematic approach to identifying hazardous substances and to the controls that apply to hazardous substances. HSNO provides that no hazardous substance may be manufactured or imported without the approval of ERMA.⁵ In granting that approval, ERMA must give the relevant hazardous substance “one or more hazard classifications in accordance with the intrinsic properties of that substance and the degree of hazard of that substance” (section 77(i)).
115. It is the HSNO approach to the classification of hazards, and to the subsequent imposition of controls, which introduces much of HSNO’s complexity.

The HSNO Hazard Classification System

116. Section 74 of HSNO provides for the establishment by regulation of a hazard classification system.
117. Hazardous substances are defined by reference to six intrinsic hazardous properties. One of these properties relates to substances that are intrinsically toxic.⁶ Toxicity is defined to mean capable of causing ill health in, or injury to, human beings. This definition makes it clear that the Hazardous Substances that are the subject of this Inquiry are hazardous substances for HSNO purposes.
118. The section 74 classification system is required to provide, for each of the six intrinsic hazardous substance properties recognised by HSNO, a number of degrees of hazard, including a degree of hazard below which any substance is not considered hazardous. This scheme is set out in The Hazardous Substances (Classification) Regulations 2001 and The Hazardous Substance (Minimum Degrees of Hazard) Regulations 2001. In the case of toxic substances, the classification regulations identify 19 degrees of hazard.

³ The aspects of HSNO dealing with new organisms are not relevant to this Inquiry. This Report does not comment on them. In this Section, the phrase “hazardous substances” has the meaning given to it in HSNO (see paragraph 117).

⁴ The concepts of health (including ill health), safety, and injury, are not defined in HSNO.

⁵ ERMA is the decision making authority for HSNO.

⁶ The other five categories are explosiveness, flammability, a capacity to oxidise, corrosiveness and eco-toxicity.

These range from 6.1A (substances that are acutely toxic) to 6.9B (substances that are harmful to target organs or systems).

Exposure Controls

119. Section 75 provides for regulations to prescribe controls for each degree or type of hazard identified by the section 74 classification scheme. In general terms, the purpose of the controls imposed by the section 75 regulations is twofold. First, to reduce the likelihood of unintended instances of the occurrence of the hazards in question. Second, to control any exposure to the hazard, and therefore to control the use of the hazardous substances in question. Thus, in the case of toxic substances, the purpose of control is to reduce the likelihood of unintended exposure and to control the adverse effects of any exposure.
120. These controls for toxic substances are contained in the Hazardous Substances (Classes 6, 8 and 9 Controls) Regulations 2001 (the Control Regulations). Part I of the Control Regulations provides a number of general controls applying to one or more Class 6, 8 or 9 substances. These controls relate to records of application or discharge, handling equipment, protective clothing and equipment, requirements for substances to be under the control of approved handlers or locked away, and restrictions on carrying Classes 6, 8 or 9 substances on passenger service vehicles.
121. Part II of the Control Regulations provides separate controls for each of Class 6, 8 and 9 substances. These involve setting what are known as potential daily exposure values and tolerable exposure limits.
122. The controls to be applied, in the case of toxic hazardous substances, involve a complex series of determinations of acceptable and potential daily exposure values and tolerable exposure limits. Those controls, however, do not apply in a place of work to which members of the public do not have access. For places of work, HSNO takes a different approach.
123. The requirement for control over potential exposure is less absolute. Whereas it is a requirement for ERMA to set exposure values and exposure limits, ERMA may, but is not required, to set workplace exposure standards. In particular, ERMA may only set a workplace exposure standard where toxicological and industrial hygiene data available for the substance is sufficient to enable a standard to be set.
124. ERMA, when it sets workplace exposure standards, is obliged to adopt a value proposed by OSH for the substance concerned. As OSH has already set workplace exposure standards for a wide range of substances, these become workplace exposure standards for HSNO purposes as well.
125. The purpose of a workplace exposure standard is to protect persons from the adverse effect of toxic substances. The degree of protection a workplace exposure standard is required to achieve is not specified.
126. Once a workplace exposure standard has been set, the person in charge of a place of work must ensure that a person is not exposed to a concentration of a substance that exceeds the workplace exposure standard for that substance. That obligation, unlike the 'all practicable steps' in HSE, is absolute. On the other hand, it is clear that the 'all

practicable steps' HSE obligations are not completely discharged by ensuring exposures are no greater than the relevant workplace exposure standard.

Further Controls

127. Section 76 provides for regulations for further controls on hazardous substances, again by reference to the section 74 degrees or types of hazard classifications. These controls relate to:

- packaging and containers
- identification, labelling and advertising
- disposal
- emergency management
- tracking
- qualifications for handlers.

128. These controls are set out in a set of six further regulations.⁷ All of these further controls impact on the management of hazardous substances in workplaces. Of particular significance are the regulations relating to the identification of hazardous substances (the Identification Regulations) and the obligations introduced, for the first time, for a systematic approach to preparing and providing information relating to hazardous substances in workplaces.

129. Part I of the Identification Regulations imposes general duties on suppliers, and persons in charge of, hazardous substances. Part 2 applies to place of work, and imposes duties on persons who supply hazardous substances to, and who are in charge of, places of work. The obligation on suppliers is to provide information. The obligation on persons in charge of the place of work is to ensure that information is available to the people who 'handle' the substances in question.

130. In general terms, the information that must be provided is comprehensive. Such information must be available to a person handling the substance concerned within 10 minutes, and must be readily understandable by a fully trained worker. Compliance with the Identification Regulations, in effect, mandates the provision and availability of material safety data sheets in workplaces.

OSH Enforces HSNO in Workplaces

131. Pursuant to section 97(a) of HSNO, OSH is responsible for enforcing HSNO in workplaces.

⁷ Hazardous Substances (Packaging) Regulations 2001, the Hazardous Substances (Identification) Regulations 2001, the Hazardous Substances (Disposal) Regulations 2001, the Hazardous Substances (Emergency Management) Regulations 2001, the Hazardous Substances (Trucking) Regulations 2001, and the Hazardous Substances and New Organisms (Personnel Qualification) Regulations 2001.

HSNO Codes of Practice

132. Under HSNO the controls are generally expressed by reference to performance standards that must be achieved. HSNO itself does not give guidance, or contain prescriptive measures, as to the manner in which those performance standards are to be achieved.
133. Section 78 of HSNO provides for codes of practice, being methods of implementing specific requirements included in regulations made under HSNO. Where a Code of Practice exists, compliance with the Code of Practice is a defence to a prosecution for failure to comply with the relevant controls. The Inquiry understands that ERMA is shortly to approve the first HSNO Code of Practice. Prepared by the New Zealand Chemical Industry Council, this code relates to *Signage for Premises Storing Hazardous Substances and Dangerous Goods*. It provides an approved method, therefore, for complying with the site signage requirements of the Identification Regulations.
134. The New Zealand Chemical Industry Council is also currently working towards finalisation of an approved code for (material) safety data sheets. A third code, *Labelling*, will complete a set of approved codes for compliance with all aspects of the Identification Regulations.
135. The work involved in preparing these codes indicates the resources required to achieve full implementation of HSNO.

Transitional Provisions

136. HSNO is yet to come into force for substances previously regulated pursuant to the Toxic Substances Act 1979, toxic substances regulations, the Dangerous Goods Act 1974 and dangerous goods regulations, and a number of other specific regulatory frameworks. HSNO requires that these traditional, and less systematic, approaches continue to apply until such time as regulations are promulgated under section 160 of HSNO. At that point, substances previously regulated under such provisions will be deemed to have been assessed under HSNO, and will be given by that deemed assessment one or more hazard classifications under section 77, and the HSNO controls will then apply in place of the current controls. Initiatives have recently been announced which are intended to streamline this whole process. The last date for transfer of the Hazardous Substances is, in general terms, currently 1 July 2006.
137. Accordingly, at the present time, the Hazardous Substances continue to be regulated under the transitional provisions of HSNO.
138. These traditional provisions do not directly address workplace management. Rather, they generally relate to the way in which substances may be sold, and are to be packaged and labelled, stored and advertised. Except as regards labelling and storage, these controls are not directly relevant to the way in which hazardous substances are used in workplaces.

Injury Prevention, Rehabilitation and Compensation Act 2002 (IRPC)

Introduction

139. The third element in the legislative framework is New Zealand's no-fault accident compensation scheme. Dating back to the first Accident Compensation Act 1972, the right to sue for personal injury by accident was abolished in exchange for universal, no-fault, injury by accident cover.
140. Promoting safety and preventing accidents were recognised from the outset as being closely linked to the question of compensation.
141. That accident compensation scheme has been reviewed from time to time during the past 30 years in response to various pressures and policy viewpoints. It is continued currently by IRPC, which came into force on 1 April 2002.
142. IPRC established injury prevention as a primary function of ACC, specified a new rehabilitation programme, provided a new framework for the collection, co-ordination and analysis of information across the whole of the injury prevention sector, and made a number of changes directly affecting claimants, including the re-introduction of lump-sum compensation and the provision of a code of claimants' rights.
143. IPRC's over-riding purpose is stated to be to enhance the public good and reinforce the social contract represented by the first accident compensation scheme. It is to do this by providing for a fair and sustainable scheme for managing personal injury that has, as its over-riding goal, minimising both the overall incidence of injury in the community, and the impact of injury on the community (including economic, social and personal costs).

Occupational Health and IPRC

144. When reviewing the IPRC in the context of adverse health effects associated with the Hazardous Substances, it is useful to distinguish between effects that occur at a particular point in, or over a short period of, time and as a result of one or more specific incidents of exposure, and those that occur gradually over time and may not be associated with specific instances of exposure. This distinction is important because of the distinction drawn by IPRC between personal injury caused by accident and personal injury caused by work-related gradual process, disease or infection.
145. The first question under IPRC is not whether a person has suffered harm from illness or injury at work, as is the issue under HSE, but whether an event has occurred for which cover is provided. Adverse effects from exposure to the Hazardous Substances could give rise to an entitlement to cover under IPRC in two ways:
 - as personal injury caused by accident, or
 - as personal injury caused by a work-related gradual process, disease, or infection.

146. In both instances, personal injury is required. Personal injury is defined to mean, essentially, death or physical injury and, in certain circumstances, mental injury.
147. The definition of accident includes, in addition to the core concepts of the application of, or sudden movement to avoid, a 'force or resistance' external to the body:
- the inhalation or oral ingestion of any solid, liquid, gas or foreign object on a specific occasion, and
 - the absorption of any chemical through the skin for a defined period of time not exceeding one month.
148. Cover could, therefore, be available for certain adverse effects associated with exposure to the Hazardous Substances under the 'personal injury by accident' definition. These would, given the distinction drawn above, tend to be acute instances of such adverse effects.
149. Occupational ill health (as opposed to classical accident-caused injury) often involves chronic exposure, that is exposure over long periods of time. Under IPRC, chronic ill-health, or personal injury caused by a gradual process, disease, or infection is not covered (there being no identifiable traditional 'accident'), unless the gradual process, disease or infection (which causes the personal injury) is:
- work-related, or
 - caused by medical misadventure, or
 - consequential on 'covered' personal injury (section 26(2) and section 20(2) (e) to (h)).
150. The concept of 'work-related' is defined by reference to the particular circumstances set out in section 30(2). The inclusion of a requirement to identify the presence of the section 30(2) circumstances is intended to evidence the 'work-related' nature of the gradual process, disease or infection. It creates a considerable hurdle in the way of a person who seeks cover under IPRC for occupational illness.
151. The application of section 30, and of the associated definitions, is a matter of some complexity. It raises the issue of the relationship between workplace sickness and disease generally, and the concept of personal injury. It also raises the difficult issue of the relationship between the concept of accident, and the occurrence of workplace disease, and other forms of illness. Two aspects of these difficult issues are of particular relevance. These are:
- the extent to which 'personal injury', as distinct from disease, must be established to gain cover
 - the necessity under section 30(2)(b) to find causal connections between the relevant properties and characteristics of the employment task or employment environment and the personal injury in question.
152. These complex provisions, and the specific way that ACC must therefore deal with personal injury caused by gradual process, disease or infection, are, in the Inquiry's view, central to understanding the difficult dynamics that surround certain occupational health issues in New Zealand. Many individual submissions, and the criticisms of ACC they contained, reflected those factors. Some people who had experienced acute exposures to the Hazardous Substances, and who therefore came within the personal injury by accident category, reported relatively positive experiences with ACC. Other

people, who had been exposed over time and who therefore came within the section 30 process or its predecessors, reported more negative experiences with ACC.

153. These provisions have changed over time, in a way that has impacted directly on ACC's response to occupational health claims. When first enacted, the Accident Compensation Act 1972 included in the definition of the term personal injury by accident "incapacity resulting from an occupational disease to the extent that cover extends in respect of the disease under sections 65 to 68 of this Act".
154. Under sections 65 to 68, entitlement to cover was dependent on total or partial incapacity for work "resulting from any disease" and "the disease being due to the nature of any employment". The relevant claim, however, could not be made more than a "prescribed period" after the cessation of employment.
155. Section 28 of the Accident Compensation Act 1982, as relevant, referred to "total or partial incapacity resulting from any disease, and the disease being due to the nature of any employment". In those circumstances, cover existed as if the disease were a personal injury by accident. Of relevance to the Inquiry, under the provisions of the 1982 Act the Accident Compensation Appeal Authority accepted a number of claims for multiple chemical sensitivity.
156. The current provisions of IPRC were first introduced in the Accident Rehabilitation and Compensation Insurance Act 1992. As can be seen from the foregoing analysis, the current provisions and, in particular:
 - the requirement for the disease to also constitute personal injury
 - the causal connection now required by section 30(2),

make occupational health claims more difficult than had previously been the case. In a decision in 2002⁸, the Accident Compensation Appeal Authority noted that it would be extremely unlikely for the multiple chemical sensitivity claims accepted under the 1982 Act to be accepted under the 1992 or the 1998 legislation.

157. These aspects of IPRC reflect ongoing debates within the medical and scientific communities regarding the status and recognition of disease. How much weight is to be given to an individual's perception of disease and ill health? How much weight should be given to the objective observation of the individual's well-being and a rational search for cause and effect? The two 'sides' that are often taken on these questions could be described as coming from an experiential or from a rationalistic, or scientific, point of view.
158. Central to such debates is the issue of causation. From a scientific point of view, two questions are asked about the symptoms or disease a specific person has, and the likelihood that a chemical exposure at work caused those symptoms or disease. The first question is could 'A' cause 'B', where 'A' is exposure to a chemical and 'B' is symptoms or disease? This question is a general one, and is central to considerations of multiple chemical sensitivity discussed later in this Report. The second question is specific to each individual case. If 'A' does or could cause 'B', in this situation did 'A' cause 'B'? This second question is central to the section 30(2) investigation.
159. In certain circumstances, difficulties arising from this second question are addressed by the terms of IPRC itself. Pursuant to section 30(3) and Schedule 2, a range of

⁸ *Wilde v ACC*, Cartright J, 20 November 2001, 10/2002.

occupational diseases are recognised presumptively as being associated with exposure to certain substances or work conditions. In these cases, the assessment of causation required by section 30(2) is not necessary.

