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**WORKSHOP ON**  
**PREVENTION OF ACCIDENTS INVOLVING HAZARDOUS SUBSTANCES**  
**GOOD MANAGEMENT PRACTICE**

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## INTRODUCTION

This Monograph is part of a series prepared in conjunction with the OECD Environment Committee project to improve prevention of, and response to, accidents involving hazardous substances (\*). That project was started in 1988 in response to a call by Ministers and other high level officials at the OECD Conference on Accidents Involving Hazardous Substances held in February 1988. A special body was formed to supervise the work on this project, the OECD ad hoc Group of Experts on Accidents Involving Hazardous Substances.

One aspect of this project is the development of guidance related to accident prevention and response. This will include principles concerning investments and aid programmes with respect to hazardous installations in non-OECD countries. It is expected that the guidance document will be finalised in 1991.

Another aspect of this project is a series of activities to promote the exchange of information and experience and to analyse specific issues of mutual concern. As part of this work, four OECD Workshops are being held related to the questions of accident prevention and response. The first was on management's role in the prevention of accidents, (Berlin, May 1989) and the second on the role of workers in accident prevention and on provision of information to the public (Stockholm, September 1989). The third Workshop will cover the role of public authorities and questions of land use (London, February 1990) and the fourth will deal with emergency preparedness and response as well as the role of research in accident prevention (Boston, May 1990).

These workshops bring together experts from government authorities, industry, labour, public interest groups, and international organisations. It was recognized that in light of the expertise of participants, these workshops provide an opportunity not only for a direct exchange of information but also for obtaining input into the development of the guidance document. Therefore, the materials from the workshops are expected to provide significant input into the drafting of the guidance document.

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\* Two monographs have already been published in conjunction with this project. The first, entitled Accidents Involving Hazardous Substance (Environment Monograph No.24) includes the conclusions of the OECD High Level Conference as well as two Council Acts which were adopted immediately following the Conference. These Council Acts are the: "Decision-Recommendation concerning Provision of Information to the Public and Public Participation in Decision-Making Processes related to the Prevention of, and Response to, Accidents Involving Hazardous Substances" [C(88)85(Final)] and the "Decision on the Exchange of Information concerning Accidents Capable of Causing Transfrontier Damage" [C(88)84(Final)]. A second monograph is entitled "Survey of Information Systems in OECD Member countries covering Accidents Involving Hazardous Substances" (Environment Monograph No. 25).

This monograph includes the documents from the first Workshop which was entitled "Workshop on Prevention of Accidents Involving Hazardous Substances: Good Management Practice" and was hosted by the Federal Ministry of the Environment of the Federal Republic of Germany. It includes the Conclusions of the Workshop which present the highlights of the discussions where there appeared to be a consensus among Workshop participants. It also includes a Revised Discussion Document. The Discussion Document was prepared by a consultant to the OECD for use as a starting point for Workshop discussions. It describes, in the view of the consultant, best practice with respect to the role of management in the prevention of industrial accidents, taking into account existing international policy statements. The Document was subsequently revised to reflect the conclusions of, and discussions at, the Workshop.

The materials in this Monograph are products of the Workshop and have not been endorsed by the OECD or its Member countries. Therefore, they do not necessarily reflect the views of the OECD or any of its Member countries.

Nevertheless, the ad hoc Group has concluded that it would be beneficial for the documents to be widely circulated. It is hoped that readers of this monograph will provide feedback on the two documents so that views of as many interested parties as possible can be taken into account in the development of the guidance document. Three additional monographs will be prepared containing the documents from the other three workshops. They will be published as Environment Monographs No. 29, 30 and 31 respectively (in chronological order).

Anyone wishing to comment on either document should directly contact the representative of their country to the ad hoc Group of Experts (a list of Heads of Delegations is included with this monograph). If you wish to comment and you are not from an OECD country, please contact:

OECD Chemicals Division  
2, rue André-Pascal  
75775 Paris Cedex 16  
FRANCE

**WORKSHOP ON PREVENTION OF ACCIDENTS INVOLVING HAZARDOUS SUBSTANCES**  
**GOOD MANAGEMENT PRACTICE**

Berlin  
22nd-25th May 1989

Hosted by the Federal Ministry of the Environment  
of the Federal Republic of Germany

Sponsored by the  
OECD ad hoc Group of Experts on Accidents  
Involving Hazardous Substances

**CONCLUSIONS**

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\* The attached conclusions were derived from the discussions at the Workshop. They have not been adopted by the ad hoc Group and therefore are not necessarily the views of the OECD or its Member countries.

**WORKSHOP ON PREVENTION OF ACCIDENTS INVOLVING HAZARDOUS SUBSTANCES  
GOOD MANAGEMENT PRACTICE**

**CONCLUSIONS**

The Workshop started with the premise that safety is an integral part of operating a business, that management has the primary role in the prevention of accidents and that industry's responsibility extends throughout the life-cycle of chemicals from conception, through production to final disposal. To this end, a number of points were emphasized at the Workshop.

1. Unequivocally, a safe business is a good business. While the costs of safety cannot be clearly separated from the total cost of running a facility, it was agreed that the potential costs due to accidents are significantly higher than the cost of making an operation safe. Furthermore, there is a clear correlation between safely run installations and economically efficient operations.

2. Companies should strive to reach the objective of "zero incidents" and resources must be targeted towards that goal. Doing so provides the incentive to achieve the best possible performance and ensure continuous efforts toward safety. This objective of zero incidents should be widely promoted for companies producing, using, handling and storing hazardous chemicals including small and medium-sized enterprises. The fact that incidents do occur does not necessarily mean failure. Efforts should be made to learn from incidents. Progress towards the objective can be furthered by setting and securing interim goals other than "zero incidents".

3. Small, medium-sized and large enterprises must operate to the same safety standards. Although small and medium-sized enterprises have inherent advantages (e.g., better communication channels), their limited resources may necessitate special approaches to facilitate the achievement of safety objectives, such as making use of external consultants, professional associations and suppliers. In promotion of safety, including establishing procedures, developing regulations and related activities, it may be necessary to give special consideration to their application in small and medium-sized enterprises.

4. Companies need to establish within the corporation a safety "culture". This starts with the visible commitment of the most senior company executives and of board members in developing, communicating, and applying a meaningful corporate safety policy.

5. Employees at all levels, including managers, must be motivated and educated to recognize safety as a top priority and its continuing improvement as a main corporate aim. This can be done by various means including: good communication; positive feedback for actions taken to increase safety; quick response to remedy identified faults; financial and career incentives for good safety performance; worker participation in developing and reviewing safety management procedures; and, in general, obvious interest of management in the staff safety performance through personal involvement.

6. The responsibility for day-to-day management of safety is in the hands of line management at site locations. Every manager should come to "own" his safety procedures by being actively involved in developing local arrangements to satisfy the broader corporate safety objectives. Each employee must be willing to accept responsibility for his own activities and the safety of his colleagues to the extent that it is linked to his activities. In this regard, it is vital that employees at all levels, including managers, be properly trained for, and fully informed about, the nature of the work and the potential hazards and that the safety performance of such employees be reviewed annually as integral part of overall performance.

7. The need for effective and continual training, at all levels, along with the assessment of training effectiveness, is essential. Safety training should be promoted in the education of engineers and of other technical specialists at universities and schools.

8. Safety services must be available to assist line management in the development of safety programmes to meet local needs, including cultural and geographic conditions. Recognising the need for expertise within the safety services group, rotation of people between line management and safety services may increase understanding of safety problems throughout the organisation, lead to better solutions and strengthen the safety culture.