160. However, this does not apply to the Hazardous Substances that are the subject of this Inquiry. They are not referred to in Schedule 2, and accordingly the provisions of section 30(3) are not available in cases of adverse health effects caused by exposure.
161. Recognising the complexity of matters related to work-related gradual process, disease or infection, section 31 of IPRC requires the appointment of a ministerial advisory panel on these issues. The function of the panel is to “provide independent and specialised advice to the Minister on any matter relating to work-related gradual process, disease, or infection”. The panel must keep under review, and may advise the Minister on: whether Schedule 2 should be amended; how ACC deals with claims for personal injury caused by work-related gradual process, disease, or infection; and the definition of work-related gradual process, disease, or infection.

ACC and Injury Prevention

162. Also of significance for this Inquiry are the safety and injury prevention activities of ACC. Injury prevention is included in the purpose statement of the Act and is a primary function of ACC. IPRC does not prescribe a structure for ACC to achieve and to deliver injury prevention, but it does require ACC to allocate funds and manage injury prevention. The injury prevention programmes must, under section 263 of IPRC, be likely to result in reductions in levy rates in either the short or the long term. The Government can also allocate money to ACC for injury prevention.
163. ACC has industry injury prevention programmes aimed at industries with high injury levels as well as associated high injury costs. The accredited employers’ programme, known as the ACC Partnership Programme, forms part of ACC’s discharge of this function. The philosophy underpinning the accredited employers’ programme is that employers require a financial incentive to encourage them to invest in improvements to their workplace health and safety programmes. If employers have to pay directly for the costs arising from workplace injury then employers have a financial incentive to invest in injury prevention in order to reduce these costs.
164. The Inquiry understands that there are approximately 1,200 employer entities in the programme, employing some 25.6% of the full-time work force. Participating employers range in size from 93 to 13,000 full-time employees. The programme is recognised by ACC as being most suitable for employers who have an ACC levy of greater than \$100,000 per annum. As these statistics indicate, this programme is not of particular relevance to small to medium enterprises. To encourage effective safety management practices in workplaces of all sizes, ACC has the Workplace Safety Management Practices (WSMP) program. Employers are able to qualify for discounts on the ACC levy of up to 20 percent. Unlike the Partnership Program, employers do not manage their own ACC claims.
165. ACC also carries out, in co-operation with OSH in some instances, a range of general and specific accident and injury reduction initiatives. The Inquiry understands that, currently, the practical focus is on reducing predominantly traumatic or acute injuries rather than long-term occupational disease.

Overview of Legislative Framework

166. As can be seen from the foregoing review, the legislative framework that governs health and safety issues in relation to Hazardous Substances is extensive and complex. Given that scope and complexity, it would be a brave person who would suggest the possibility that there may be gaps left in the framework! The general sense the Inquiry has as a result of its investigations is that the focus should be on making the existing framework work, rather than considering ways of adding to it. This is particularly the case with the HSNO scheme, which is still very much in its formative days, with much work remaining to be done to achieve full implementation.
167. The Inquiry does have two reservations as regards the completeness of the legislative framework.
168. The first reservation relates to the decision to provide the core elements of the implementation of HSE as regards hazardous substances – namely the detailed approach to the systematic management of substances hazardous to health – by way of an Approved Code of Practice rather than by way of regulation. The Inquiry's reason for this is not any general belief that regulation is necessarily more effective in the occupational health and safety area than codes of practice and guidelines. The Inquiry is of the view that, when it comes to the practical implementation of the HSE 'all practical steps' obligation, the arguments in favour of codes of practice and guidelines are compelling. The *MOSHH ACOP*, however, performs a different function. It contains the detail of behaviour patterns that are central to the practical discharge of an employer's duties under HSE. The Inquiry's concern is, therefore, that implementing those matters as an Approved Code of Practice may have left a degree of uncertainty, and have made enforcement of HSE more difficult than is appropriate.
169. The second reservation relates to the provision of material safety data sheets (MSDSs). The section 12 obligation to provide information to employees is recognised as being of central importance to the HSE scheme. Informing employees of the existence and nature of hazards, and of the steps to be taken to avoid or control exposure to those hazards, is fundamental to ensuring the safety of employees.
170. MSDSs are the internationally recognised way of providing such information. Manufacturers or suppliers of hazardous substances have, however, no specific obligation under HSE to provide MSDSs. Whilst there is a general assumption that such documents will be available to employers, and that employers should obtain MSDSs as part of discharging their OSH obligations, the current absence of any obligation to actually produce such MSDSs is anomalous. Concerns were also expressed to the Inquiry as to the quality of information provided by many MSDSs. Often such information was expressed in a very technical manner, making it difficult for the average person to understand.
171. In the Inquiry's view the more general conclusion to be drawn from this overview relates to the significance of the role played by HSE as regards the issue at the heart of the Terms of Reference, that is the management of the risks associated with the toxicity of the Hazardous Substances.
172. The operation of IPRC is based around the provision of cover for the personal injury by accident. The approach ACC brings to compensation is governed by IPRC, and its approach to injury prevention is significantly influenced by its compensation role.

173. HSE takes a broader approach, being aimed at the prevention of illness or injury to workers.
174. For HSNO, workplace control of the toxicity of the Hazardous Substances focuses particularly on protection through exposure control by reference to workplace exposure standards. This is complemented by requirements relating to approved handlers, protective clothing and emergency management. HSNO should also result in significantly improved information being provided in workplaces.
175. However, the HSE duties summarised by the 'identify, eliminate, isolate, minimise, protect' hierarchy of duties, continue to impact broadly on employer and employee behaviour.
176. Accordingly, it is clear to the Inquiry that HSE itself, and those duties in particular, should have, and should continue to be seen as having, a central role in occupational health and safety matters involving the toxic effects of the Hazardous Substances. This, in turn, emphasises OSH's role in these matters as the agency responsible for HSE and for the enforcement of HSNO in the workplace.
177. Finally, the extent of the obligation imposed on suppliers of plant and equipment by regulation 67 of the Health and Safety in Employment Regulations 1995 was not clear to the Inquiry. In particular, does that obligation involve suppliers providing detailed use instructions, for example relating to ventilation, to users of equipment? It is clear that regulation 67 relates to the plant and equipment itself. It is less clear that it relates to ancillary issues, such as the design of associated local exhaust ventilation, required to operate that plant and equipment safely. This is a matter which could usefully be clarified by OSH.
178. The issues raised in the preceding paragraphs are addressed in Recommendations 1 through 5 of this Report, set out in paragraphs 383 to 387.

Section 6 The Nature and Extent of the Adverse Health Consequences Arising from Exposure to the Hazardous Substances: Issues of Causation

Introduction

179. This Inquiry was specifically directed to review the nature and extent of the adverse health consequences associated with exposure to the Hazardous Substances, and to consider whether there were causative or other relationships between the Hazardous Substances and those consequences. This section of the Report summarises the results of this review.
180. These matters are, in some instances, the subject of much medical and scientific debate. More generally, there are few definite answers to the question of how extensive those adverse effects are, which the Inquiry understood to mean how frequently they occur.
181. It quickly became apparent that this Inquiry was not going to be able to resolve those debates or uncertainties. However, information provided by submissions and other information it considered did provide the Inquiry with a basis for comment on the matters it was required to review. This section summarises those findings to provide a context for the Inquiry's principal task of commenting on gaps in the availability and adoption of best practice for management of the Hazardous Substances. Not only is this section reasonably summary in nature, it endeavours to express some complex scientific and medical issues in lay terms.

Nature of Adverse Consequences of Exposure to the Hazardous Substances

182. In considering the nature of adverse consequences associated with exposure to the Hazardous Substances, the section first discusses glutaraldehyde, and refers to issues of causation relating to neurotoxicity. It then canvasses issues relating to the disease known as multiple chemical sensitivity, including its status and causation. Finally, it summarises adverse consequences of exposure to formaldehyde, organic solvents and other organic compounds within the Terms of Reference.

Glutaraldehyde

183. Exposure to glutaraldehyde, either in liquid or vapour form or both, is now generally accepted as being causally linked to irritation of the eyes, nose, throat, chest and skin, headaches, dermatitis, rhinitis (inflammation of the mucous membrane of the nose – runny nose) and asthma.

184. Internationally, glutaraldehyde is accepted as being a skin sensitiser. Increasingly it is also recognised as a respiratory sensitiser, and therefore as causing allergic as well as irritant asthma. In New Zealand, glutaraldehyde has been recognised as a sensitiser by OSH for many years.
185. Use of the words 'sensitisation' and 'allergy' specifically mean that the body has initiated an immune system response to a particular chemical, often through the mechanism of antibodies. Importantly, individuals who are sensitised to a particular substance will react to far smaller quantities of the substance than is the case for the general population. In 1998, the UK Health and Safety Executive withdrew their Occupational Exposure Standard for glutaraldehyde stating they could no longer identify a safe and achievable level below which respiratory sensitisation would not occur. The new, reduced, UK Maximum Exposure Level (MEL) of 0.05 ppm requires employers to reduce exposure as far below the MEL as is reasonably practicable. This is a similar, but stricter, approach to that taken by OSH to its equivalent workplace exposure standard for glutaraldehyde of 0.05 ppm also.
186. In New Zealand, exposure to glutaraldehyde, either as a cold sterilant or in x-ray processing chemicals, has also been accepted as causing neurotoxicity. Neurotoxicity involves damage to the nervous system. Symptoms range from reversible effects such as fatigue, through to less reversible effects such as memory loss or depression. Neurotoxicity is generally considered an adverse health effect from exposure to solvents. Following neuropsychological work by the late Dr Dorothy Gronwell of Auckland, a number of cases of glutaraldehyde-induced neurotoxicity have been officially recognised by both OSH and ACC. Exposure to glutaraldehyde would not appear to be recognised as causing neurotoxicity outside New Zealand. For example, in a very helpful response to a number of queries, the United Kingdom Health and Safety Executive commented, "We have no evidence at all that glutaraldehyde has any neurological effects"⁹. There continue to be differing medical views in New Zealand on this issue.
187. In a paper reviewing instances of exposure to glutaraldehyde, published in the *Shadows* magazine, Dr. Bill Glass spoke of the issue of 'cross sensitivity'. He described this as occurring where a reaction to one chemical 'crosses over' and becomes a more general reaction to other structurally unrelated chemicals. Just over half the people studied by Dr. Glass for the purpose of that article experienced this type of reaction.
188. Dr. Glass's reference to 'cross sensitivity' raises the vexed question of the condition known as multiple chemical sensitivity (or sensitivities). Multiple chemical sensitivity is also referred to as MCS, toxicant induced loss of tolerance (TILT), idiopathic environmental intolerance (IEI), '20th century disease' and a variety of other names. This Report will refer to it as MCS.
189. MCS was identified by a number of individual submitters as an adverse health effect caused by their exposure to the Hazardous Substances. This was particularly the case for many of the nurses and radiographers who made submissions. Submissions strongly advocated the case for the acceptance of MCS as a disease by the medical profession generally, and by ACC for compensation purposes in particular.

⁹ Letter from UK Health and Safety Executive to the Inquiry, 7 February 2003.

What is MCS?

190. MCS has a number of definitions. A reasonably typical consensus version is that MCS is “an acquired disorder with multiple recurrent symptoms, associated with diverse environmental factors tolerated by the majority of people, and not explained by any known medical or psychiatric disorder”.¹⁰
191. In lay terms, people with MCS react adversely and severely to a wide range of types and concentrations of chemicals encountered in every-day life by most other people without any adverse effects. A typical range of symptoms of MCS referred to in submissions to this Inquiry included – again in lay terms – severe loss of breath, asthma, heart palpitations, dizziness, muscular pain, nausea, fatigue, mood swings, lack of concentration and memory loss.
192. Central to the debate about MCS is that, for the most part, the complaints of ill health identified as constituting MCS are not supported by any clinical manifestation of disease. For example, if MCS does involve a sensitisation to chemicals, it should be possible to isolate antibodies and show by laboratory tests that an immune reaction is occurring. It has to date not been possible to confirm symptoms by these means. In the medical/scientific sense there is no measurable physiological evidence of the existence of MCS, and therefore of identified causal pathways.
193. Views on MCS, and whether or not it should be recognised as a disease, cover a broad continuum. At one end of that continuum, MCS is regarded as a spurious diagnosis for any number of separate health phenomena, many of them of psychological origin. At the other, MCS is seen as the disease of the 21st century, plain evidence that we are being poisoned by the world around us. In medical circles, proponents of a more traditional, evidence-based approach generally do not accept MCS as a disease, nor exposure to chemicals as its cause, though they are prepared to accept the reality of the symptoms associated with the label. Alternative, and in particular environmental, practitioners are generally receptive to concerns about adverse effects of chemical exposure. They worry less about issues of scientific certainty as to cause and effect, accept the illness identified by their patients, and treat that illness with a variety of approaches, often involving detoxification techniques. The advantages of their approach were repeatedly emphasised by submitters.
194. Various theories are advanced by those who advocate recognition of MCS to explain its cause. None of these have received general acceptance. Some, and in particular a theory known as ‘limbic kindling’ – relating to the development in the nervous system of patterns of responses to substances – are recognised even by some ‘traditionalists’ as being plausible.
195. MCS has received the greatest degree of official recognition in the United States. To quote an ERMA Generic Issues Report on MCS, “In the United States the legal ramifications of MCS are far ahead of the science”. In that report, ERMA noted research which identified courts and workers’ compensation boards in eight states recognising MCS as a physical disorder by 2000. MCS is recognised in the United States in a variety of other ways at both federal and state level.

¹⁰ Sparks P, 2000.

196. In New Zealand, the debate about MCS is closely related to, and influenced by, the way entitlement to compensation is determined under IPRC. As has been noted, entitlement to cover under IPRC depends on the establishment, even in cases of gradual process, injury or disease, of personal injury. In the absence of any generally accepted medical view recognising MCS as a disease, ACC's official position, as expressed to the Inquiry, is that:

“A physical injury must involve bodily harm or damage. As multiple chemical sensitivity syndrome does not have the basic requirement of being a physical injury, it cannot be seen to constitute a personal injury under the IPRC Act 2001.”¹¹

197. ACC does, in general, recognise that work-related diseases resulting from exposure to hazardous substances can constitute personal injury¹². A diagnosis of MCS, however, currently means that ACC does not consider issues of causation, as what has been caused (MCS) is not a condition or disease that would in any event provide an entitlement to cover.

198. The official ACC view has been supported by a number of district court decisions¹³, although the Inquiry is also aware of one review decision that accepts MCS is a condition that may give rise to coverage.

199. ACC's unwillingness to recognise MCS as a disease that can constitute personal injury was commented on adversely by many submitters.

200. The Inquiry also asked OSH what its views on MCS were. OSH does not have a formalised approach to this issue. It was therefore a little difficult for the Inquiry to determine OSH's view as an agency. The Inquiry's understanding is that OSH is more likely to accept MCS as a workplace issue under HSE if it can be linked to a high exposure event such as a chemical spillage. Although the OSH publication *Workplace Exposure Standards from 2000* recognises, as have previous versions of that publication, the issue of individual susceptibility to chemicals, OSH is less likely to accept the work relatedness of MCS if an individual's exposure to the relevant hazard is well below the exposure standard. In those circumstances, OSH may see the issue as an environmental one.

201. The Inquiry also spoke with a number of doctors who have been involved with OSH and ACC's response to employees who have associated MCS with workplace exposure to the Hazardous Substances. The views of those doctors reflected the general medical debate on possible causes of MCS and its status as a distinct disease. Notwithstanding those differences of opinion, all the doctors the Inquiry spoke to emphasised the importance of accepting the reality of MCS for the individuals in question, and the severity of the adverse consequences that can be associated with it. A number of those doctors recognised the difficulties created by IPRC's requirement for proof of personal injury, given the lack of medical consensus on MCS as a recognised disease. This situation was also seen as being compounded by the generally superior care considered to be available under IPRC, relative to the public health system generally. IPRC's emphasis on personal injury was also seen as promoting an

¹¹ Letter from ACC to the Inquiry of 28 April 2003.

¹² Letter from ACC to the Inquiry of 7 February 2003.

¹³ For example, *Robertson v Accident Compensation Corporation*, District Court, Auckland, 21 March 2001, Decision No. 58/2001.

unhelpful mind/body duality in the way treatment of occupational ill health was approached in New Zealand.

202. Based on its investigations, and its consideration of the submissions received, the Inquiry's view is that the following statement represents a sensible middle ground on MCS at the present time:

"It is currently unknown whether MCS is a distinct disease entity and what role, if any, the biochemical mechanisms of specific chemicals have in the onset of this condition. The workgroup finds that MCS is currently a symptom-based diagnosis without supportive laboratory tests or agreed-upon clinical manifestations. This dependence on symptom-based diagnosis has resulted in the absence of a uniformly agreed-upon case definition. The workgroup could locate no previously published reports of definite end-organ damage attributable to MCS. However, scientific knowledge changes over time as additional findings are reported; it is therefore important not to lose sight of lessons from the past in which suspected health effects of environmental exposures were verified at a later date through scientific research."¹⁴

203. Adopting that approach has a number of important consequences.

204. In the HSE context, the starting point is the definition of harm as including illness or injury. Whatever the debate about MCS, the reality of the adverse effects on the health and well-being of the people affected is not to be denied. Furthermore, prevention of less controversial adverse health effects of exposure to the toxic effects of the Hazardous Substances is consistent with an approach which endeavours to reduce the circumstances that are associated with the onset, or can trigger the symptoms, of MCS, even for unusually sensitive people. OSH has long cautioned that compliance with workplace exposure standards is not a holy grail for the discharge of HSE obligations. Where practicable steps are available to reduce exposures below those levels, then those steps should be taken. On that basis, and as an occupational health issue, the reality of MCS should be accepted. In the Inquiry's view, it is not satisfactory to regard MCS, when caused or triggered by exposure to the Hazardous Substances and other known hazardous chemicals at levels below relevant workplace exposure standards, as an environmental problem. These matters are reflected in Recommendation 8, set out in paragraph 392.

205. In the IPRC context, the possibility of our understanding of MCS improving as time passes needs to be recognised, and appropriate ongoing attention paid to this possibility. There would also appear to be a degree of overlap, in terms of the adverse health effects caused by workplace exposure to the Hazardous Substances, between the symptoms sometimes labelled as MCS, and the more recognised conditions of sensitisation and neurotoxicity. Although the Inquiry recognises that issues relating to ACC do not come within the Terms of Reference, it would seem appropriate for ACC to be open to the possibility that a diagnosis of a condition it does not currently recognise, MCS, may be consistent with a diagnosis of conditions it does recognise, including sensitisation and neurotoxicity, and assess entitlement for cover accordingly.

¹⁴ US Federal Interagency Working group on Multiple Chemical Sensitivity, (Draft Statement) 1998.

A final comment on MCS

206. Many individual submitters who identified themselves as suffering from MCS made the point, in response to the difficulties they had experienced obtaining recognition for MCS as a disease and exposure to the Hazardous Substances as its cause, that there simply was no other sensible explanation for what had happened to them.
207. Prior to the onset of the effects of exposure to the Hazardous Substances, whether that exposure had been chronic or acute in nature, they had been healthy, well-adjusted people. Radiographers and nurses in this position commented especially on their commitment to, and enjoyment of, their professions. Following the onset of recognised adverse health consequences of exposure, including sensitisation, to one particular chemical – often glutaraldehyde – they suffered more severe symptoms than were generally recognised as being a consequence of that exposure. They also reacted to a range of other chemicals in a similar way. In some instances, colleagues were similarly affected. More typically, colleagues often did not suffer adverse effects, or not at least to the same severe extent.
208. As health workers, these people recognised the difficulty in explaining what was happening to them. Sometimes they doubted their own sanity! But, in their minds, the link between the recognised cause of what they had experienced as a direct, and accepted, consequence of exposure, and those wider symptoms, was too obvious to be supplanted by less plausible explanations – often to do with psychological well-being or psycho-social factors.
209. The Inquiry recognises the medical and scientific difficulties associated with MCS but, from a legal but otherwise lay perspective, the Inquiry was struck by the force of those submissions, and the common-sense and objectivity of the people who made them.
210. In the Inquiry's view, this emphasises the importance of accepting the reality of MCS for those affected and of maintaining an actively open mind on the question of the status and cause of MCS.

Formaldehyde

211. Adverse health consequences of exposure to formaldehyde include both irritant and allergic dermatitis. It is a severe irritant of the eyes, nose and throat, and is recognised in New Zealand as a respiratory sensitiser. A small number of studies have recorded symptoms of neurotoxicity. It is not widely accepted that formaldehyde is neurotoxic. Formaldehyde is “probably carcinogenic to humans”¹⁵.
212. Groups such as SNFTAAS, and a number of submissions to the Inquiry, identified exposure to formaldehyde as being associated with MCS, and the associated wide range of adverse health effects.

¹⁵ International Agency for Research on Cancer – Working Group, 1994.

Organic Solvents

213. Solvents are associated with irritant contact dermatitis. Some solvents have a burning sensation on the skin.
214. Organic solvents can have an intoxicating effect, causing a person to experience disorientation, euphoria, dizziness and confusion. This can be followed by headaches or feelings of nausea.
215. Different groups of organic solvents cause specific long-term or chronic health effects. These include cirrhosis of the liver, blindness and leukaemia.
216. Long-term exposure to solvents is associated with the condition known as chronic organic solvent neurotoxicity. Chronic neurotoxicity has a significant, sometimes severe, general debilitating effect on a person's life. Symptoms include headache, fatigue, irritability, memory and intellectual function impairment, depression, emotional instability, sleep disturbance, alcohol intolerance, loss of libido and/or potency and loss of interest in daily activities. In extreme cases, dementia can result. Some of the most compelling submissions received by the Inquiry came from people suffering from neurotoxicity.
217. Severe, acute exposure to organic solvents can be fatal. Death can occur from respiratory or cardiac arrest from a single high dose of exposure to a wide range of organic solvents.

Other Organic Compounds

218. The Inquiry identified a number of other organic compounds as coming within the Terms of Reference. The adverse effects associated with exposure to those chemicals are now summarised.

Other x-ray processing chemicals

219. In addition to glutaraldehyde, x-ray processing chemicals contain a number of other hazardous substances. Three in particular are acetic acid, sulphur dioxide and hydroquinone. Acetic acid vapour irritates the eyes, nose and throat. At high concentrations in the air, irritation can be severe. Acetic acid is believed to cause asthma type symptoms, probably from an irritation rather than an allergic mechanism. Inhaling sulphur dioxide irritates the throat. Sulphur dioxide is not recognised as being a sensitising agent. Hydroquinone can cause irritant contact dermatitis of the skin. It is a poison if ingested. It is not considered to pose a vapour threat from photo-processing applications, due to its high water solubility and low vapour pressure.

Isocyanates

220. Isocyanates cause respiratory irritation and sensitisation. Exposure to mists or vapours containing isocyanates irritate the eyes, throat, skin and the respiratory system. Prolonged exposure to isocyanates can sensitise a person and cause occupational asthma. Once sensitised, asthma symptoms can result from exposures in concentrations lower than the workplace exposure standard.

Epoxy Resins

221. The main effect of contact with uncured resins has been both irritant and allergic dermatitis. Epoxy resins have been recognised as both irritants and sensitisers.

Methyl Bromide

222. Methyl bromide is an extremely toxic chemical. It can cause severe irritation and corrosion of the skin, and irritation and tearing of the eyes. It can be absorbed through the skin. If inhaled it can cause headaches, dizziness, abdominal pain, nausea, vomiting and muscle pain, amongst other symptoms. It is a central nervous system depressant. High exposures can cause convulsions, unconsciousness and death.

Extent of Adverse Consequences of Exposure to the Hazardous Substances

Introduction

223. This Report will now consider the extent to which the adverse consequences associated with exposure to the Hazardous Substances occur amongst the workforce in New Zealand. In general terms, information relating both to the incidence of exposure to the Hazardous Substances, and to associated adverse health effects, was relevant to this part of the Inquiry's investigations.
224. Most of the 120 submissions received by the Inquiry address these issues directly or indirectly. Those submissions are, therefore, the principal source of information for the Inquiry. The Inquiry endeavoured to obtain information on these issues from a number of other sources, but had limited success. Reflecting that situation, this section of the Report first analyses information from submissions on these issues and then discusses other relevant information. Following that analysis, some comments are made on general issues relating to the availability of relevant information.

Evidence from Submissions

225. Information dealing with exposure to the Hazardous Substances in the health sector is dealt with first. This primarily relates to glutaraldehyde. Information dealing with exposure to the Hazardous Substances in the printing and manufacturing sectors is then analysed.

Health Sector - Glutaraldehyde

226. The Inquiry's review of information from submissions on the extent of adverse health effects of exposure to glutaraldehyde in the health sector can be summarised as follows:

- exposure to glutaraldehyde was an inherent aspect of radiography from the time glutaraldehyde was introduced into x-ray processing chemicals in the 1960s, but became particularly prevalent from the early to mid-1980s onwards
- exposure to glutaraldehyde was also experienced by nurses, particularly in association with the cold disinfection of endoscopes and other medical instruments. Again, such exposures became common from the mid-1980s onwards
- little data was provided to the Inquiry based on measurement of levels of exposure experienced, but it would appear adverse health effects were experienced in association with exposures below workplace exposure standard levels
- 60 individuals made submissions relating to their experience of adverse health effects consequent on exposure to glutaraldehyde. The New Zealand Nurses Organisation submission reported it had represented some 80 nurses in connection with exposure to glutaraldehyde, with symptoms ranging from mild to extreme
- these submissions received support from general comments on the occurrence of adverse health effects from exposure to glutaraldehyde made in a number of more general submissions
- thirty seven submitters reported symptoms of neurotoxicity and a further fifteen referred to the symptoms identified as constituting MCS
- in several instances, submissions were received from a number of radiographers and nurses who had been adversely affected by exposure at the same workplace
- some 24 individuals who made submissions relating to the adverse health effects of exposure to glutaraldehyde noted that, as a consequence of those adverse health effects, they had been unable to continue working as radiographers or nurses
- submissions referred to both chronic (long-term) and acute exposure being associated with adverse health effects. Acute exposures were typically associated with spills and equipment failure
- submissions indicate that exposure to glutaraldehyde, and the occurrence of associated health effects, are today far less common than was the case previously.

227. On this basis, the Inquiry concludes that exposure to glutaraldehyde has been associated with a marked incidence of adverse health effects for radiographers and nurses in New Zealand. The Inquiry notes, furthermore, that the adverse health consequences reported in New Zealand appear to be more severe than has been the case internationally. It is not possible for the Inquiry to comment on the relative incidence rates of adverse health effects as between New Zealand and other jurisdictions.

Health Sector – Other Hazardous Substances

228. Other substances in the health sector mentioned in submissions include formaldehyde, organic solvents, other components of x-ray processing chemicals such as acetic acid and exposure to anaesthetic gasses. In most cases people who spoke of exposure to these substances were also exposed to glutaraldehyde.
229. Exposure to formaldehyde was mentioned in 13 submissions, both from handling formalin (the liquid form of formaldehyde) in a laboratory setting, and also as part of an indoor air-quality problem. Formaldehyde as an indoor air contaminant was released from materials such as wooden boards made from formaldehyde-based resins.

Hazardous Substances in the Printing and Manufacturing Sectors

230. In comparison to submissions received relating to the health sector, fewer submissions were received relating to individual experience of exposure to the Hazardous Substances in the printing and manufacturing sectors. Printing and boat-building featured prominently in that regard, but even there overall numbers (six and three respectively) were not large. Other submissions in the manufacturing sector were from a supermarket worker, a factory hand, a jewellery craftsman, a tanning worker, an auto machinist, a fitter/turner, a plastics worker, office workers, a chiropractor, a shop fitter, and a furniture maker. These submissions reflected the wide range of circumstances referred to in Section 3 of this Report in which the Hazardous Substances are used in New Zealand.
231. The submissions that were received tended to involve the more severe types of adverse effects associated with exposure to the Hazardous Substances, including eight instances of solvent-induced neurotoxicity. These were some of the most difficult cases that the Inquiry heard of. They confirm the severity of adverse effects that can be caused by exposure to the Hazardous Substances.
232. Given the limited number of submissions received in this area, the Inquiry is not in a position to draw any general conclusions from those submissions on the extent to which those adverse effects are occurring in the New Zealand workforce.

Evidence from Other Sources

233. The Inquiry also reviewed evidence from a range of existing sources as to the nature and extent of adverse health consequences arising from exposure to the Hazardous Substances. That information is summarised, in descending order of generality, in the following paragraphs.

OSH Estimates

234. In the 1996 *Together to Zero* report, OSH extrapolated from relevant Australian data that, if the Australian experience was applied in New Zealand on a proportionate population basis, there would “be about 5,310 cases of occupationally-related disease or death in New Zealand”. A similar exercise extrapolated a result of approximately 400 deaths per year from exposure to hazardous substances in New Zealand. These estimates are used by OSH currently in commentaries on occupational health issues.