9. Safety services personnel should be technically competent, either through specialised training or adequate experience or both, as well as have good interpersonal and communication skills. They have to interact with, and be respected by, all levels of staff. It is critical that safety personnel have management support and the necessary authority to carry out their responsibilities.

10. It is evident that environmental protection, worker protection and industrial safety are closely related and this view is consistent with public perception. Therefore, it would be beneficial to ensure as far as possible integration and co-ordination of these areas within a corporation as part of a total loss prevention activity. Integration may also provide additional benefits such as sharing common information and eliminating duplication.

11. Safety performance assessment should be carried out in order to:

- assess achievements with respect to the goals set;
- focus resources where improvements are most needed;



- provide information to justify the adjustment (upgrading) of those goals and to achieve improvements;
- demonstrate management's commitment to safety and provide motivation for improvement;
- provide a basis to recognize good and inadequate performance; and
- to be able to present the company's safety achievements to the community and to shareholders.

12. Traditionally, safety performance has been measured on the basis of changes in loss time accidents, a reactive and uneven indicator. Although this approach has value, further efforts are needed to develop and utilize proactive "success" indicators (safety performance surrogates) and alternative methods to assess achievements of risk reduction.

13. Management needs to encourage the reporting and critical examination of accidents and near misses in order to generate additional information on which to base further action. All employees must be given appropriate training in hazard reduction and reporting, and be given responsibility and positive encouragement to report "near-misses". Analysis of safety performance must take into account that increased reporting of incidents and near misses does not constitute a worsening safety record but on the contrary may be a positive contribution to risk reduction.

14. Internal safety audits are an essential management tool for promoting safe operations and should include technical and management aspects. External audits can be a valuable means in certain cases for raising safety performance by providing a more independent viewpoint. Furthermore, insurance companies can play a particular role by providing assistance to their customers, especially small and medium-sized enterprises, on ways and means to reduce certain hazards.

15. Mechanisms for companies to foster open and frank exchange of accident and related information both inside and outside the company must be further developed and encouraged. There is an obvious need to capture and share this institutional memory more widely throughout industry. Means should also be developed to involve government in some ways in these discussions without jeopardising the companies' interests.

16. The dissemination and use of recognized safety technology by suitable means needs to be encouraged (e.g., through the creation of a technology data base). This could be of help to many companies, in particular small and medium enterprises and in developing countries.

17. Some governments, companies, industry associations, etc., have undertaken to set standards for safety technology. These standards make an important contribution to safety management in the widest sense because they provide clear guidance on how the relevant safety objectives can be achieved. However, since safety is a dynamic process, these standards must be kept under review and be regularly updated in the light of developments in technology and

safety management practices. In general, current standards should be considered minima; and companies should be encouraged to go beyond these standards and associated codes of practice to the extent necessary to ensure a higher level of safety. Furthermore, in order not to inhibit progress, standards should accept that equivalent or higher levels of safety may be achieved by alternative means. (This important and complex issue will be further discussed in a workshop in the United Kingdom scheduled for February 1990).

18. For safe operation of a hazardous installation, it is necessary to focus not only on improving hardware technology but also to improve "software", particularly to enhance safe human behaviour by means such as management systems, improving and utilising worker know-how, and effective two-way communication channels. The Japanese management approach provides an interesting example of a structure in which every day during all activities there is "bottom-up" motivation and attention to every detail to promote safe operation of facilities by all employees.

19. Safe operation is a concern of each employee. The management of safety is a multidisciplinary activity starting with the identification and assessment of risk using a wide variety of techniques such as checklists, hazard analysis and operability studies. It was noted that use of analytical tools can also generate cost savings and improvements in productivity. Even while management actions are being taken to minimize the risks from an analytical or technological view, steps should be taken to further reduce risks focussing on human actions, and to introduce defenses against the potential harm posed by residual risks.

20. Human error is often found to be the direct cause of accidents but little effort is made to understand the underlying problems. It should no longer be acceptable to record accidents or near-misses as simply human errors. We must go beyond to determine exactly what elements contributed to the error. Such elements could include: boredom; stress; overwork; lack of training; inadequate procedures; poor ergonomic design; poor system/technology design; inappropriate communications; management inadequacies; inappropriate safety goals, etc.

21. Since a significant number of major accidents involve warehouses, newly developed guidance and technology should be integrated into new and existing facilities (with respect to, e.g., warehouse operation, training, firefighting, containment of contaminated water from firefighting, etc.) with particular emphasis being given to incorporating into new warehouses automated systems for handling hazardous substances, for limiting access and for responding to emergencies with a focus on protecting health and the environment.

22. The manufacturer of a potentially hazardous substance has a responsibility, legally and/or morally, for his products. Their mishandling or misuse could have significant impacts on health and the environment as well as repercussions on the company or industry as a whole. Special efforts must be made to help prevent accidents from the handling and use of hazardous materials downstream (e.g., by product stewardship). Technology, information and assistance should be provided to contractors, distributors, transporters

and users and the potentially affected public so that they can follow appropriate prevention practices. A company should not hire contractors unless they are competent to carry out the contracted work in accordance with the safety standards of the company. Companies should also monitor the performance of their contractors. Companies should actively try to determine whether their customers have adequate facilities and know-how to handle hazardous substances. If such determination cannot be achieved, judgment has to be exercised to decide whether to accept such customers. If customers are found to be incapable of safely handling the hazardous substances, the seller of the substances should assist the customer in obtaining this capability or else not accept such customers.

23. Operators of facilities in the non-chemical industry which use, handle or store chemicals need to recognize the potential hazards and operate to standards consistent with the chemical industry. Again, there is an obligation on the chemical supplier to create greater awareness and to provide the necessary assistance.

24. The need to provide information to prevent accidents must weigh heavily when considering the rare instances when such information is of vital commercial importance to the company concerned. While all information necessary to prevent accidents or to mitigate their consequences must always be supplied to the competent authorities, provision of information to the public must recognise the need to protect legitimate trade secrets. However, all information required by the population at large to protect themselves in case of an accident should be provided regardless of trade secrets. The communities concerned should be made clearly aware that companies have a duty to ensure that - even where some information is withheld from public circulation - sufficient information is always provided to ensure that those likely to be affected are informed and that they, as well as the environment, are adequately protected. Nevertheless, when considering the exchange of information on safety technology - and much is freely exchanged among companies - it is recognised that valuable commercial property such as new inventions and technology can only be released by licensing, purchase agreements, etc. as part of the business enterprise.

25. Transfer of hazardous technologies should only take place with related safety technology and know-how, together with the assurance that safe operating conditions can be achieved in the receiving enterprise or country. Parties transferring and receiving such technology, financing bodies and the authorities in the receiving country, as well as concerned public and private organisations, should continue to take action to support this principle. Action at the international level may be needed so as to induce OECD exporting countries to adopt a common position related to technology transfer to non-Member countries.

26. Duplication of effort in developing safety technologies and related research, and in the preparation of guidance documents across countries, industry groups and international organisations, should be avoided. Therefore, it would be beneficial to establish a central forum to promote co-operation and the sharing of information.