Data from NODS Records

235. The Notifiable Occupational Disease System (NODS) was set up by OSH in 1992 to cater for notification of occupational diseases that had previously been provided to the Ministry of Health. NODS is a voluntary scheme, and involves a four-step process to investigate and confirm possible work-related diseases.
236. OSH has, at various times, published reports listing statistics based on the NODS on notified and verified cases of occupational disease. The NODS report of 1998 lists statistics for 1992 to 1998. Reflecting a database change in 1998, the NODS report of 2000 lists statistics for only the two-year period from July 1998 to June 2000.
237. In the period March 1992 to June 1998, OSH was notified of 8,440 cases of suspected occupational disease. Of these, fewer than half (3801) were validated or confirmed as being caused by occupations.
238. Although the 1998 NODS report does include some detailed information, it is difficult to draw firm conclusions from that data. The report listed (48) cases of poisonings from chemicals in hospital x-ray departments, and (3) asthma cases associated with aldehydes in the health sector. The report did not give sufficient detail to enable comparison with the number of submissions. Better information is provided on cases of solvent neurotoxicity, where 223 were notified and 86 in total were verified.
239. The Inquiry could not draw any useful data from the 2000 NODS report.
240. The Inquiry endeavoured to acquire further information on these questions from OSH’s Health and Safety Accident Recording Database (HASARD), and related NODS files. Notwithstanding considerable effort by the Inquiry secretariat, that project was unsuccessful. It became apparent that numbers of cases recorded on the HASARD

database was different to the number of cases on some OSH Regional office files. Because of this, it was not possible to rely on HASARD data as an estimate of the extent of health consequences.

241. Whilst the NODS reporting system is limited by the fact that it is a voluntary reporting system, nevertheless it provided the Inquiry with information of a lower quality than might be expected. OSH is aware of issues relating to the NODS system and is currently reviewing the system. Issues that the Inquiry became aware of included lack of adequate administrative support and of continuity of administrative support, and shortcomings in the design of the supporting database and its location in OSH's HASARD system. The fact that the NODS 2000 report did not provide the Inquiry with any useful data would appear to be symptomatic of these issues. These are matters that need to be addressed by OSH in that review.

ACC Data

242. The Inquiry approached ACC for ACC data on the number of claims made and accepted relating to the chemicals in industries that are covered by the Inquiry Terms of Reference. ACC, in responding to that request, provided information relating to 'poison' claims, broken down by reference to the health, printing, manufacturing and 'other' sectors. The relationship between 'poison' claims and the matters covered by the Terms of Reference was not clear. In providing that information, ACC noted that ACC data was not collected in a manner that aligned with the Terms of Reference. The Inquiry subsequently discussed with ACC whether any more meaningful information could be provided. ACC was not, however, in a position to provide more meaningful information.

New Zealand Medical Journal Paper on Chronic Solvent Neurotoxicity Data between 1993 and 1997

243. In November 1998, Dryson and Ogden published a paper on chronic solvent neurotoxicity cases considered by the OSH solvent panel between 1993 and 1997. The paper reports 193 cases notified during this period, with 76 verified as being work-related. Table 3 of the paper identifies spray painters (25 cases), printers (10 cases), and boat-builders (6 cases) as the three occupational groups most affected. The main solvents identified were aliphatic and aromatic hydrocarbons, and ketones. The paper concluded:

“This suggests there are many cases of solvent neurotoxicity which are still unidentified and that the notified cases may represent the tip of a very large iceberg.”¹⁶

¹⁶ Dryson E & Ogden J, 1998.

OSH Audits

244. A series of audits conducted by OSH from 1998 to 2000 reviewed HSE compliance issues in a range of industries that used the Hazardous Substances. These were printing, mortuaries and funeral directors, boat-building and, finally, flooring contractors. These audits are of particular relevance for the Inquiry's review of employer management practices (Section 7 of this Report). They also provide limited indirect evidence of exposures and adverse health effects. Most relevantly, the boat-building audit reported that 31% of interviewed employees believed they had some health problem relating to their work.

A Recent Study

245. The Inquiry was provided with a copy of a report prepared by R N Mumford in partial satisfaction of the requirements for the degree of Master of Management (OSH) at Massey University. The report comprises a case study, entitled *Towards Achieving Improved Occupational Health Outcomes in the Fibreglass Boat-Building Industry*. Prompted by public comment on possible occupational health issues in the boat-building industry (North & South supra, and the OSH boat-building audit) Mumford sampled boat-builders employed on a single large site. Thirty-three boat-builders out of a target population of 73 agreed to be interviewed. Mumford reports the incidence of respiratory and dermatological effects as following a similar pattern to, but higher than, that found in the OSH boat-building audit. Acute neurological effects were noted, and there was some evidence of chronic solvent neurotoxicity.

Overseas Studies

246. A number of overseas studies of radiographers have reported on symptoms associated with exposure to glutaraldehyde. Two recent Canadian studies^{17, 18} have compared outcomes between comparable groups of radiographers and physiotherapists. Radiographers are found to present increased incidence of symptoms, such as asthma, associated with exposure to x-ray chemicals than physiotherapists, indicating a link to that exposure. The overseas studies reviewed did not report the more severe adverse consequences identified in submissions to the Inquiry.

¹⁷ Liss G *et al*, 2002.

¹⁸ Dimich-Ward H *et al*, 2003.

Conclusions based on evidence from Other Sources

247. It is not possible to draw firm conclusions based on the evidence the Inquiry has from other sources as to the way in which the Hazardous Substances are being managed currently. What can be said, however, is that such evidence is consistent with the concerns expressed in submissions, and taken together indicates that there is certainly no room for complacency regarding the incidence of adverse effects from exposure to the Hazardous Substances in the health, printing and manufacturing sectors.

Information Issues

248. The Inquiry's investigations in this area have been marked by the absence of reliable information relating to exposure to the Hazardous Substances in workplaces and to associated adverse health effects. This situation has been commented on many times before, and was referred to by OSH in discussions with the Inquiry.
249. Part 8 of IPRC provides for the establishment of an 'Information Manager' for injury-related information. This role has been given to Statistics New Zealand. *The New Zealand Injury Data Review* (Department of Labour and Statistics New Zealand, 2003) identified issues associated with occupational disease as requiring further work. Whilst agreement in principle was reached to include occupational disease in the definition of injury for those data collection purposes, the review noted that the Department of Labour was to report to the Information Manager on defining occupational disease itself.
250. The Inquiry understands that that report has not yet been completed and to date Statistics New Zealand has not made any further progress on this issue. The Australian National Occupational Health and Safety Commission (NOHSC) identified problems with the collection of occupational disease data in a study they carried out in 2000. The NOHSC study questions the usefulness of administrative databases to record occupational disease, which is currently the main method of collating injury-related data in New Zealand. NOHSC suggests that official disease registers need to be supplemented by other data collection methods, including surveys.
251. It is not at all clear to the Inquiry that the Information Manager project will produce better occupational health data. The sense the Inquiry has is that occupational health data may require a different approach than the collection of national statistics from administrative data sets. That approach would need to acknowledge issues both as to possible sources of relevant information and to differences in the types of information. The NOHSC 2002 study supports this conclusion. This suggests that specific, focused, research is required.
252. Issues identified in this section in relation to the availability of reliable occupational health information generally, the subject of MCS and in relation to the NODS system in particular, are addressed in Recommendations 6 through 10, set out in paragraphs 390 to 394 of this Report.

Section 7 Best Practice

Introduction

253. The principal objective of the Inquiry is to identify gaps in the availability and adoption of best practice for the management of the Hazardous Substances. One role expressly given to the Inquiry is to review the extent to which employers and others adopt best practice.
254. To address these issues, the Inquiry needed to reach a view on the meaning of the term 'best practice'. In the context of HSE, this requires consideration of the relationship between 'best practice' and the 'all practicable steps' duties. The Inquiry also needed to reach a view on the extent to which information on best practice is available and on what constitutes best practice for the workplace management of the Hazardous Substances.
255. This section of the Report addresses those issues.

What is Meant by Best Practice in the Terms of Reference

256. The concept of 'best practice' is widely used to distinguish exemplary or improved performance in organisations. Best practice is seen as a dynamic, not static, concept, which incorporates continuous improvement as an integral feature. Best practice emphasises a systematic approach to the issues in question.
257. In the occupational health and safety context, the concept of 'best practice' is used in general terms to highlight the practical ways particular employers have resolved problems, to encourage benchmarking of performance and to promote the pursuit of higher standards through highly publicised awards for which various categories of employers are encouraged to compete.
258. Best practice in this sense relies strongly on the rationale that improved occupational health and safety outcomes are good for business. Best practice exemplars highlight the need for a systematic approach to these issues, as well as highlighting certain key components of those systems.
259. The concept (or language) of best practice is now well established and is widely used to support HSE compliance.
260. The term 'best practice' does not appear anywhere in HSE. It is not legally defined. Promoting excellence in health and safety management is, however, one of the express ways by which the objective of HSE (the prevention of harm to persons at, or in the vicinity of, places of work) is to be achieved. Excellence in health and safety management is a concept compatible with best practice, where 'best' means exemplary practice.

261. 'Excellence', however, is an outcome only promoted by HSE. For compliance purposes 'all practicable steps' are what is required. The meaning of 'all practicable steps' is discussed in Section 5.
262. Given the foregoing discussion, best practice could be seen as constituting or requiring a standard of behaviour higher than that required to meet the all practicable steps duties imposed by sections 6, 8, 9 and 10 of HSE. It could also be a higher standard than the duty imposed by section 7 of HSE to establish 'effective methods'.
263. This is not the sense in which OSH generally uses the term. OSH has, in a draft document entitled *Guidelines for the Development of Best Practice Documents*, expressed the view that:
- "A best practice document has the purpose of advising employers and employees of preferred ways of achieving compliance with the Act. It complements the HSE Act and the Regulations issued under the Act. It will provide clear guidance on how to ensure 'all practicable steps' have been taken to provide a safe place of work, within the context of a health and safety management system"¹⁹.
264. The Inquiry's view is that, where regarded as an 'absolute', best practice may indeed be different from the standard of performance required by HSE. The Inquiry concluded, however, that the sensible approach to the meaning of 'best practice', as used in the Terms of Reference, was consistent with OSH's apparent approach; that is, construing it as a reference to a preferred or recommended way of achieving HSE compliance on a systematic basis. The Report will now use the phrase 'best practice' in this sense.
265. This means that, in terms of the Inquiry's principal object, the Inquiry has reviewed the extent to which information is available relating to preferred or recommended ways of systematically complying with HSE obligations. Where that information is available, the Inquiry has further considered the extent to which that information is being implemented and adopted.

Best Practice for the Management of the Hazardous Substances

Glutaraldehyde

266. The Inquiry's investigations established that, as regards glutaraldehyde, a range of best practice guidance information has been produced at various times. They also established, fairly clearly, what the elements of that best practice are.
267. In November 1984, the Department of Health wrote to 'Chief Executives/All Hospital Boards', referring to a Massey University study that had identified risks associated with the use of photographic development chemicals under unsatisfactory work conditions. Glutaraldehyde was identified as the most likely chemical implicated. The Department of Health wrote again to hospitals in July 1985. Chief executives were advised that

¹⁹ OSH, 2000.

“developers and fumes may cause a variety of health problems”, but that “good ventilation and observation of good hygiene protocols will, in most cases, minimise the occupational health hazard”. Express reference was made to both local exhaust ventilation “over open baths” and to the need for general extraction ventilation to achieve 12–15 air changes per hour.

268. In 1986 Marjorie Gordon published her guidelines (see above) in conjunction with ACC, and with the support of the Department of Health. These addressed the use of glutaraldehyde in x-ray processing chemicals, but not its use as a cold disinfectant.
269. In 1992, prior to but in anticipation of HSE becoming law, OSH published guidelines on *The Safe Occupational Use of Glutaraldehyde in the Health Industries* (the 1992 Glutaraldehyde Guidelines).
270. The 1992 Glutaraldehyde Guidelines described the physical properties of glutaraldehyde and its potential adverse effects. They referred to the well-recognised effects of dermatitis, rhinitis, eye irritation and asthma. They also noted a number of generalised symptoms involving both the nervous system (memory loss, difficulty in concentrating, etc.) and other symptoms such as fatigue, tiredness. They commented specifically that glutaraldehyde could cause health problems amongst exposed workers even where the degree of exposure was well below the recommended limit. Sensitisation was noted as occurring after any number of exposures to a substance and that whilst only a few people out of the many exposed become sensitised, having become sensitised, these people could develop symptoms from small exposures.
271. Reference was made to the use of glutaraldehyde both in radiography and as a cold sterilant. In the latter context, the 1992 Glutaraldehyde Guidelines noted that as the use of such equipment (endoscopes) became common practice in smaller health enterprises, unsafe work practices and the consequent health problems would only increase unless proper work practices were instituted.
272. The 1992 Glutaraldehyde Guidelines emphasised:
 - the desirability of substitution
 - the necessity for effective ventilation when substitution was not possible
 - the need for engineering advice in establishing effective ventilation
 - the importance of personal protective equipment.
273. In the Inquiry’s view these were by then well established as the basic elements of best practice.
274. Although the Inquiry did not attempt a systematic review of the health sector, the visits it made to hospitals and other health sector workplaces provided the Inquiry with an insight into current best practices relating to the use of glutaraldehyde. These remain much as described in the 1992 Glutaraldehyde Guidelines, but with substitution having become far more practicable.
275. Best practice in 2003 first and foremost provides for the substitution of glutaraldehyde by other products. Substitution is now possible for x-rays generally, whether in terms of glutaraldehyde-free wet processing chemicals or by the introduction of digital, film-free x-ray technologies. For mammography purposes, some users expressed the view that the quality of outcome required necessitated the ongoing use of glutaraldehyde. Other users, however, reported that, even for mammography purposes, satisfactory glutaraldehyde-free products were now available and being used successfully.

276. For instrument sterilisation purposes, alternative and generally accepted products would now appear to exist, such as Steris or Cidex-OPA. Some users expressed concern about the effect on endoscopy equipment of the heat associated with the use of Steris. Other users did not see this as a problem.
277. Where glutaraldehyde does continue to be used, best practice involves:
- appropriately designed facilities
 - physical isolation of the processing machines and associated chemical storage units from users
 - continuous ('24/7') local exhaust ventilation, involving the use of fume hoods and/or adjacent 'slot' ventilation
 - general air-conditioning (not sufficient by itself)
 - the availability of personal protective equipment, to be used especially when x-ray processing chemicals are being added to the processing machines
 - well-defined spill-response procedures
 - education of employers and employees about the risks associated with glutaraldehyde
 - environmental monitoring and employee health surveillance.
278. Where glutaraldehyde continues to be used as a cold sterilant, best practice currently involves the use of an automated sterilisation procedure, which isolates glutaraldehyde from users and incorporates local exhaust ventilation. This would, as for x-ray processing use, be accompanied by general air-conditioning, personal protective equipment for use in cleaning machinery and filling chemical tanks, spill procedures and appropriate education.
279. Material provided to the Inquiry by a number of the health workplaces visited reflected both a systematic approach to best practice and the individual elements of best practice referred to above.