**ROLE OF MANAGEMENT IN THE PREVENTION OF INDUSTRIAL ACCIDENTS**

Prepared in conjunction with the Workshop on  
"Prevention of Accidents Involving Hazardous Substances:  
Good Management Practice"

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Hosted by the Federal Ministry of the Environment  
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on Accidents Involving Hazardous Substances

**REVISED DISCUSSION DOCUMENT**

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- \* This document was prepared by a consultant to the OECD, Mr. T.J. Brewer. It was used as a basis for discussion at the Workshop and was revised to reflect the comments at the Workshop. Similar documents will be prepared in conjunction with further Workshops and these will be used in the preparation, in the future, of an OECD guidance document on Prevention of, and Response to, Accidents Involving Hazardous Substances. This document does not necessarily reflect the views of the OECD or its Member countries.

## ROLE OF MANAGEMENT IN THE PREVENTION OF INDUSTRIAL ACCIDENTS

### INTRODUCTION

The OECD, through its Environment Committee, has undertaken a project to improve prevention of and response to accidents involving hazardous substances. This was in response to a call by Ministers and other high level officials at the OECD Conference on Accidents Involving Hazardous Substances held on February 1988. The body responsible for supervising the work on this project is the OECD ad hoc Group of Experts on Accidents Involving Hazardous Substances.

One aspect of this project is the development of guidance related to accident prevention and response. This will include principles concerning investments and aid programmes with respect to hazardous installations in non-OECD countries (the guidance will hereinafter be referred to as the "guidance document").

As part of the project, two OECD Council Acts have been adopted, which are binding on OECD Member countries. These are the "Decision-Recommendation concerning Provision of Information to the Public and Public Participation in Decision-Making Processes Related to the Prevention of, and Response to, Accidents Involving Hazardous Substances" [C(88)85(Final)]; and the "Decision on the Exchange of Information concerning Accidents Capable of Causing Transfrontier Damage" [C(88)84(Final)]. These two Council Acts, along with the conclusions of the OECD High Level Conference, are available in a Publication of the OECD entitled Accidents Involving Hazardous Substances, Environment Monograph No. 24.

The project also includes a number of activities regarding the exchange of information and experience and the analysis of specific issues of mutual concern. As part of this work, four OECD Workshops are being held related to the issue of accident prevention and response. These will address: management's role in the prevention of industrial accidents; the role of public authorities with respect to prevention; the role of labour and provision of information to the public; and emergency preparedness and response. It was recognized that in light of the expertise of participants, these workshops provide an opportunity not only for a direct exchange of information but also for obtaining input into the development of the guidance document. Thus, the drafting of the guidance document will take into account the conclusions of the Workshops.

This document was prepared in conjunction with the first workshop and deals with those areas for which the operators/managers of hazardous installations have responsibility for safety, and includes the full range of considerations from setting safety objectives and the design and planning of facilities to operation, monitoring and follow-up. For each area, this paper describes what should be done by management to

achieve the safe operation of their installations. These statements have been developed utilizing conclusions already reached by various bodies such as international organisations, national and international trade associations, industrial corporations as well as other non-governmental organisations. It takes into account the comments made by the Workshop participants, who included over 100 representatives from industry, governments, labour union organisations, international organisations and non-governmental organisations.

The main thrust of this document is accident prevention although it is appreciated that "accidents do happen" and that it is essential that emergency plans are made so that the effects of any loss of containment are minimised.

For purpose of this document, the word "corporation" has been used in its broadest sense to include any industrial enterprise. Where reference is to a particular type of corporation (for example, a multinational enterprise, a small or medium-size enterprise, etc.), it is specifically indicated as such.

This document should be read to cover all installations that produce, use or store hazardous substances. This would obviously include the chemical and petrochemical industries but would also include associated industries such as manufacturers who use chemicals and petrochemicals in their operations. Although much of what is included in this document is relevant to transportation of hazardous substances, the scope is limited to fixed installations and activities within the boundaries of such installations.

## **I. PREVENTION OF INDUSTRIAL ACCIDENTS**

### **A SAFETY AND HEALTH POLICY AND OBJECTIVES**

Safety is an integral part of operating a business such that the responsibility of the industry extends throughout the life-cycle of a chemical from its conception, through production to its final disposal with the primary role for the prevention of accidents resting with management.

The fundamental requirement from which all principles in accident prevention are derived is a clear and meaningful statement of the Safety and Health Policy which has been developed and agreed at the highest level in a Corporation. This Policy should set out to protect the safety and health of all persons involved in, or who may be affected by, the manufacture and use of its products and should be widely communicated throughout the Corporation to establish a corporate safety "culture" which starts with the visible commitment of the most senior company executives and Board members. The organisation and arrangements for implementing this policy should be embraced such that the intent is fully understood and well appreciated by all employees throughout the Corporation. The line of prime responsibility for safety in the Corporation, as well as individual responsibility for safety, should also be described.

It will be necessary for each location within a Corporation to develop its own Safety and Health Policy which conforms to the corporate policy and addresses specific requirements and safety concerns in greater detail.

All installations within a Corporation should strive to reach the ultimate objective of "zero incidents" and resources must be targeted towards that goal. Doing so provides the incentive to achieve the best possible performance and ensure continuous efforts towards greater safety. This objective should be widely promoted for companies producing, using, handling and storing hazardous chemicals, including small and medium-sized enterprises. Progress towards the objective of "zero incidents" can be furthered by setting and achieving interim goals as the fact that incidents do occur does not necessarily mean failure but rather that greater effort must be made to avoid and learn from such incidents.

Small, medium-sized and large enterprises should, in general, operate to the same safety objectives. Although, small and medium-sized enterprises have some inherent advantages (e.g., better communication channels), resource limitations may necessitate special approaches to facilitate the achievement of safety objectives such as making use of external consultants, professional associations and suppliers. It may be necessary to give special consideration in the application of safety procedures, development of legislation and related activities to promote safety in small and medium-sized enterprises.

Operators of facilities in the non-chemical industry which use, handle or store chemicals need to recognise the potential hazards and operate to standards consistent with the chemical industry. There is also an obligation on the chemical supplier to create greater awareness of hazards and to provide assistance and/or guidance where necessary.

Unequivocally, a safe business is a good business. There is a clear correlation between safely run installations and economically efficient operations. Although the cost of safety cannot be clearly separated from the total cost of running a facility, the potential costs due to accidents are significantly higher than the cost of making a operation safe.

## **B. PLANNING CONSIDERATIONS**

These are more usually the subject of consideration in relation to new plants and process designs, but they can also be important when considering modifications to existing plants and process designs as well as research activities. They can also be affected by changes in public and/or governmental attitudes.

Some governments, companies, industry associations, etc. have undertaken to set standards for safety technology. Since safety is a dynamic process, standardisation of safety technology may lead companies to selecting inappropriate or outdated technologies and thereby providing

a false sense of security. However, this does not diminish the usefulness of certain standardisation or of the development of codes of practice on relevant subjects to encourage a higher level of safety. Any such standards or codes should be considered to be the minimum requirement and companies should be encouraged to go beyond these standards or codes of practice.

## **B.1 Hazard Identification and Assessment**

Safe operation is the concern of each employee. The management of safety is a multidisciplinary activity starting with the identification of hazards and assessment of risk using a wide variety of techniques such as hazard analysis, operability studies, fault tree and event tree analysis, checklists, etc. embraced by the term hazard studies.

When planning, designing and modifying plants and processes it is essential that formal systematic hazard studies are carried out in order that hazards are identified at the various stages of the project, including the research stage, and the most suitable means of control instituted.

Inherent safety thinking should be applied during this procedure by avoiding processing/using toxic or flammable materials, substituting less hazardous materials, reducing inventories of toxic or flammable materials, reducing process temperatures/pressures, simplifying the process, and separating people from hazardous substances wherever practical.

Such critical examination techniques as Hazard and Operability Studies are advocated for formally checking a design with less detailed (coarse) hazard studies being carried out in advance of detailed design so that hazards are anticipated as early as possible in the project, and eliminated where practicable. Consequently, the use of such analytical tools can also generate cost savings and improvements in productivity.

The scale of the consequences that could result from each significant hazard and their likelihood should also be assessed using techniques such as fault tree and event tree analysis so that the worst reasonably credible potential for harm is ascertained. Reducing either the hazard or its probability of occurrence reduces the risk and increases the inherent safety. In some cases it may be helpful to assess the level of risk from the hazard as an aid to determining appropriate preventive measures although it should be recognized that this is only one option.

Where existing plants have not been subject to these techniques the importance of carrying out the appropriate hazard studies in retrospect in order to be assured that hazards have been properly identified and assessed cannot be over-emphasized.



Safety checks should also be carried out at the commissioning and operating phases of a project to ensure that the requirements of the hazard studies have been correctly installed and operate as intended such that the design intent has been completely fulfilled.

Even while management actions are being taken to minimise the risks from an analytical or technological view, steps should be taken to further reduce risks focussing on human actions.

## **B.2 Engineering for Safety**

The appropriate equipment, facilities and safe systems of work (including maintenance) must be provided which reduce the risk from hazards as far as is reasonably practicable.

For new plants and modifications, the relevant most up-to-date international standards, codes of practice and guidance should be used. These should be supplemented by guidance developed both from outside the Corporation (in professional associations, trade associations, other corporations and Government bodies) and from within the Corporation as a result of operational experience and specialist knowledge. The latter should be embodied in "in-house" engineering design guides and specifications which should be formally verified by authorised engineers in particular cases, e.g., pressure vessel design.

Specific process safety considerations such as pressure relief, fire and explosion assessment and area classification, etc., should also be established as mandatory instructions.

For existing plants any deficiencies with respect to current standards should be assessed to determine what improvements may be necessary so that the appropriate modifications can be undertaken.

All equipment purchased by a Corporation should be formally inspected to ensure that it conforms to design specifications and safety requirements before being put into use.

Although the emphasis is on inherent safety, it is normally necessary to "add-on" protective systems and to implement procedures to minimise the chance of failure and should there be a failure, to minimise adverse affects, thereby assuring safety through "extrinsic" measures. Similarly, the effects of a loss of containment having occurred may be minimised by other "extrinsic" measures such as water sprays, fire protection equipment and emergency procedures.

The dissemination and use of recognised safety technology by suitable means needs to be encouraged, e.g., through the creation of a technology data base. This could be of particular help to many companies, in particular small and medium-sized enterprises, as well as in developing countries.

### **B.3 Construction**

Contractors should provide assurances that their services will be carried out in accordance with all applicable laws and regulations in addition to the relevant safety and health policies of the Corporation. Specific site safety information should be made available to all such contractors and compliance should be an integral part of the contract.

Formal inspection of plants should also be carried out during construction to ensure that the correct materials and methods, such as welding techniques, are being used. These formal inspections should be supplemented by physical tests such as pressure and leak testing of vessels and pipework.

Safety checks should also be carried out during the construction phase of a project to ensure that the requirements of the hazard studies are being fully implemented and correctly installed so that the integrity of the original design is maintained.

### **B.4 Siting Considerations**

In recent years there has been an increasing demand throughout the world by government authorities, international organisations and the general public for information regarding the siting of installations handling hazardous substances and for the provision of such information as a statutory requirement.

Consequently there is a need for a list to be maintained of all hazardous substances - toxic chemicals, flammable substances, explosives, corrosives - handled during manufacturing and storage operations and their location on site.

Details of the analytical methods available for detecting the presence of such hazardous substances should also be available together with a description of the hazards which they may create.

When considering the siting of an installation involving hazardous substances, management should ensure the development of a scale plan of the site showing the locations and quantities of the hazardous substances relative to the surrounding area, the nature of adjacent land use, the local population and sensitive environmental areas. The processes to be operated and/or inventory stored and the conditions

under which the hazardous substances are handled should also be part of the siting considerations. In addition, the possibility of "knock-on" effects and the need for "separation distances" to provide a buffer zone between potentially hazardous areas should be considered. Increasing the separation distances between people and hazardous installations reduces the risk to those people.

The minimum and maximum number of people likely to be on site at any one time, the availability of external emergency resources (infrastructure) and prevailing weather conditions should also be taken into siting considerations particularly where toxic chemicals are involved.

## **B.5 Transfer of Technology**

When considering the transfer of a technology, a level of safety and health protection equivalent to that achieved in the home facilities of the technology supplier should be pursued by management. This should be the highest degree of safety reasonably practicable according to the current state of knowledge. Safety should be independent of political, social, economic or commercial factors, such that the safest of the alternative technologies available is selected, taking into account local requirements and circumstances.

The technology supplier should be responsible for safe process design, initial technical training, the supervision of commissioning, start-up assistance and information for the safe operation and handling of the products used or manufactured. The extent of these responsibilities and the period during which they apply can vary depending on the type and context of the specific contract. The contract governing the transfer of technology should clearly define and regulate the division and sharing of responsibilities between the parties involved.

Transfer of hazardous technologies should take place only when the related safety technology and "know-how" coupled with the assurance that safe operating conditions can be achieved in the receiving enterprise or country. Parties transferring and receiving such technology, financing bodies and the authorities in the receiving country, as well as concerned public and private organisations, should continue to take action to support this principle. Action at international level may be needed so as to induce OECD exporting countries to adopt a common position related to the transfer of technology to non-Member countries.

## **B.6 Acquisitions**

Safety, health and environmental considerations should be taken into account by management when assessing other companies and facilities with a view to acquisition with responsibility being on the "seller" to disclose all known or suspected safety, health and environmental

problems. The type and degree of hazard present should be determined as well as what would be entailed in operating the proposed acquisition in conformity with the technical standards and safety culture of the parent Corporation. All of the relevant guiding principles for the prevention of accidents involving hazardous substances should apply to acquisitions immediately. The new relationship is similar to that between new and existing plants relative to improving standards. The basic question is how long it will take to bring the "old" up to the "new" standard.

Where "standards" (including procedures, techniques, approach, "culture" etc.) are better in the acquired company or facility, then they should be introduced into the acquiring company as soon as practically possible.

## **B.7 Relationship with Customers and Contractors**

The manufacturer of potentially hazardous substances has a responsibility, legally and/or morally, for his products. Their mishandling or misuse could have significant impacts on health and the environment as well as repercussions on the corporation and industry as a whole. Consequently, special efforts must be made to help prevent accidents from the handling and use of hazardous materials downstream through product stewardship. Technology information and assistance should be provided to contractors, distributors, transporters and users.

Companies should actively try to determine whether their customers have adequate facilities and "know-how" to handle hazardous substances and, if such determination cannot be achieved, judgment has to be exercised to decide whether to accept such customers. If customers are found to be incapable of safely handling the hazardous substances, the seller should assist the customers in obtaining this capability or else not accept them as customers.

A Corporation should do business only with those contractors who provide assurance that their services will be carried out in compliance with all applicable laws and regulations in addition to those safety and health policies of the Corporation which are relevant.