Formaldehyde

280. Compared to the position as regards glutaraldehyde, there is relatively little best practice information relating to formaldehyde available from New Zealand sources. In 1985 the Department of Health produced guidelines that summarised the principal areas of formaldehyde use. As regards each of those principal areas, these guidelines recommended basic principles of plant design, engineering controls, adequate maintenance, good housekeeping and safe work practices. Particular attention was paid to issues relating to the storage of formalin and formaldehyde-based resins, and the need for appropriate and adequate ventilation, personal protective equipment for everyday use, and emergency procedures. These guidelines are typically expressed in fairly general terms, but do provide some more specific advice, for example relating to the use of down-draught tables for embalming. In 1989, the Department of Health published a two-sided information sheet entitled *Working with Formaldehyde*. This provided general information and referred readers to the 1985 guidelines.
281. No material on formaldehyde would appear to have been published by official sources in New Zealand since 1989. Issues relating to formaldehyde are referred to in a 1998 funeral directors code.

282. In the case of formaldehyde, elements of best practice would appear to be reasonably well established. Compared to information relating to glutaraldehyde, however, they are expressed at a somewhat higher level of generalisation.

Solvents

283. In 1992 the Department of Labour published a document entitled *Practical Guidelines for the Safe Use of Organic Solvents*, providing fairly general best practice information. None of the information provided is specific to any particular solvent, nor to any particular workplace or work process using solvents. References are made to the general principles of elimination or substitution, isolation, ventilation, and the use of personal protective equipment. In terms of identifying where solvent use is occurring, reference is made to material safety data sheets as a source of information.

284. In October 1998, OSH published Work Place Health Bulletin No. 4. entitled *Working with Organic Solvents*. As with the 1992 organic solvent guidelines, the information provided is general, and non-specific. It appears to be designed more to alert employers and employees to the risks of organic solvents than to provide specific advice about dealing with them on a day-to-day basis.

285. A range of more specific guideline documents deal with organic solvents in particular industries. The Inquiry is aware of the following documents that fall into this category:

- *Approved Code of Practice for Safe Use of Timber Preservatives and Antisapstan Chemicals*
- *Approved Code of Practice for Safety in Photo Engraving and Lithographic Processors*
- *Approved Code of Practice on the Safe Use of Isocyanates*
- *Code of Practice for Health and Safety in the Manufacturing of Composites Based on Synthetic Resins (Fibreglass)*.

These documents provide specific best practice information, in a manner similar to the 1992 Glutaraldehyde Guidelines.

286. There is a significant amount of other general information available from New Zealand sources relating to best practice for the use of the Hazardous Substances. Including the *MOSHH ACOP*, there are over 30 publications produced by OSH alone that, to a greater or lesser degree, refer to management issues within the Inquiry's Terms of Reference. In general terms, these publications recommend management practices which reflect the HSE hierarchy of identification, elimination, isolation, minimisation and protection. They do not, however, focus on issues relating to the risks associated with specific substances in particular industries, nor how the risks associated with those specific substances should be managed in those industries.

287. It should also be noted that many industry groups have developed best practice type documents with OSH assistance. A number of these documents relate to industries and substances in the Terms of Reference. Examples considered by the Inquiry include a code relating to funeral directors, a health and safety and environment guide prepared by the printing industry and the New Zealand Chemical Industry Council's *Responsible Care Management System Handbook*. Individual companies or industry groups also write best practice type documents without OSH having played a role in

their development. These are valuable sources of best practice information, but they also tend to be written at a reasonably high level of generality.

Comments on Availability of Best Practice Information and Role of OSH

288. A number of submissions, both from individuals who had experienced adverse health effects, and from organisations, commented on the desirability of making practical advice available to employers and employees, particularly in small to medium enterprises, to assist with controlling risks associated with the Hazardous Substances. A number of submissions emphasised the importance of such information being expressed, when provided to employees, in simple and useable terms. One submission proposed making information available at the point of exposure to Hazardous Substances, for example on or adjacent to the piece of plant or equipment where any given Hazardous Substance was actually used. Stickers affixed to that plant or machinery were proposed as one way of achieving this. The Inquiry was struck by the common sense of these submissions. Issues relating to the quality of information provided to employers and employees were also raised in discussions the Inquiry had with interested parties, and during visits to a number of workplaces.
289. These comments and submissions would appear to have their origin in the relatively general nature of advice contained in many guidance documents. They may also reflect OSH's approach to its role in distributing standards and codes.
290. In 1996 the Labour Select Committee in a report to Parliament on OSH noted general agreement that codes were valuable in providing health and safety information, with both employer and employee groups calling for more resources to be invested by OSH in this area of its activities.
291. An important issue raised by this aspect of the Inquiry was, therefore, the role of OSH in determining, and distributing information about, best practice. As noted, the Inquiry spoke with representatives of OSH on a number of occasions and considered a wide range of material related to these topics.
292. Under HSE, regulations may be promulgated, and codes of practice approved. OSH may also, and has, published a wide range of generic guidance information. More recently, OSH has encouraged the creation of industry safety councils, but would appear to have been less active itself in publishing guidance documents than it was in the 1990s.
293. The Inquiry asked OSH to comment on the extent to which OSH believed it had a responsibility to set standards and to write and distribute best practice documents to ensure people have the necessary information to comply with legislation. OSH's reply was that, at a practical level, OSH did not consider it was best placed to write and distribute best practice documents. OSH's experience indicated that, where best practice is developed by industry sectors themselves, there is greater acceptance of the standards and less tolerance within the industry for those who do not meet the standards. OSH saw its role as facilitation of the process and quality control against legislative standards. OSH's approach to this question reflects respected and well-established views that standards and codes developed within industry and by independent bodies tend to be more practical and therefore potentially more effective instruments of progress than statutory regulations. OSH did recognise three principal

limitations on this approach: non-existent industry groups, unrepresentative industry groups, and urgent or high-public-interest issues where no consensus exists within an industry.

294. The Inquiry is aware that OSH, in conjunction with ACC, has the issue of industry health and safety groups, and OSH's relationship with them, under active consideration. A draft statement of position records that OSH will continue to provide general guidance material and may take the lead in developing industry-specific guidance material if it is not satisfied with progress being made by industry health and safety groups.
295. In the Inquiry's view, there is an important role for OSH itself to take the lead on codes, standards and guidance documents. OSH does have the dual roles of advice and enforcement. OSH must therefore itself be a leader as to what constitutes best practice; that is, what should be done to achieve compliance and, where appropriate, what should be enforced if not done.
296. The difficulties faced by small to medium enterprises in achieving HSE compliance are not unique to New Zealand. The United Kingdom has in recent years established a specific initiative to address this problem. A study in 1998 by Russell et al concluded that small firms need more basic, readily available advice on how to effectively control hazardous substances. A new scheme was developed to meet this need. Given the title *COSHH Essentials*, the scheme lists a simplified process for the identification of appropriate control measures for hazards based on the provisions of 'good practice' control guidance sheets.
297. Introduced in 1999, there was initially little penetration of the target business groups with the paper version of *COSHH Essentials*. Provision of web-based electronic versions have reversed that position and the UK Health and Safety Executive is "very pleased with the number of assessments (based on the number of pdf files downloaded) being undertaken"²⁰. The UK Health and Safety Executive plans to add 70 new control guidance sheets to its web-site in October of this year, related to areas where previous guidelines have recommended that 'expert advice' be obtained. These include some relating to health surveillance for substances that cause occupational asthma and issues for designers of local exhaust ventilation systems to address.
298. This system would appear to have real potential to address issues for small to medium enterprises. Until HSNO is fully implemented, the hazard assessment procedures provided by *COSHH Essentials* may be difficult to adapt. But the concept of guidance control sheets, delivering simple and practical information, is one that should be able to be adapted to existing New Zealand conditions.
299. Adopting this approach is also a way to address the gap that can exist between general statements of best practice and the practical implementation of those statements in workplaces. This may be a way of tailoring the *MOSSH ACOP* to individual industries and specific hazardous substances.
300. The Inquiry's investigation also quickly showed, as has already been referred to, that there is a vast amount of information available, particularly via the internet, relating to the Hazardous Substances, their characteristics and the adverse health effects they can cause, and of appropriate ways of managing risks associated with the use of the Hazardous Substances in workplaces. As a central regulator OSH could, in the

²⁰ E-mail to the Inquiry.

Inquiry's view, play an invaluable role as a type of clearing house for that information for use by industry groups and others involved in the development of best practice information in New Zealand. OSH has the permanent resources, and personnel with the necessary skills and experience, to review internationally available information and to make it available to interested groups in New Zealand. In the Inquiry's view, OSH should establish a permanent capacity to undertake such work.

301. Issues identified in the foregoing paragraphs in relation to availability of best practice information, particularly for small to medium enterprises, and OSH's role in the provision of best practice information, are addressed in Recommendations 13 through 16, set out in paragraphs 399 to 402 of this Report.

Comment on Use of Phrase 'Best Practice' by OSH and Others

302. As noted above, OSH understands the phrase 'best practice' to mean practice that complies with the 'all practicable steps' duties mandated by HSE. As noted at the beginning of this section, however, there is another sense in which 'best practice' means an absolute best, or excellent, practice, which would exceed the relevant statutory standard.
303. In the Inquiry's opinion, there are risks associated with the use of the phrase 'best practice' to describe approved or recommended methods for meeting HSE standards, including those set out in codes of practice. The 'all practicable steps' standard is one that involves a balance of competing considerations. To describe that standard in an unqualified way as 'best' practice may be confusing. Many businesses will, in a day-to-day sense, recognise that 'best' practice may be something to which they aspire, but that may in certain circumstances be beyond their capacity at a particular time, either in a financial or human sense. 'All practicable steps', on the other hand, is the legal standard they are required to meet. Therefore, to describe preferred ways of achieving all practicable steps as 'best practice', may suggest that it is not something that must necessarily be achieved. In the Inquiry's view, OSH should therefore use the phrase 'best practice' with caution, and could well consider using another phrase (such as recommended or approved practice) in its place.
304. Consideration of the appropriateness of the term 'best practice', where in reality it is referring to 'all practicable steps' standard mandated by HSE, also raises issues relating to the promotion of what is, in fact, absolute best practice, and therefore practices that are higher than the standards called for by HSE. In the Inquiry's view, achievement of the all practicable steps standards should be the focus. Furthermore, even there 'absolute perfection' is an elusive goal. Although substitution is to be preferred, achieving isolation and local exhaust ventilation goes a very long way. Take the case of glutaraldehyde in the health sector. Total substitution can be an expensive step. Isolation and local exhaust ventilation can, by contrast, and based on the Inquiry's investigations and visits to health sector workplaces, be relatively easily achieved. That could, particularly for small to medium health sector enterprises, be real progress. Focussing initially on the more easily achieved of the 'all practicable steps' has to be a sensible approach.
305. Issues identified in the foregoing paragraphs relating to the use of the term 'best practice', and to the approach to 'all practicable steps', are addressed in Recommendations 19 and 20, set out in paragraphs 405 and 406 of this Report.

Section 8 Management of the Hazardous Substances and Adoption of Best Practice

Introduction

306. The Terms of Reference require the Inquiry to review the way employers (and others with responsibility in workplaces, including self-employed and employees) manage the Hazardous Substances, and the extent to which those persons adopt best practice. To carry out a comprehensive review, and audit, of management practices for the Hazardous Substances across the various sectors was clearly beyond the scope of the Inquiry. Furthermore, given the background to the Inquiry and the directive for the Inquiry to learn from past experiences, the Inquiry determined that the submissions and the hearings the Inquiry undertook were to be the key information source for this part of the Inquiry's work.
307. As with other sections of this Report, the Inquiry's consideration of these issues has been informed by information from a range of other sources. These include, in particular, a number of audits undertaken by OSH of particular industries.
308. This section of the Report first considers the management of the Hazardous Substances, and in particular glutaraldehyde, in the health sector. It then considers the management of the Hazardous Substances in the printing and manufacturing sectors. In each case it does so on the basis first of information provided in submissions to the Inquiry and then of other available information.

Information from Submissions – the Health Sector

309. Altogether, some 29 separate workplaces, ranging from major hospitals to small radiology clinics and doctors' surgeries, were referred to in submissions from individuals who reported personal exposure to the Hazardous Substances, and glutaraldehyde in particular, and adverse effects.
310. A number of aspects of the way glutaraldehyde has been managed were subject to repeated adverse comment by individual submitters. These criticisms of the management of glutaraldehyde principally focussed on:
- poor design and general ventilation of workplaces
 - the apparent absence of any attempt to isolate the equipment that was the source of the hazard (eg. processors, chemical storage bins, disinfectant baths) from the people using that equipment
 - the absence of any, or of effective, local exhaust ventilation
 - inappropriate work practices and the lack of any, or of appropriate, personal protective equipment
 - the absence of environmental monitoring or health surveillance
 - the failure to provide information to employees as to the hazards associated with glutaraldehyde and ways to manage the associated risks.

311. It was a feature of many of these submissions that appropriate practices to manage the glutaraldehyde hazards were only implemented in workplaces after individual employees had been adversely affected, in some cases to the extent that they were unable to continue working as radiographers or nurses.
312. The individual submissions therefore point to a failure in the past to adopt best management practices for preventing harm associated with exposure to glutaraldehyde to employees in the health sector. Many submitters, however, did acknowledge more recent improvements in practice, although some pointed to current examples of what would appear to be inadequate practice.
313. Those submissions were supported by submissions from the New Zealand Nurses Organisation (NZNO) and the New Zealand Institute of Medical Radiation Technology (NZIMRT). Both NZNO and NZIMRT conducted surveys to support their submissions. Both organisations confirmed significant concerns with past failures to implement best practice, acknowledged recent improvements, but remained concerned due to continuing reports of unsafe use and handling of glutaraldehyde and other chemical substances.
314. Corroboration of that general picture was provided from the, albeit few, submissions from hospital organisations. The organisations who made submissions reported a clear understanding of best practice, and a commitment to its effective ongoing implementation. One of those organisations also acknowledged past difficulties in this area and instances of poor health and sensitisation amongst its employees associated with exposure to glutaraldehyde.
315. Seven submissions were received from laboratories and other users of glutaraldehyde, formaldehyde and other Hazardous Substances in the health sector, other than for disinfection or radiography purposes. These submissions all emphasised the important ongoing role that those substances play in their work and the lack of any substitutes for them. They indicated a high degree of current knowledge about the hazards involved and best practice management approaches. Past difficulties with management of the hazardous substances were acknowledged, relating to under-estimation of risks and unsatisfactory handling facilities and user safety techniques.
316. Concern was expressed by a representative of one supplier of chemicals that, whilst there had been significant improvement in the use of glutaraldehyde as a disinfectant, the same was not necessarily the case with the use of formaldehyde.