## **B.8. Provision of Information**

Operators of installations involving hazardous substances should take all reasonable measures to inform those potentially affected members of the public of the general hazards to which they may be exposed either directly or through the local community. The information should be presented to local residents in an easily understandable manner. It should also contain relevant safety information regarding means of

notification of an emergency and the action to be taken to minimise any adverse effects. Extensive experience on how to do this effectively has been established in the developed countries by the larger corporations.

Operators of hazardous installations should take all reasonable measures to provide public authorities with the information needed to assess risks and draw up emergency plans. This information is a legal requirement in many countries and often takes the form of a Safety Report, Notification or Safety Case embracing most of the principles covered by this paper for the prevention of accidents involving hazardous substances.

The need to provide information to prevent accidents must weigh heavily when considering the rare instances when such information is of vital commercial importance to the company concerned. While all information necessary to prevent accidents or to mitigate their consequences must always be supplied to the competent authorities, provision of

information to the general public must recognise the need to protect legitimate trade secrets. However, all information required by the population at large to protect themselves in case of an accident should be provided regardless of trade secrets. The communities concerned should be made clearly aware that companies have a duty to ensure that, even where some information is withheld from public circulation, sufficient information is always provided to ensure that the environment and those likely to be affected are adequately protected. Nevertheless, when considering the exchange of safety technology it should be recognised that valuable commercial property such as new inventions and technology can only be released by licensing, purchasing agreements, etc. as part of the business enterprise.

## **C. OPERATING CONSIDERATIONS**

### **C.1 Organisational Prerequisites**

For the safe operation of a hazardous installation, it is necessary to focus not only on improving hardware technology but also to improve "software" such as management systems, worker "know-how", two-way communication channels, etc. The Japanese management approach provides one interesting example of motivation and attention to detail to promote the safe operation of facilities by all employees.

Safety is ultimately a line management responsibility with accountability for day-to-day management of safety in the hands of local line management at site locations. This should be clearly laid down in the Safety and Health Policy of a Corporation such that commitment to safe operation and taking all appropriate measures to prevent accidents is clearly evident throughout the management organisation. Every manager should come to "own" his safety procedures by being actively involved in developing local arrangements to satisfy

the broader corporate safety objectives. Safety performance should be considered as being of the same importance as any other management responsibility and be part of management performance appraisal/reward systems.

Adequate professional safety resources must be available to give technical advice and assist line management in carrying out their safety responsibilities and in the development of safety programmes to meet local needs which can be affected by cultural and geographic conditions. Competent "in-house" specialists share the responsibility with line management when arrangements and decisions are based on their specific expert advice. The scope of the safety organisation should be appropriate to the size, technology and complexity of the business. The role of the safety organisation should be to remain impartial and independent functioning as a Corporation's conscience. Recognition of the need for certain expertise within the safety services group and rotation of people between line management and safety services will increase understanding of the problems, lead to better solutions and strengthen the "safety culture".

Safety personnel should be technically competent, either through specialised training or adequate experience or preferably both in addition to possessing good interpersonal and communication skills. They have to interact with and be respected by staff at all levels in the corporation. It is essential that safety personnel are seen to have management support and the necessary authority to carry out their responsibilities.

Each employee must be willing to accept responsibility for his own activities and the safety of his colleagues, to the extent that it is linked to his activities, and co-operate in preventing accidents. Two-way channels for communication of information on safety between management and workers should exist in hazardous installations, strengthened by the establishment of joint safety committees with representation from the Safety function. No measures prejudicial to a worker should be taken if he complains of what he considers to be a serious breach of statutory requirements or a serious inadequacy in the measures taken by his employer in respect of occupational safety. This approach is essential if the necessary "open" attitude to safety matters is to be achieved.

Systematic safety improvement programmes should be developed at each location within a Corporation aimed at ensuring compliance with the Corporation's Safety and Health policy and improving safety performance. Such programmes should be reviewed on a regular basis.

It is evident that industrial safety, worker protection and environmental protection are closely related and this view is consistent with public perception. Therefore, it would be beneficial to ensure the integration and co-ordination of these areas, as far as possible, as part of a total loss prevention activity within a corporation. Integration may also provide additional benefits such as the sharing of common information and eliminating duplication.

## **C.2 Hazard Information and Safe Systems of Work**

Operators of hazardous installations should take all reasonable measures to inform on-site workers of the general hazards to which they may be exposed. Adequate information on the hazards (including hygiene standards and exposure levels) and procedures to be used for the safe handling of all substances used on the installation or manufactured as intermediates or for sale shall be obtained, kept up-to-date and disseminated widely in a language which all workers can understand. The exchange of such information should be provided to legitimately interested parties subject to any over-riding consideration of confidentiality proper to the protection of the business and the interests of third parties.

The arrangements should ensure that every piece of information on the process and on process equipment relating to hazards, design, operation, maintenance and foreseeable emergencies is collected, as a data base, in a process documentation file or plant dossier.

This will include information such as manufacturing procedures, process and operating instructions (including safe start-up and shut-down), line diagrams, results of safety tests and safety data on raw materials, reaction mixtures and first products as well as data resulting from hazard studies, etc. Such a dossier is essential for training as well as for operational reasons and in developing the Safety Report required by many countries. By virtue of its importance it is essential that this file is kept up-to-date.

Each location should develop written job and process operating procedures sufficient to keep operating conditions within the design intent and maintain the integrity of the plant. The location should also decide in which areas access should be limited and controlled, and how to apply such controls.

The relevant standards, codes and guidance should be applied to ensure equipment, plant and premises provide a safe place of work. Particular attention should be given to the requirements for safe access and egress, pressure systems, instrumented protective systems, electrical classification, permit to work systems, entry into confined spaces, welding, means of isolation, control of ionising radiation, pipework, guarding of machinery and lifting equipment.

Formal arrangements should be made so that appropriate measures are taken for the prevention of fire, for the protection of personnel, buildings, plant and equipment and for fighting fires should they occur. The arrangements should take account of equipment, procedures and training. The need for full-time fire safety personnel should be considered relative to the risks present and the local services available. Appropriate arrangements should also be made to minimise the possibility of sabotage.

Managers and supervisors have a special obligation to keep informed about safety standards and risks such that they know and fully understand the properties and behaviour of the materials being used and the limitations of the equipment and machinery, and should be competent to implement the measures to be taken in an emergency at all times.

Duplication of effort in developing safety technologies and in related research, safe systems of work and in the preparation of guidance documents across countries, industry groups and international organisations should be avoided. Therefore, it would be beneficial to establish a central forum to promote co-operation and the sharing of information.

### **C.3 Training**

Employees at all levels, including managers, must be motivated and educated to recognise safety as a top priority and its continuing improvement as a major corporate objective. This can be done by various means such as positive feedback for actions taken to increase safety, quick response to remedy identified faults, worker participation

in developing and reviewing safety management procedures, financial and career incentives for continued good safety performance, etc. In general, this means the obvious interest of management in the safety performance of all staff through personal involvement with the encouragement/training to develop critical facilities to be able to think through the job rather than just carry it out mechanically.

All new employees should receive safety and health orientation as part of their initial induction training to create safety consciousness and commitment. As a minimum, operators should receive specific training in hazard identification and corrective measures, basic emergency procedures, proper material handling procedures and hazards unique to their job. Where appropriate, a special training programme should be provided for "foreign" workers in their mother tongue.

Operators of hazardous installations should take all reasonable measures to ensure that all on-site workers receive appropriate training for plant operation under both normal and abnormal conditions in order to create the high level of awareness necessary not only to prevent accidents but also to respond to unusual occurrences quickly and effectively.