Information from Submissions – Other Sectors

317. The submissions from printers and boat-builders and other individuals in the printing and manufacturing sectors raised many concerns relating to the management of the Hazardous Substances in the workplace. As regards the extent to which best practice is adopted, they focused on two issues in particular. First, the majority of them emphasised the need to ensure that people working with the Hazardous Substances are provided with accurate information about the risks involved. Second, almost all of the submissions referred to the need to protect those people from the associated hazards, particularly by ventilation and appropriate protective equipment.

318. Seven submissions were received from employers and employer organisations. A number of those repeated submissions made by Business New Zealand, questioning the need for the Inquiry, particularly in light of the introduction of HSNO and the Identification Regulations. Business New Zealand, presenting to the Inquiry in Wellington, emphasised its view that the Hazardous Substances are now generally well managed by employers. Other employers recognised some current issues; one in particular spoke of the difficulty presented to employers wishing to adopt best practice by the lack of relevant information and difficulties encountered obtaining MSDSs.

Information from Other Sources

Health Sector

319. There is some publicly available information that reflects concerns expressed in submissions on the use of glutaraldehyde and other hazardous substances in the health sector.

320. Southern Crown Health Enterprises Limited was prosecuted by OSH in 1997 in connection with adverse effects of the use of glutaraldehyde for disinfection purposes on two nurses at Kew Hospital in Invercargill²¹. Southern Crown Health Enterprises pleaded guilty to two charges under section 6 of HSE and was fined a total of \$8,000.00.

321. A claim for exemplary damages was brought against Northland Health Limited by a radiographer who became ill following exposure to glutaraldehyde²². In a carefully reasoned decision, Judge A I M Tompkins found that, although Northland Health's standard of conduct was not such as to give rise to a claim for exemplary damages, nevertheless Northland Health had been negligent and breached its duty of care to the plaintiff, Ms Marjan Creusen-Foot. In particular, Judge Tompkins noted that at the heart of that breach were failures:

- to take into account information and experience the defendant undoubtedly possessed, both in relation to the scientific and other information regarding the dangers of glutaraldehyde and in relation to its earlier and continuing experience with the radiology unit, and
- to proactively guard its employees and staff against the known hazards posed by the use of glutaraldehyde.

322. The Inquiry reviewed a series of OSH files relating to investigations and other work carried out by OSH in connection with concerns relating to glutaraldehyde in the health sector. In many cases, these involve individuals who had made submissions to the Inquiry. Although those files do in some instances reflect efforts being made over time by employers in the health sector to address the glutaraldehyde issue, they generally reflect and confirm the gist of the submissions made by those individuals to the Inquiry.

²¹ *Health and Safety Inspector v Southern Crown Health Enterprises Ltd*, (unreported) District Court, Invercargill, 10 March 1997, CRN 6025007576/74.

²² *M Creusen-Foot v Northland Health Limited*, (unreported) District Court, Whangarei, 17 March 1998, NP 868/93.

Printing and Manufacturing Sectors

OSH Audits

323. During the 1990s, OSH audited compliance with HSE as regards management of the Hazardous Substances in a number of industries.
324. The industries involved were spray painting (isocyanate use), printing (solvents) and boat-building (general). During the same period, OSH also audited mortuaries, principally in connection with infectious disease risks but also covering formaldehyde use, and flooring contractors as regards risks from asbestos fibres.
325. The three audits that specifically addressed issues relating to the management of certain of the Hazardous Substances did not produce encouraging results. Audited against the existing *Approved Code of Practice for the Safe Use of Isocyanates*, and the Spray Coating Regulations 1962, only 21% of workplaces were found to be 'fully compliant' at the time of OSH contact. Issues of spray booth design and maintenance, use of spray booths, health surveillance, knowledge of risks and use of personal protective equipment were all identified. OSH issued 305 improvement notices. These were seen to have brought about improved compliance.
326. The audit of solvent use in the printing industry concluded as follows:
- “Many employers are not managing the health hazards associated with solvents and their use in the printing industry, as required according to the MOSHH approved code of practice and the HSE Act. There are significant areas in need of improvement – such as identifying and controlling hazards, providing information and training, and the monitoring of employee health. The level of awareness and the information about the health hazards associated with solvent use in the printing industry is minimal.”²³
327. In the absence of any industry-specific guidelines, and in contrast to the spray-painting audit, there would appear to have been little follow-up action on this audit.
328. The boat-building audit focused on the health status and knowledge of occupational health hazards amongst employees. One third of respondents identified health problems related to their job. The report on the audit noted that:

“It is of concern that occupational health nurse observations, made during the course of the survey, found little evidence for the use of Material Safety Data Sheets (MSDS) or adherence to recommended health guidelines as laid down in the Health and Safety in Employment Act 1992.”²⁴

²³ OSH, 2000, page 4.

²⁴ Ruttenberg *et al*, 2001.

329. In summary, these audits indicate that, at the relevant time, there were issues of compliance with HSE in the relevant industries. In the case of the isocyanate audit, this was anticipated by OSH.
330. The Inquiry notes that, in the case of the printing industry, guidelines on a range of issues have subsequently been prepared. Boat-building is, the Inquiry understands, currently a priority industry for OSH. The Inquiry was not able to obtain from OSH, however, any more up-to-date information on the compliance issues raised by these audits.
331. The audits of mortuaries and flooring contractors, though not directly relevant to this Inquiry, produced similar evidence of non-compliance.
332. The Inquiry's review of the audits conducted by OSH raised issues as to whether those audits contributed as effectively as they might to the adoption of best practice for the management of the Hazardous Substances. The Inquiry considered that, whilst those audits were a very positive initiative by OSH, there were improvements to be made. Those improvements relate in particular to the development, prior to audit, of appropriate guidelines to audit against, and to follow-up activity.
333. These issues are addressed in Recommendation 17, set out in paragraph 403 of this Report.

Conclusions on Management of the Hazardous Substances and Adoption of Best Practice

334. As is the case with the Inquiry's review of the extent of the adverse health consequences associated with exposure to the Hazardous Substances, based on information from submissions the Inquiry is in a position to draw some conclusions on the management of glutaraldehyde in the health sector, but not more broadly.
335. It seems clear that, in the past, there were fairly frequent instances of failure in the health sector to adopt best practice as regards the management of glutaraldehyde. Those failures cover – by omission – the range of best practice management methods that had been identified and reasonably well publicised.
336. Of particular note is that fact that attention was drawn to risks associated with glutaraldehyde in the early 1980s, that guidelines for the management of glutaraldehyde in connection with radiography were promulgated in 1986, and that more general guidelines – covering both radiography and disinfectant use of glutaraldehyde – were promulgated and distributed by OSH in 1992.
337. Also of note, as regards past experiences, are the instances where improved practices were not adopted until health workers had been adversely affected, in some cases severely, by their exposure to glutaraldehyde.
338. It is more difficult to reach a conclusion as to the way in which glutaraldehyde is being managed today in the health sector. The general sense the Inquiry has, confirmed by submissions, is that the situation today in the health sector is much improved on what the case was in the past. Visits the Inquiry made to health sector workplaces confirmed that current position. The Inquiry's sense is that reasonable progress is

being made towards the elimination of glutaraldehyde in x-ray processing chemicals, although not all sections of the health sector would appear to have the same view on the practicability of elimination, particularly as regards mammography x-rays. Where glutaraldehyde is still present in x-ray processing chemicals, far better results would appear to be being achieved as regards isolation of the source of the hazard, local exhaust ventilation and the use of personal protective equipment. As for cold disinfection, the use of the glutaraldehyde substitutes would appear to be reasonably widespread. Where glutaraldehyde is being used, particularly in larger institutions, adoption of automatic cleansing machines would appear to be reasonably normal practice.

339. The submissions the Inquiry received as regards the Hazardous Substances other than glutaraldehyde were far less numerous.
340. Based on those submissions, the Inquiry is not in a position to draw any particular conclusions relating to the way in which employers manage those Hazardous Substances, and adopt best practices. The submissions received, however, are consistent with other evidence that suggests – albeit not based on particularly extensive information – that the Hazardous Substances are causing adverse effects in employees and that there are issues as to the extent to which best practice is being adopted. Audits conducted by OSH, in particular, support that conclusion directly.
341. These conclusions are reflected specifically in Recommendations 11, 12 and 18, set out in paragraphs 397, 398 and 404 of this Report. More generally, they inform all the Recommendations in this Report.
342. There is one further matter that the Inquiry considers it appropriate to comment on in this section. This Report has already commented on the role of OSH in the preparation and distribution of best practice guidance material. Another important role of OSH is, of course, the enforcement of the duties and obligations created by HSE. An inevitable question for the Inquiry, given the information the Inquiry received indicating failures to implement available best practice guidance material, was the extent to which OSH had considered it appropriate to take formal or informal enforcement action. As has already been noted, one health enterprise was prosecuted by OSH. In addition, the Inquiry's investigations reveal that OSH undertook formal investigations into a number of health sector workplaces and, as part of those investigations, issued various improvement notices. On occasions, those improvement notices were challenged by employers and matters subsequently resolved informally. The Inquiry's investigations also revealed that, although OSH considered prosecution in other instances, the decision was taken for a variety of reasons that such a course of action was not appropriate. Included amongst those reasons were the six month time-bar on prosecutions (lifted in the recent amendments to HSE) and particular difficulties of proof associated in linking specific instances of exposure to adverse health effects. Those difficulties were often also compounded by medical debate about the nature and status of the adverse health effects in question.
343. A number of individual submissions reflected dissatisfaction with the way OSH had carried out its enforcement role. Employee organisations also referred to this issue. In correspondence to the Inquiry, the New Zealand Chemical Industry Council emphasised the need for robust enforcement in this area.
344. Given the Terms of Reference, the Inquiry did not consider it appropriate to review in any great detail the decisions OSH made in the past. However, the Inquiry does think there is an important lesson to be learnt from these experiences as regards the role of enforcement with respect to the occupational health risks associated with exposure to

the Hazardous Substances. Because of the latent nature of those adverse effects, and because of the medical and scientific debates about the precise nature or status of disease, and of causality, enforcement of HSE in the occupational health area presents some special difficulties.

345. Instances of these difficulties were encountered in the Inquiry's review of materials provided to it by OSH relating to investigations of instances of glutaraldehyde exposure. In one instance, poor management practices were identified at a workplace. Improvement notices were issued, and steps subsequently taken by the employer to remedy poor practice. Although the OSH file noted there had been a failure to systematically identify and control hazards in the workplace, the conclusion reached was that no further action would be taken in respect of that matter.
346. The Inquiry asked OSH for the reasons for that conclusion. OSH responded, noting that the belief that failures had occurred did not satisfy the 'beyond reasonable doubt' test. In particular, there were no hard facts upon which a strong case of cause and effect could have been put together. Evidence of glutaraldehyde levels, let alone levels above the workplace exposure standard, was not available.
347. In another instance, again where fairly clearly poor work practices were involved, a prosecution was not taken in the absence of any levels of actual exposure.
348. In the Inquiry's view, this approach needs to be reviewed. There are often likely to be difficulties of cause and effect. Furthermore, even in cases of actual reported adverse effects, absence of relevant evidence of measurement of workplace exposure standard levels may not be surprising. What is important, is that the behaviour patterns required by HSE are enforced proactively. Enforcement should not necessarily be limited to cases where not only have the necessary behaviour patterns not been followed, but also there is proof of the occurrence of actual harm and clear evidence of causality. Waiting for such evidence in this area may mean that enforcement will be too late.
349. OSH does recognise the importance of section 7 in its current enforcement policy. In the Inquiry's view, this is of particular importance when it comes to issues of occupational health.
350. As noted above, the Inquiry considers that the general lessons to be learnt in this area emphasise the importance of the preventative aspect of the HSE duties. This points, in an enforcement sense, to the particular significance of the proactive encouragement of the behaviour patterns that HSE requires, as distinct from a reaction to specific instances of illness or injury. Proactive enforcement of those duties – including by way of the more formal steps of infringement notices and prosecutions - should be undertaken.
351. The issues discussed in the preceding paragraphs are addressed in Recommendation 21, set out in paragraph 407 of this Report.

Section 9 Relationships between Various Parties in Connection with the Manufacture, Storage and Transportation, Use and Disposal of the Hazardous Substances

352. The Terms of Reference directed the Inquiry to review the extent and the effectiveness of the relationships between those manufacturing, those storing and transporting, those using, and those disposing of, the Hazardous Substances. The purpose of that review was to identify how well the interdependencies between those various parties promote best practice arrangements.
353. This is the area where the Inquiry had most difficulty in obtaining relevant information and insights. Few, if any, of the submissions received addressed these issues.
354. The Inquiry was able to obtain some information from industry sources on the importation of the Hazardous Substances. The Inquiry discussed disposal issues with one local authority.
355. Based on the limited amount of information available to the Inquiry, but more significantly on the analysis carried out for the purposes of the review of the legislative framework, it became apparent that full implementation of HSNO would be of considerable significance in this area. This was confirmed by commentary received from the New Zealand Chemical Industry Council following the completion of the Inquiry's hearings.
356. The Inquiry also became aware of the work being done to modify HSNO, the results of which have recently been publicly announced.
357. It seems likely that the relative lack of attention given to these issues in submissions made to the Inquiry reflects a general sense that, pending full implementation of HSNO, this aspect of the Inquiry was not one that required further extensive review.
358. Pending full implementation of HSNO, difficulties in this area are likely to remain.
359. The Inquiry did, however, identify and this Report has already commented on, two issues which relate to these matters. These are the current lack of any clear legal obligation to provide MSDSs and the uncertain extent of regulation 67 of the Health and Safety in Employment Regulations 1995 relating to the obligations of manufacturers and suppliers of plant. These issues are discussed in Section 5 of this Report, and are referred to again in Section 10.
360. Beyond that, and given the already complex and demanding transitional issues relating to HSNO, the Inquiry concluded that this was an area where progress should be measured as and when HSNO achieves full implementation. Pending that full implementation, and the ability to assess the extent to which HSNO does achieve its aims and objectives in this area, the Inquiry – somewhat pragmatically – did not embark on a broader review.

Section 10 Lessons, Recommendations and Priorities

Lessons

361. This Inquiry has been marked by two contrasting features regarding the availability of relevant information.
362. On the one hand, and as has already been noted, there is virtually unlimited information available, some from New Zealand sources but much more from international sources via the internet, relating to the nature of the Hazardous Substances, their potential to cause adverse health effects, and how, in a general sense, they should be managed in workplaces. OSH itself has produced over 800 publications, of which some 30 relate directly or indirectly to the Terms of Reference.
363. At the same time, there is very little information available regarding the actual incidence and prevalence of adverse health effects from exposure to the Hazardous Substances and how the Hazardous Substances are, in fact, being managed in workplaces.
364. OSH currently relies on high-level estimates to make an overall assessment of occupational ill health. It has also carried out a number of audits, which provide some information on the management of safety and health in workplaces, and adverse health effects associated with workplace exposure. Some information on these matters is also provided by OSH's NODS system, but less than might be expected. ACC is not in a position to provide much useful information at all in this area.
365. This Inquiry is not alone in facing a lack of broad and reliable occupational health data. Such a lack is an ongoing issue for OSH in New Zealand, and for health and safety regimes around the world.
366. The best information the Inquiry received related to past experiences in the health sector with glutaraldehyde. These submissions would appear to represent – at least in New Zealand and perhaps more widely – a significant occupational health reporting event.
367. Here, the position can be summarised in the following way:
 - There has been available for quite some time now reasonably comprehensive information about glutaraldehyde, its potential adverse health effects and how the risks associated with glutaraldehyde should be managed in the health sector.
 - Attention was first drawn to the risks associated with glutaraldehyde in the health sector in the early 1980s. In 1986, Marjorie Gordon drew up comprehensive guidelines for the use of glutaraldehyde in radiography, in conjunction with ACC and the Department of Health. Guidelines covering the use of glutaraldehyde more generally, but equally comprehensively, were published and distributed widely by OSH in 1992.
 - The causal links between exposure to glutaraldehyde and a range of adverse health effects (eg. dermatitis, rhinitis, asthma) are well accepted. There was, and remains, debate in medical circles about the status of the links between exposure to glutaraldehyde and the development of neurotoxicity. It is now accepted by OSH and ACC that exposure to glutaraldehyde may cause

neurotoxic effects, but that was not always the case. The subject of MCS remains controversial both here and internationally.

- Whatever the debate as to the causation and status of certain identified adverse effects, the submissions the Inquiry received – supported by other information – indicate that there were fairly frequent instances of failure in the health sector in the past to adopt best practice as regards the management of glutaraldehyde.
- In particular, there were a number of situations where clearly identified best practice management principles were implemented only after one or more workers had suffered significant adverse effects.

368. In summary, the gap that existed as regards glutaraldehyde related to the adoption of, rather than to the availability of information about, best practice. There was also a recognition in the submissions that the situation was now much improved and that the health sector is far better at managing, and indeed eliminating, the risk from glutaraldehyde than was the case in the 1990s and earlier. That general sense was confirmed by the visits the Inquiry made to a number of hospitals and other health sector workplaces. It could not be said, however, that the Inquiry is confident that the issues associated with the use of glutaraldehyde in the health sector have been completely dealt with.
369. The position as regards the other Hazardous Substances is more complex.
370. There is reasonably comprehensive information available about the toxic effects of exposure to these Hazardous Substances, and their associated potential adverse health effects. There would appear to be little controversy on the nature of those adverse effects or, in general terms, on the causal links with exposure. Information regarding best management practice is not available for all the other Hazardous Substances and their wide range of uses in New Zealand to the extent it is for glutaraldehyde. Whilst there is certainly a significant amount of such information, the level of generality at which much of it is expressed reduces its usefulness.
371. The Inquiry received less information on the actual incidence of adverse effects associated with exposure to the other Hazardous Substances than it did for glutaraldehyde. The information that was received, together with existing sources of information – principally OSH audits and the NODS system – indicated failures to implement appropriate management practices similar to those that have occurred with glutaraldehyde. Based on the information available to it, the Inquiry is not in a position to draw any new conclusions on the extent of those instances, or of associated adverse health effects. The Inquiry's conclusion as regards the other Hazardous Substances is, therefore, that there would appear to be gaps in both the availability of information about, and the adoption of, best practice, but the significance of those gaps is not clear.
372. What, then, can this Inquiry say as to why those gaps occurred, and what lessons can be learnt from this Inquiry for the future? The Inquiry will first make some general comments, and then set out its recommendations by reference to the various roles given to the Inquiry by the Terms of Reference, and to the relevant sections of this Report.
373. The issues raised by this Inquiry are complex. Any occupational health issue is influenced by a multiplicity of factors, and a temptation to over simplify has to be avoided. In the case of the health sector's experience with glutaraldehyde there may be particular factors at work. Prior to the introduction of HSE in 1992, hospitals as workplaces had not been subject to the oversight of the Factories and Commercial Premises Act 1981, but were under the more general control of the Department of Health. HSE was first introduced in 1992, and it would inevitably have taken some time

to achieve acceptable compliance rates. Both of these factors may have contributed to the delays in implementing known best practice.

374. Contributing to that situation may have been a tendency for both employers and employees in the sector to place more emphasis on patient health and safety than on worker health and safety. Awareness amongst employees, and especially perhaps radiographers, of the adverse effects of exposure to glutaraldehyde may also have contributed to the level of reporting to this Inquiry of examples of the occurrence of those adverse effects.
375. Nevertheless, having carefully considered the information available, the Inquiry's view is that the lessons to be learnt appear to relate to two issues in particular. These are:
- the latency associated with occupational disease and ill health; that is – as recognised in the definition of significant hazard itself – it can and frequently does take considerable periods of time for the adverse health effects associated with continuing exposure to known hazardous substances to become apparent
 - the consideration that, as recognised by Marjorie Gordon in 1986 and again by OSH in 1992, certain people may be adversely affected at levels of exposure lower than those that others (and perhaps the majority) can, it would appear, tolerate without apparent harm.
376. Both of these factors, in the case of the management not only of glutaraldehyde but also of the Hazardous Substances generally under HSE, make the preventative aspect of the HSE duties of special significance. They serve to emphasise the importance of the behaviour patterns called for by HSE relating to the systematic identification and assessment of hazards. If, as a first step, a hazard has not been identified and assessed in a formal way, and relevant information communicated to employees, it is much less likely that appropriate hazard control strategies will be adopted in a timely fashion.
377. These issues were central to many of the submissions relating to adverse health consequences associated with exposure to the Hazardous Substances in the health, printing and manufacturing sectors. In many of those submissions, it was the failure to identify the hazard in the workplace, and to provide employees with relevant information following on from that identification, that was central to the concerns of individuals. There was also the concern that, even when the adverse health effects were realised, the fact that only one or two employees may have been affected seemed to count against acceptance of the reality of the problem for those employees. The lack of awareness of occupational health issues amongst doctors was also a concern.
378. These factors also emphasise the care with which workplace exposure standard levels must be treated. Whilst workplace exposure standards provide a guide to acceptable exposure levels, the HSE objective is still to reduce actual and potential exposures as far as practicable below the workplace exposure standard by elimination, isolation, minimisation and protection.

Recommendations

The Legislative Framework

379. The legislative framework is complex and, in parts, difficult to understand. There are areas of overlap. Nevertheless, as regards occupational health issues, HSE clearly remains an important element of the legislative framework.
380. The operation of IPRC is based around the provision of cover for personal injury by accident. The approach ACC brings to compensation is governed by that, and its approach to injury prevention is significantly influenced by its compensation role. HSE takes a broader approach, being aimed at the prevention of illness or injury to workers.
381. For HSNO, workplace control of the toxicity of the Hazardous Substances focuses particularly on protection through exposure control by reference to workplace exposure standards. This is complemented by a range of specific controls, and improved information being provided in workplaces. However the HSE duties, summarised by the 'identify, eliminate, isolate, minimise, protect' hierarchy, continue to impact broadly on employer and employee behaviour.
382. Section 5 of this Report also comments on:
- the importance of the role carried out by the *MOSHH ACOP*
 - the current absence of any specific regulatory requirement for the provision of MSDSs
 - issues relating to regulation 67 of the Health and Safety in Employment Regulations 1995.
383. Recommendation 1
- That in the administration of the regulatory framework that governs the workplace safety and health risks of exposure to the toxic effects of the Hazardous Substances, the important role of HSE, and of the 'identify, eliminate, isolate, minimise, protect' duties in particular, should be acknowledged and reflected in practice on an ongoing basis.
384. Recommendation 2
- That research should be initiated by OSH to investigate the extent to which employers, particularly those in small to medium enterprises, find the *MOSHH ACOP* a useful guide to HSE implementation and do, in reality, adopt its recommendations.
385. Recommendation 3
- That consideration should be given to whether the *MOSHH ACOP* would be more effective if enacted as a regulation under HSE.

386. Recommendation 4

That consideration should be given to the introduction of requirements for the provision of MSDSs by way of regulation under HSE, pending HSNO requirements in that regard coming into force.

387. Recommendation 5

That OSH should review Regulation 67 of the Health and Safety in Employment Regulations 1995 with a view to clarifying the extent to which manufacturers and suppliers are obliged to provide information as to the safe use of plant and equipment on matters, such as local exhaust ventilation, required to operate that plant and equipment safely where the use of Hazardous Substances is intrinsic to that operation.

Nature and Extent of Adverse Health Consequences and Review of Causative Relationships

388. Section 6 of this Report shows that, in general terms, there is reasonable certainty about the nature of the adverse health consequences associated with exposure to the Hazardous Substances, and the causal relationships that are involved. The subject of multiple chemical sensitivity is controversial. Section 6 also reflects the general lack of information on the incidence of exposure to the Hazardous Substances and of associated adverse health effects.

389. The recommendations that follow address issues relating to that lack of reliable occupational health information, the subject of MCS and to improving the existing NODS reporting system.

390. Recommendation 6

That in the implementation of the injury-related information project under Part 8 of IPRC as it relates to occupational health issues, early consideration be given to supplementing that project, and the administrative databases upon which it is currently proposed to conduct that project, with a range of more specialised occupational health data collection initiatives, including ones designed to provide epidemiological information, and to those initiatives being undertaken separately from that project.

391. Recommendation 7

That a programme of research should be established to determine more accurately the incidence and prevalence of exposures to the Hazardous Substances, and other hazardous substances, in the health, printing and manufacturing sectors and the health consequences of those exposures.

392. Recommendation 8

That OSH should approach the subject of MCS as an occupational health issue by accepting the reality of the effects of MCS, by maintaining an actively open mind on the questions of the status and cause of MCS and by emphasising the taking of all practicable steps to reduce the risks from exposure to the Hazardous Substances, and

other hazardous substances, which are associated with the onset of, or which can trigger the symptoms of, MCS.

393. Recommendation 9

That OSH should continue, and give extra emphasis to, its work to improve the NODS system, with particular reference to database issues and administrative support for the work of the NODS panels. OSH should, as soon as practicable, prepare a stock-take of the NODS system for you, including reporting on current problems relating to the NODS database and to administrative support for the NODS system. That stock-take should provide proposals for improvements to the NODS system in light of issues raised in this Report. OSH should incorporate into that stock-take comments from members of the NODS panels on the issues discussed.

394. Recommendation 10

That to complement, and encourage support of, the NODS system OSH should develop a regular programme to raise awareness of occupational health issues in the medical profession. That programme should include the distribution of information derived from the NODS system directly to the medical profession. OSH should consider working with ACC to give effect to this recommendation.

How Employers Manage the Hazardous Substances

395. The Inquiry considers that the general issue relating to the way in which employers manage the Hazardous Substances is not the availability – at least in theory – of information relating to the Hazardous Substances, adverse health effects associated with them and best or acceptable management practices. Rather the issue is one of the application of that information. Within that, there are issues relating to the provision of that information to employers and employees in a more usable form. These issues, furthermore, are of particular relevance to small to medium enterprises. In the context of the latency and individual sensitivity issues associated with occupational ill health, the approach taken by OSH to the enforcement of section 7 of HSE is of particular significance.

396. The Recommendations that follow are intended to:

- address issues relating to the use of glutaraldehyde in the health sector
- improve the supply of best practice information to employers, particularly in small to medium enterprises
- improve the way OSH promotes best practice through audits of particular sectors
- emphasise, through the way OSH administrates and enforces HSE, the importance of the pro-active adoption on a systematic basis of best practice management approaches to the management of occupational health risks associated with exposure to the Hazardous Substances.

Glutaraldehyde

397. Recommendation 11

That OSH should review and update the 1992 Glutaraldehyde Guidelines, and other information relating to the use of the Hazardous Substances in the health sector. That review should pay particular attention to the possibility of substitution, to the desirability of isolation, and to the necessity of fume hoods and local exhaust ventilation, and of appropriate spill management and staff information procedures. That review should be undertaken in consultation with the health sector. Practical examples of how to implement best practice should be included in the updated guidelines; for example, how to achieve isolation and how to implement local exhaust ventilation. These should take account of current best practice exemplars. The updated guidelines should then be widely distributed to employers and employees in the health sector.

398. Recommendation 12

That OSH should, following the distribution of the updated guidelines, audit the way in which exposure to the Hazardous Substances is being managed in the health sector, particularly in radiology, sterilisation and laboratory situations. OSH should ensure that appropriate attention is paid to smaller health work places as well as large ones.

Best Practice Information

399. Recommendation 13

That OSH, whilst continuing to implement the 'industry-owned safety council' approach, should also ensure that it adopts a pro-active and lead role in the development and distribution of best practice guidance material.

400. Recommendation 14

That, in conjunction with the research to be undertaken pursuant to Recommendation 6, OSH should review the terms of *MOSHH ACOP*, and other relevant codes of practice and guidance documents, with particular regard to:

- the needs of small to medium enterprises in the health, printing and manufacturing sectors where use of the Hazardous Substances is involved
- experience in the UK with *COSHH Essentials*, and with the electronic availability of control guidance sheets,

with a view to the *MOSHH ACOP* being supplemented by industry-specific initiatives in New Zealand which provide practical guidance similar to that provided by the *COSHH Essentials* control guidance sheets.

401. Recommendation 15

That consideration be given to developing 'point of exposure' information for employees on key facts relating to the Hazardous Substances and associated risks and risk management issues. This information would be displayed on stickers and

other sources of summary information that can readily affixed, or displayed adjacent, to relevant items of plant, machinery and equipment.

402. Recommendation 16

That specific work be carried out within OSH on an ongoing basis to review available international information with a view to assessing its relevance to, and possible adaptation for use in, New Zealand.

Audits

403. Recommendation 17

That, as part of its occupational health industry plan, OSH should review the series of audits of particular sectors that have already been carried out by it with a view to determining a systematic process for audit involving:

- a process for identifying sectors for audit, which should pay particular attention to the issues of latency and individual sensitivity in occupational health issues
- a pre-audit process, including a survey of the industry involved undertaken in consultation with relevant industry groups to provide clarification of issues to be focussed on during the audit and, where these do not already exist, best practice guidelines
- audit of issues identified against best practice guidelines
- following audit, encouragement of appropriate employer/employee behaviour relative to those guidelines, involving over an appropriate period of time and on a transparent basis:
 - the use of informal advice
 - the use of improvement notices
 - the implementation of more formal enforcement methods.

404. Recommendation 18

That given the information already available, OSH should audit the printing and boat-building industries on the basis identified in Recommendation 18.

Administration and Enforcement

405. Recommendation 19

That OSH review its use of the term 'best practice' where referring to preferred or recommended ways of achieving HSE compliance.