Arrangements should be made to ensure that training needs at all levels are properly identified, form part of an annual Accident Prevention Plan and are appropriately satisfied with records being kept of training carried out by managers, supervisors, technicians and operators. The level and effectiveness of training should be regularly assessed to ensure that all employees are competent at all times to carry out the duties for which they are responsible. This is particularly important in times of change, such as when a manager, supervisor or operators are being assigned to a new/different plant processing hazardous substances when it is essential that "know-how" is also "passed on".

Staff are more likely to be conscientious in their implementation of systems and procedures if their training makes it clear why the various systems and procedures are required as well as what they are required to do. The existence of training is not the end of the problem as it can also contain the tools for disaster unless correctly structured.

Every employee performing a supervisory function has to instruct those in his team on how to carry out the tasks entrusted to them safely. As a minimum, each supervisor should receive training in: safety leadership; accident investigation and reporting procedures; how to carry out job safety and health analyses; and how to conduct safety meetings. The training of some managers needs to go beyond purely functional matters.

Safety performance and behaviour should be considered an essential component of every employee's overall performance which should be reviewed annually.

Safety training should be promoted in the education of engineers and other technical specialists at universities and schools.



#### C.4 Staffing and Personnel Policies

Management is responsible for ensuring that each operation is staffed in a manner that allows for the safe operation of facilities at all times. Staffing and technical skill requirements posed by start-ups, shut-downs, abnormal or unique operating situations and emergency response needs should be identified and met. Plans for personnel development and rotation should always be consistent with maintaining operational safety requirements. Hours of work and rest breaks should be compatible with safety requirements. Overtime and weekend working by any individual should not be excessive and a record of all such abnormal hours maintained.

Consideration should also be given to the physical fitness of staff employed on hazardous operations particularly those engaged in largely sedentary activities such as managers and control room staff. Such consideration should also address the problem of substance abuse, such as drugs and excessive alcohol, and how such staff can be helped.

The prerequisites of each task should be carefully examined so that staff are not placed under unnecessary or excessive stress, e.g., by adapting the workplace to the worker using ergonomic techniques.

In hazardous installations specific personnel policies with respect to smoking, carrying matches, eating, drinking, personal hygiene, wearing of personal protective equipment, jewelry, watches, etc., may be necessary for safety reasons and included in the contract of employment.

When it is not reasonably practicable to prevent the exposure of workers to safety and health hazards by engineering or organisational measures, the employer should provide suitable personal protective equipment and ensure it is maintained in good condition.

Management should ensure that each location has procedures for the care, use and storage of personal protective equipment and enforce rules for the wearing of eye, hand, body, face, head, hearing, respiratory and foot protection where there is a reasonable probability that injury can be prevented or minimised by the use of such equipment.

Jobs which may be assigned to disabled or restricted employees, pregnant women and young workers without danger should be identified and special arrangements made for the safety of such employees at all times and under all conditions.

Before new products, processes or equipment are handed over from one department (such as research) to another (such as production) all operating procedures and safety instructions should be laid down in writing and agreed. This procedure should be formalised by an appropriately signed handover/clearance report. It should be ensured that knowledge and experience gained in research, development, pilot plant and production are passed on.

## **C.5 Safe Maintenance Procedures**

Arrangements for the safety assurance of existing plants should include the necessary provisions for regular routine inspection and testing of equipment, particularly safety and fire protection systems, to ensure that it is fit for the purpose for which it was designed at all times.

Maintenance standards should be developed to guarantee the safety of each operation and maintenance jobs performed according to known maintenance procedures. Routine preventative maintenance programmes should be developed and adhered to strictly. Maintenance needs should be recorded in a systematic manner and any maintenance modifications should conform to the best design, fabrication, installation and documentation practices. Maintenance work that is seldom performed should be analysed so that the best current safety methods are employed to assure worker protection.

Local management in each location within a Corporation should have and enforce rules for the regular testing of emergency alarms, protective and emergency devices and all devices critical to the orderly shut-down of operations. Particular attention should be given to the inspection and testing of all relief devices.

After repair, maintenance, and overhaul of plant and equipment the necessary test runs and safety checks should be performed in the presence of the plant supervisor responsible for operating the plant and a hand-back/acceptance certificate properly initiated and countersigned.

All maintenance work carried out should be recorded and equipment review and reliability procedures in place so that a planned maintenance programme can realise its full potential.

## **C.6 Plant Modification Procedures**

Management should establish formal procedures to ensure that no modifications to plant, processes, facilities or software compromise safety in any way. The arrangements should require that all modification proposals are registered and assessed so that the necessary hazard studies are carried out, the appropriate design considerations made and the changes proposed properly engineered and recorded. The competent technical people responsible for approving the proposed change should be designated.

Plant modification procedures should apply to both permanent and temporary changes, be based on appropriate, up-to-date process documentation and/or a physical inspection of the facility and include a review independent of those directly responsible. The level of management approval necessary should be based on the perceived level of risk. Applicable retrofit requirements should be included in engineering standards.

Management systems should exist to ensure as far as reasonably possible that equally effective protection exists during outages of critical instruments/alarms and emergency equipment. Arrangements should ensure that all critical systems are returned to full service as soon as possible.

In the case of any changes made to a process which could affect process safety (e.g., use of other process materials, alterations of conditions, increase in batch size, or use of larger/different equipment) the hazard analysis should be reviewed and the process documentation file supplemented accordingly. A supervisor who has authority to alter a manufacturing procedure or operating instruction must be fully aware of the hazards involved and consult the relevant competent specialists before initiating such a change. Changes in operating facilities and processes should not introduce an unacceptable risk.

### **C.7 Storage Facilities**

Individual sections/areas of a hazardous installation containing a significant inventory of toxic, flammable, corrosive or explosive materials warrant special consideration. Inventories of such materials

should be kept to a minimum and adequate separation distances maintained from bulk storage facilities in order to minimise any possible "knock-on" effect. Consideration should also be given to the conditions of storage (e.g., temperature and pressure) and the provision of safety features such as adequate bunding, fire protection and security procedures (e.g., access control).

Local management should ensure that all applicable current codes of practice and relevant legislative requirements for the safe storage of flammable materials, compressed gases, toxics, corrosives and explosives are strictly applied

Where possible, the isolation of hazardous intermediate substances should be avoided or produced in limited quantities for immediate use.

Following the significant number of major accidents involving warehouses in recent years, new guidance and technology has been developed. This should be integrated into new and existing facilities with particular emphasis being given to incorporating into new warehouses automated systems for handling hazardous substances, for limiting access and for responding to emergencies with a focus on protecting health and the environment. Special attention should also be given to the location and operation of shrink wrapping equipment and the need for containment of firewater.

## **D. PERFORMANCE REVIEW AND EVALUATION OF SYSTEMS TO PREVENT ACCIDENTS**

### **D.1 Measurement**

Safety performance should be measured in order to:

- assess achievements with respect in the goals set;
- focus resources where improvements are most needed;
- provide information to justify the adjustment/upgrading of goals and achieve further improvements;
- demonstrate management's commitment to safety and provide motivation for improvement;
- provide a basis for recognising good and inadequate performance;
- demonstrate safety achievements to the community, shareholders and influence groups.

Traditionally, safety performance has been measured to a large extent on the basis of changes in lost-time accident rates. Although this approach has value, it is a reactive indicator and only part of the total safety "picture". Further effort is needed to develop and utilise proactive, positive indicators of safety performance and alternative methods of assessing achievements in risk reduction.