406. Recommendation 20

That, notwithstanding the desirability of the promotion of excellence and the adoption of absolute best practice in occupational health matters, greater emphasis should be

placed, particularly in small to medium enterprises, on the more fundamental need to ensure the adoption of best practice in the sense given to that term by this Inquiry; that is, practice commensurate with the 'all practicable steps' standard.

407. Recommendation 21

That OSH should review its current enforcement policy – particularly as regards section 7 of HSE - with a view to taking better account of the issues of latency, and the inherent difficulties of cause and effect, associated with occupational health issues. OSH should explicitly acknowledge that proactive enforcement action focussing on system failure or inadequacy, including by way of infringement notices and prosecutions, may be appropriate even where:

- there is no specific instance of the occurrence of an illness or injury, or
- although there has been a specific instance of the occurrence of an illness or injury, there may be difficulties in establishing the cause of that illness or injury.

408. Recommendation 22

That you refer this Report to the National Occupational Health and Safety Advisory Committee for their information and consideration and invite the Committee to consider whether they may wish to respond to research initiatives recommended in this Report.

Relationship Between Manufacture, Storage, Transport, Use and Disposal of the Hazardous Substances

409. This is the area where the Inquiry had most difficulty in obtaining relevant information and insights. Few, if any, of the submissions reviewed addressed these issues. As already noted, there is a clear gap currently in the legislative framework in this area. This relates to the obligation – or absence thereof – to provide MSDSs. Implementation of HSNO should address that issue, together with many other matters relating to this area of the Inquiry. Pending full implementation of HSNO, difficulties in this area are likely to remain. Recommendation 4 addresses the issue of the current absence of a statutory obligation to provide MSDSs. Beyond that, and given the already complex and demanding transitional issues relating to HSNO and recent initiatives in that regard, the Inquiry concluded that this was an area where progress should be measured as and when HSNO achieves full implementation.

Other Matters

ACC

410. A large part of many individual submissions related to ACC and its response to these occupational health issues over time, and to ACC's involvement with the individuals

identifying themselves as having been adversely effected. This Report comments on some of the legislative and other factors that would appear to be relevant to those experiences. The role of, and people's experiences with, ACC generally fell outside the Terms of Reference of this Inquiry. This was a matter the Inquiry endeavoured to make clear at the public hearings the Inquiry held, and in other meetings and discussions involving the Inquiry. The Inquiry has no doubt that this fact was a disappointment to many submitters. The Inquiry notes, however, that this did not stop those submitters endeavouring to focus on the lessons they felt could be learnt from their personal experiences.

411. The gradual process panel to be established under section 31 of IPRC would appear to provide an appropriate forum for those issues to be reviewed.
412. Recommendation 23
The Inquiry therefore recommends that, when the gradual process panel ('the Panel') is established you invite your colleague the Minister for ACC to:
- request that the Panel review glutaraldehyde, other aldehydes and solvents for inclusion in Schedule 2 of IPRC, at least to the extent of the traditionally recognised effects of dermatitis, rhinitis, and asthma and perhaps also to the extent of neurotoxicity
 - request that the Panel place the subject of multiple chemical sensitivity on the agenda of the Panel for ongoing consideration.

Priorities

413. Resources are constrained. It is appropriate, therefore, for the Inquiry to comment on what it would regard as priorities within its recommendations. This is not straightforward, as the Inquiry has tried to limit its recommendations to practical and achievable initiatives. If asked to comment on priorities, the Inquiry would identify (in no particular order other than as they appear in this Report), Recommendations 9 (improvements to NODS), Recommendation 11 and Recommendation 12 (management of glutaraldehyde), Recommendation 14 (industry specific practical guidance) and Recommendation 18 (structured audit of printing and boat-building) as initiatives where benefits would accrue in the shorter rather than longer term.
414. The Inquiry's sense is that Recommendation 6 (better occupational health information) and Recommendation 21 (proactive enforcement action) could be of particular significance in the longer term.

APPENDIX A TERMS OF REFERENCE

TERMS OF REFERENCE

PREAMBLE

This inquiry is a Ministerial Inquiry which is convened by the Minister of Labour. It is prompted by reports of adverse health consequences that have been experienced by persons who have been known to have worked with, and been exposed to the effects of, certain organic compounds, primarily in the health sector, the printing industry, and the manufacturing sector. Those compounds are the chemicals glutaraldehyde, other aldehydes, and solvents.

The Inquiry is aimed at learning from experiences (both positive and negative) with those chemicals in those sectors. The principal object of the Inquiry is to identify any gaps in the availability and adoption of best practice systems for the management of these particular hazardous substances in those sectors, and why those gaps exist. A further object is the identification of ways of ensuring the adoption of best practice in relation to other organic compounds used in those sectors which have similar effects. To do this, it will be necessary for the Inquiry to review the nature and extent of the adverse health consequences in question, consider whether there is any causative or other relationship between the hazardous substances and those consequences, and review the content and application of current best practice management systems for the hazardous substances.

While the Inquiry will be informed by individual examples and situations, it is not the purpose of this Inquiry to allocate blame or accountability in relation to any particular situation, incident, or exposure. For the avoidance of doubt, if this inquiry obtains information that it concludes could be placed before a relevant authority for its consideration, no reference to that conclusion need be included in the report to the Minister of Labour but that information may be forwarded to the relevant authority, together with appropriate commentary from this Inquiry, for the consideration of that authority.

SCOPE

This Ministerial Inquiry shall cover the use of, and exposure to, the following substances ("the hazardous substances"):

- Glutaraldehyde, other aldehydes, and organic solvents in workplaces, paying particular attention to uses and exposures in the health sector, the printing industry, and the manufacturing sector, being for the purposes of this Inquiry the sector which involves the assembly, fabrication, and formulation of products from materials, (including the finishing, painting and repair of such products).
- Any other organic compounds used in those same sectors which the Inquiry considers cause problems similar to those caused by the substances covered by the paragraph immediately above (whether neurological, dermatological,

respiratory, allergic, or otherwise), by means of inhalation or skin contact, for persons exposed to them in workplaces.

For the avoidance of doubt, excluded from the scope are:

- the manufacture of the hazardous substances themselves;
- exposure to organochlorine herbicides, pesticides, and their contaminants; and
- any exposure of patients, rather than workers, in the health sector.

ROLE

The Inquiry will:

Review the nature and extent of the adverse health consequences arising from the use of, and exposure to, the hazardous substances, and consider whether there is any causative or other relationship between the hazardous substances and those consequences.

Identify and consider the nature, scope, and content of, and the relationship between, the various elements of the legislative framework that govern safety and health issues in relationship to the hazardous substances.

Review the way employers (and others with responsibility in workplaces, including self-employed and employees) manage the hazardous substances and the extent to which those persons adopt best practice (in storage, use, transportation and disposal of the substances, in providing information, supervision, and training for employees in relation to the hazardous substances, and in responding to instances of adverse consequences associated with exposure).

Review the extent and effectiveness of the relationships between those manufacturing, those storing and transporting, those using, and those disposing of, the hazardous substances to identify how well those interdependencies promote best practice arrangements.

Identify any factors that affect the ability of those various participants to effectively and systematically manage the hazardous substances and adopt best practice.

Identify any areas in which best practice could be improved in light of the information considered by the Inquiry.

Identify any means available to address or respond to any issues identified, and make recommendations as to preferred options.

ANCILLARY MATTERS

In carrying out its role, the Inquiry will consider such things as:

- Areas of current exposure

- Levels of current exposure
- Types of harm associated with exposure, or allegedly associated with exposure
- Medical/scientific views about exposure and its effects
- Availability and practicability of safer substitute materials

PROCESS

The Inquiry will proceed by way of an investigation and may be informed in such manner as the Inquiry thinks fit, including:

- Obtaining relevant experience, including expert scientific and medical services, to assist it to examine issues covered by the Inquiry; and
- Inviting public submissions and holding public hearings on submissions.

The Inquiry is not bound by any rules of evidence or by any particular procedure but will conduct its investigation in a fair manner and in accordance with the principles of natural justice.

The Inquiry will report regularly to the Minister of Labour on progress with the Inquiry.

REPORTING

The Inquiry shall report to the Minister of Labour by 30 May 2003.

APPENDIX B LIST OF SUBMISSIONS

Health Sector

Health Organisations (Hospitals) Submissions

Canterbury District Health Board
Southern Cross Healthcare
Waikato District Health Board

Laboratory Submissions

LabPlus, Auckland
Dr Dorothy Oorschot, Dept of Anatomy & Structural Biology, Otago School of Medical Sciences
Allan Mitchell, Otago Centre for Electron Microscopy
Microscopy New Zealand Inc.
Brynley Crosado, Anatomy Prosector, Otago University
Association of Community Laboratories
In addition, the Inquiry received one confidential submission in this category.

Individual Submissions

Kathlyn Scott
Sheryl Welby
Suzanne McLeod
Maureen Clement
Hilary Watson
Judith Lake
Margaret Firman
Catherine Houlbrooke
Victoria Davis
Fiona MacKenzie
Miriam Brown
Melanie Hill
Vanessa Leman
Corrine Green
Jennifer Cullen
Bernadette MacDonald
Lyll MacDonald
Anthony & Dawn Pollock
Robyn Williams
Susan Shand
Dr L M Boyle
Valerie Popplewell
Karyn-Anne Coleman
Robyn Hickmott
Dorita Thompson
Trudy Green
Jan Davis
Cheryl Carnahan
Pauline Hamson
Jean Coe
Dianne Phillips
Brian Newman
Andrea Hartnell

In addition, the Inquiry received 15 confidential submissions in this category.

General Submissions

Dynea, USA
Johnson & Johnson Medical Pty Ltd, NSW Australia
Johnson & Johnson Medical, New Zealand
New Zealand Institute of Medical Radiation Technologists
Hugh Fraser Technologies
SNFTAAS Network
New Zealand Nurses Organisation

Panel Beating/Spray Painting

Individual Submissions

Ian Sinclair
Mrs JA & Mr MM Cameron
In addition, the Inquiry received one confidential submission in this category.

Printing

Individual Submissions

Mel Hollis
Ken Richards
Alf Crowe
Beverley and Kevin Francis
In addition, the Inquiry received two confidential submissions in this category.

General Submissions

Printing & Allied Industries Training Council (Inc.)

Boat Building

Individual Submissions

Sean Crawford
Robert Wallace
In addition, the Inquiry received one confidential submission in this category.

Plumbing

Individual Submissions

The Inquiry received one confidential submission in this category.

General Submissions

Impact Roofing & Plumbing Ltd
Master Plumbers, Gasfitters and Drainlayers NZ Inc.

Funeral Parlours

General Submissions

Funeral Directors Assn of NZ Inc.

Various Industries

Individual Submissions

Janette Blackler
Adam Buckingham
Phyllis Sweetman
Charlotte Mallia
Margaret Green
Steve Carter
Clarrie Jensen

Leanne Mallia
Lynette Mallia
Patricia Davy
Richard Cheyne
Keith Elson-Haigh

In addition, the Inquiry received four confidential submissions in this category.

Organisations and General Submissions

Howard Sutton
Business New Zealand
New Zealand Amalgamated Engineering, Printing & Manufacturing Union Inc.
(2 submissions)
Carter Holt Harvey Ltd
NZ Council of Trade Unions
ExxonMobil Chemical New Zealand Ltd

Submissions Outside the Terms of Reference

Audrey Christie (Western Australia)
Michael Webster,
Action on Smoking and Health (ASH)
Healthy Schools Network Inc. (USA)
Carol Young (Geelong, Australia)
Anne Rutter (Victoria, Australia)
Rewa Kereopa
Te Runanga o Te Rarawa

In addition, the Inquiry received five confidential submissions in this category.

APPENDIX C LIST OF PARTIES SENT THE INQUIRY'S GUIDELINES FOR PARTICIPATION

ACC Corporate Office
Auckland District Health Board
Bay of Plenty District Health Board
Beauty Therapists Association
Boating Industries Association
Business New Zealand
Canterbury District Health Board
Capital and Coast District Health Board
Collision Repair Association New Zealand
Composite Association of New Zealand
Counties Manukau District Health Board
Department of Conservation
Department of Internal Affairs
Department of Labour
Department of the Prime Minister & Cabinet
District Health Boards New Zealand
ERMA New Zealand
Exxon Mobil Chemical New Zealand Ltd
Funeral Directors Association of New Zealand Inc
Furniture Association of New Zealand
Furniture Manufacturing & Associated
GP Weekly
Hawkes Bay District Health Board
Hutt Valley District Health Board
Lakes District Health Board
Land Transport Safety Authority
Manufacturing & Construction Workers Union
Maritime Safety Authority
Master Painters New Zealand Assn (Inc)
Mid Central District Health Board
Ministry for the Environment
Ministry of Agriculture and Forestry
Ministry of Defence
Ministry of Economic Development
Ministry of Fisheries
Ministry of Foreign Affairs & Trade
Ministry of Health
Ministry of Health Head Office
Ministry of Housing
Ministry of Justice
Ministry of Pacific Island Affairs
Ministry of Research, Science & Technology
Ministry of Transport
Ministry of Women's Affairs
Motor Industry Association
National Poison Centre
Nelson Marlborough District Health Board
New Zealand Building Trades Union
New Zealand Charter of Health Practitioners

New Zealand Chemical Industry Council Inc
New Zealand College of Pharmacists
New Zealand Council of Trade Unions
New Zealand Customs Service
New Zealand Dental Association
New Zealand Doctor
New Zealand Film And Video Technicians Guild
New Zealand Institute of Health Management
New Zealand Medical Association
New Zealand Medical Laboratory Workers' Union
New Zealand Nurses Organisation
New Zealand Occupational Health Nurses Association
New Zealand Occupational Hygiene Society Inc
New Zealand Orthopaedic Association
New Zealand Retailers Association
New Zealand Abrasive Blasting Association
New Zealand Amalgamated Engineering Printing & Manufacturing Union
New Zealand Building Authority
New Zealand Federation of Commercial Fisherman
New Zealand Fishing Industry Board
New Zealand Institute of Hazardous Substances Officers
New Zealand Paint Manufacturer's Association
New Zealand Paint, Ink and Adhesives Manufacturers Association
New Zealand Road Transport Association
New Zealand Seafood Industry Council
New Zealand Ship & Boat Builders Federation
New Zealand Society of Anaesthetists
Northland District Health Board
OSH Penrose (Evan Dryson)
Otago District Health Board
Safeguard Magazine
Support Network for the Aldehyde and Solvent Affected (SNFTAAS)
South Canterbury District Health Board
Southland District Health Board
State Services Commission
Statistics New Zealand
Surface Coatings Association
Tairāwhiti District Health
Taranaki District Health Board
Te Puni Kokiri Head Office
Transit New Zealand
Transport Accident Investigation Commission
Waikato District Health Board
Wairarapa District Health Board
Waitemata District Health Board
West Coast District Health Board
Whanganui District Health Board

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