### **D.2 Monitoring**

Every Corporation as a matter of policy should continually review its operations to ensure that they are free from unacceptable risks to safety and that the required degree of compliance is obtained with the relevant legislation, codes and procedures. By this means, any needs for additional, new or improved standards and procedures should be revealed. Improvements beyond those legally required should be made where they provide significant benefits at reasonable cost.

Therefore, it is essential that the management arrangements for every hazardous installation include a comprehensive system for monitoring safety internally, covering both technical and management aspects, to promote safe operations. This should be a continuous activity consisting of an integrated programme of examinations, inspections, surveys and audits carried out on a daily, weekly, monthly, or yearly basis as appropriate.

The approach should be systematic with an audit plan being developed at each location within a Corporation embracing auditing at each of several levels. Such a plan could call for regular routine inspections at the work place, periodic detailed checks on specific aspects and an overall assessment of performance.

The auditing plan should be developed in whatever ways and using whatever techniques are seen as most appropriate for the needs of the location at the time such that there could be flexibility and

differences within a Corporation. However, all levels should be covered if auditing is to be thorough. The auditing plan should be owned by the local management and primarily implemented by them and their workforce.

External audits can be a valuable means in certain cases for raising safety performance by providing a more independent viewpoint. Further, insurance companies can play a particular role by providing assistance to their customers, especially small and medium-sized enterprises, on ways and means to reduce hazards.

The perceived level of risk will be a significant factor in determining the frequency of auditing. Emphasis in the audits should be on those aspects particularly vital to the safety of the activity as revealed by the hazard studies. Some general aspects will need to be covered in all situations such as organisation and administration, training and awareness, safe systems of work, plant integrity, fire protection and prevention, reporting and investigating accidents and dangerous occurrences as well as emergency procedures.

To be of value an audit should result in an assessment of performance against the hardware and software standards previously defined. Level of performance could be categorised as 'poor (immediate action necessary), satisfactory (consider improvement) or good (no action necessary). Alternatively, a points score allocated to specific topics, weighted and combined to give an overall total could be used.

Such a review procedure could form the basis of a hierarchy of annual safety assurance reports from location executives to Division/Business/Company executives and subsequently to the Chief Executive Officer of a Corporation.

A statement of a Corporation's Safety and Health performance should be a part of the Corporation's Annual Report.

### **D.3. Accident Investigation and Reporting**

Efficient accident reporting is an important stage in effective safety management. Consequently, management needs to encourage the reporting and critical examination of accidents and "near misses" in order to generate additional information on which to base further action.

All employees must be given appropriate training in hazard identification and reporting and positively encouraged to report "near misses". Consequently, analysis of safety performance must take this into account by recognising that increased reporting of incidents and "near misses" initially does not constitute a worsening safety record necessarily but rather can make a positive contribution to risk reduction through greater "openness".

Local management in a Corporation should be responsible for ensuring prompt investigation, thoroughly analysis, correction of problems, communication and reporting in writing to appropriate members of management in the Corporation all accidents or incidents involving (or having significant potential of causing) personal injury, property damage or loss and business interruption. Storing the details of all such major and minor injury accidents and dangerous occurrences ("near misses") in a computer data base facilitates their analysis by management locally and at headquarters. By this means particular trends can be highlighted and historical data used proactively in accident prevention, e.g., by orientating training towards the type of events being experienced.

Human error is often found to be the direct cause of accidents but all too often little effort is made to understand the underlying problems. It should no longer be acceptable to record accidents or "near misses" as simply human errors. It is essential to go beyond and determine exactly what elements contributed to the error. Such elements could include boredom, stress, overwork, lack of training, inadequate procedures, poor ergonomic design, poor system/technology design, communications problems, management inadequacies, inappropriate safety goals, etc.

All fatalities and major incidents which are the result of a sudden unplanned event involving an emission, fire, explosion, poisoning or reaching the "never-exceed-limit" should be immediately reported by telephone to the appropriate members of management, including those at corporate level, and followed up subsequently by a written report of the incident.

Management should ensure that all locations in a Corporation maintain records of workers injuries and illnesses and their exposure to any hazardous substances found in the working environment.

All lost time accidents, major injuries and dangerous occurrences should be reported to the relevant authorities as required. Details of major accidents should also be brought to the notice of the relevant trade association.

Mechanisms for companies to foster the open and frank exchange of accident and related information both inside and outside the company must be further developed and encouraged. There is an obvious need to capture and share this institutional memory widely throughout industry. Means should also be developed to involve government in some way in these discussions without jeopardising the companies' interests.

## ANNEX I

### **PROVISIONAL WORKING OUTLINE RELATED TO THE OECD GUIDANCE FOR ACCIDENT PREVENTION AND RESPONSE**

#### Introduction

##### A. General Overview of Document

1. Purpose
2. To Whom Directed
3. Format/Approach

##### B. Scope and Definitions

#### I. Prevention of Industrial Accidents

##### A. Planning Considerations

1. Setting Safety Objectives
2. Setting Design, Construction and Operational Safety Criteria
3. Engineering for Safety
4. Utilizing Land Use Policies
5. Provision of Information
6. Transferring of Technology
7. Acquiring an Enterprise

##### B. Construction Considerations (Trevor - Any ideas on subheadings?)

##### C. Plant Operation Considerations

1. Organizational Prerequisites
2. Hazard Information and Safe Systems of Work
3. Operating Management and Worker Safety Training Programmes
4. Staffing and Personnel Policies
5. Procedures for Safe Maintenance
6. Plant Modification Procedures
7. Protecting Storage Facilities

##### D. Review and Evaluation by Government or Operators of the Systems to Prevent Accidents

1. Monitoring
2. Accident/Investigation and Reporting

## II. Emergency Preparedness and Response

### A. Planning Considerations

1. Content and Scope of Emergency Plans (Offsite/Onsite)
2. Gathering Information from Operators, Public Authorities, National Governments, etc.
3. Co-ordinating with Government Agencies, Community Associations, Related Industries
4. Involving Community Members
5. Adapting to Social and Cultural Realities
6. Organising Practice Drills

### B. Operational Considerations

1. Availability of Specialized Personnel
2. Availability of Necessary Equipment
3. Installing Communication Systems
4. Availability of Specialized Health Care Facilities
5. Availability of Financial Resources
6. Co-ordinating with Government Agencies, Community Associations, Related Industries
7. Post-Accident Recovery and/or Restoration of the Environment

### C. Review and Evaluation by Government and Operators of Emergency Plans

1. Routine Reviews of Emergency Plans
2. Post-Accident Review System

## III. Co-ordination Among Countries

### A. Co-ordinating the Accident Prevention Process

1. Information Disclosure Prior to Accidents
2. Information Disclosure After Accidents

### B. Co-ordinating Emergency Response

### C. Developing International Technology Safety Standards

### D. Co-ordinating Transfrontier Accident Recovery



IV. Arrangements for International Investment and Aid Programmes Related to Installations in Non-OECD countries

A. Preventing Industrial Accidents

1. Applying the Planning Principles (Section I.A) in Non-OECD Countries
  - a. Arranging for Planner's Access to Environmental or Demographic Data
  - b. Preparing a Supplemental Hazard Analysis
  - c. Adapting Safety Features to any Special Situations in non-OECD Countries
2. Applying the Plant Operation Procedures (Section I.B) in Non-OECD Countries
3. Allocating Responsibilities between Aid Agencies and Aid Recipients, Foreign Suppliers/Investors and Host Country Recipients, etc.

B. Emergency Preparedness and Response

1. Applying the Emergency Preparedness Planning Principles (Section II.A) in Non-OECD Countries
2. Applying the Emergency Response Operational Considerations (Section II.B) in Non-OECD Countries

LIST OF HEADS OF DELEGATIONS  
TO THE OECD AD HOC GROUP OF EXPERTS ON ACCIDENTS  
INVOLVING HAZARDOUS SUBSTANCES

ALLEMAGNE  
GERMANY

Dr. Hans-Jeurgem PETTELKAU  
Wiss-Director  
Federal Ministry of the Environment,  
Nature Conservation and Reactor  
Safety  
Postfach 12 06 29  
D - 5300 Bonn 1

Tel: (49) (228) 305 24 22  
Fax: (49) (228) 305 35 24  
Tlx: 885790

AUSTRALIE  
AUSTRALIA

Mrs. Louise HINGEE  
First Secretary  
Australian Delegation to the OECD  
4, rue Jean-Rey  
75724 Paris Cedex 15  
FRANCE

Tel: (33) (1) 40 59 33 59

AUTRICHE  
AUSTRIA

Mr. G.E. SCHNABL  
Counsellor  
Austrian Delegation to the OECD  
3, rue Albéric-Magnard  
75116 Paris

Tel: (33) (1) 45 20 74 45

BELGIQUE  
BELGIUM

M. Jan GORIS  
Ministère de la Santé Publique et  
de l'Environnement  
Cellule Environnement  
Cité administrative  
Bâtiment Vésale, 4ème étage  
19 boulevard Pachéco B.P. 7  
B - 1010 Bruxelles  
BELGIQUE

Tel: (32-2) 210 45 43  
Fax: (32-2) 210 47 04

CANADA

Mr. D. Wayne BISSETT  
Chief, Chemical Industries Division  
Industrial Programmes  
Environment Canada  
Ottawa, Ontario K1A 0H3

Tel: (1-819) 953 82 57  
Fax: (1-819) 953 29 40  
Tlx: 053 4567

DANEMARK

DENMARK

Dr. Albert S. WELINDER  
Head of Division  
Miljostyrelsen  
National Agency of Environmental  
Protection  
Strandgade 29  
DK - 1401 Copenhagen

Tel: (45-31) 57 83 10  
Fax: (45-31) 57 24 49

ESPAÑE

SPAIN

Mr. Rafael MOLINO-FERNANDEZ  
Direction Générale de la Protection Civile  
Ministère de l'intérieur  
Evaristo San Miguel No. 8  
28008 Madrid

Tel: (34-1) 542 9365  
Fax: (34-1)

ETATS-UNIS

UNITED STATES

Mr. Jim MAKRIS  
Director  
Chemical Emergency Preparedness  
and Prevention - OS 120  
Environmental Protection Agency  
401 M Street, S.W.  
Washington D.C. 20460

Tel: (1-202) 475 86 00  
Fax: (1-202) 382 78 84

FINLANDE

FINLAND

Mr. Heikki SALONEN  
Planning Officer  
Ministry of Trade and Industry  
Bureau for Technical Inspection  
P.O. Box 230  
SF - 00171 Helsinki

Tel: (358-0) 160 37 22  
Fax: (358-0) 160 26 94

FRANCE

M. Philippe ROCARD  
Ingénieur des Mines  
Chef de Division  
Secrétariat d'Etat à l'Environnement et  
à la Prévention des Risques  
Technologiques et Naturels Majeurs  
DEPPR/SEI  
14 bld du Général Leclerc  
92524 Neuilly-sur-Seine Cedex

Tel: (33-1) 47 58 12 12  
Fax: (33-1) 47 45 04 74

GRECE  
GREECE

Mr. Vorisis DIONYSIOS  
Sut Lieutenant  
Fire Corps Headquarters  
Part IV Section B  
4 Mourouzi St.  
Athens 10172

Tel: 721 14 41

ITALIE  
ITALY

Mr. Luigi NOE  
Vice Président  
E.N.E.A.  
Viale Regina Margherita 125  
00198 Rome

Tel: (39-6) 85 28 23 26

JAPON  
JAPAN

Mr. YuJi KIMURA  
Japanese Delegation to the OECD  
7 avenue Hoch  
75008 Paris  
France

Tel: (33-1) 47 66 02 22

NORVEGE  
NORWAY

Mr. Gunnar HEM  
Director  
Directorate for Fire and Explosion  
Prevention  
P.O. Box 355  
3101 - Tonsberg

Tel: (47-33) 160 80  
Fax: (47-33) 161 75

PAYS-BAS  
NETHERLANDS

Dr. Cees VAN KUIJEN  
Director of Toxic Materials and Risk  
Management Directorate  
Ministry of Housing, Physical Planning  
and Environment  
Postbus 450  
NL - 2260 MB Leidschendam

Tel: (31-70) 3209 367  
Fax: (31-70) 3279 868  
Tlx: 32362 VROM NL

PORTUGAL

M. Rui Figueiredo SIMOES  
Secrétariat d'Etat à l'Environnement et  
aux Ressources Naturelles  
Direction Générale de la Qualité  
de l'Environnement  
Av. Alm. Gago Coutinho, 30-6  
1000 Lisbonne

Tel: (351-1) 80 90 68

ROYAUME-UNI  
UNITED KINGDOM

Dr. Alun J. WILLIAMS  
Head of Branch B  
Hazardous Substances Division  
Health and Safety Executive  
Baynards House - Room 405  
1 Chepstow Place  
London W2 4TF

Tel: (44-1) 243 62 39  
Fax: (44-1) 229 18 85  
Tlx: 25683

SUEDE  
SWEDEN

Mr. Ulf BJURMAN  
Deputy Assistant Under Secretary  
Ministry of Defence  
S - 10333 Stockholm

Tel: (46-8) 763 26 11  
Fax: (46-8) 723 11 89  
Tlx: 17946 MINDEF-S

SUISSE  
SWITZERLAND

M. Hans Peter HAURI  
Chef de la Division déchets et sécurité  
des installations  
Office Fédéral de l'environnement,  
de la forêt et du paysage  
CH - 3003 Berne

Tel: (41-31) 61 93 62  
Fax: (41-31) 61 99 81

TURQUIE  
TURKEY

Mme. N. FEYIZOGLA  
Turkish Delegation to the OECD  
9 rue Alfred-Dehodencq  
75016 Paris  
France

Tel: (33-1) 42 88 50 02

COMMISSION DES COMMUNAUTES EUROPEENNES  
COMMISSION OF THE EUROPEAN COMMUNITIES

Mme Paola TESTORI-COGGI  
Commission of the European Communities  
Directorate General for Environment,  
Nuclear Safety and Civil Protection  
200, rue de la Loi  
B - 1049 Bruxelles  
BELGIQUE

Tel: (32-2) 235 34 30  
Fax: (32-2) 235 01 44  
Tlx: 21877 COMEU B

PROGRAMME DES NATIONS UNIES SUR L'ENVIRONNEMENT  
UNITED NATIONS ENVIRONMENT PROGRAMME

Mme. Jacqueline ALOISI DE LARDEREL  
Director  
United Nations Environment Programme  
Industry and Environment Office  
Tour Mirabeau  
39-43 Quai André-Citröen  
75739 Paris Cedex 15

Tel: (33-1) 40 58 88 58  
Fax: (33-1) 40 58 88 88